ENCYCLOPAEDIA OF
STATISTICS

D. Uppreti
Jasmer Singh
Dr. Trapty Agarwal

Encyclopaedia of Statistics

D. Uppreti, Jasmer Singh
Dr. Trapty Agarwal

Encyclopaedia of Statistics

D. Uppreti, Jasmer Singh
Dr. Trapty Agarwal

Dominant
Publishers & Distributors Pvt Ltd
New Delhi, INDIA

Knowledge is Our Business

ENCYCLOPAEDIA OF STATISTICS

By D. Uppreti, Jasmer Singh, Dr. Trapty Agarwal

This edition published by Dominant Publishers And Distributors (P) Ltd
4378/4-B, Murarilal Street, Ansari Road, Daryaganj,
New Delhi-110002.

ISBN: 978-93-84161-26-2

Edition: 2022 (Revised)

©Reserved.

This publication may not be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the publishers.

Dominant
Publishers & Distributors Pvt Ltd

Registered Office: 4378/4-B, Murari Lal Street, Ansari Road,
Daryaganj, New Delhi - 110002.
Ph. +91-11-23281685, 41043100, Fax: +91-11-23270680

Production Office: "Dominant House", G - 316, Sector - 63, Noida,
National Capital Region - 201301.
Ph. 0120-4270027, 4273334

e-mail: dominantbooks@gmail.com
info@dominantbooks.com

w w w . d o m i n a n t b o o k s . c o m

CONTENTS

CHAPTER 1
GENE ONTOLOGY AND KEGG ENRICHMENT ANALYSIS OF LYMPHOMA-RELATED GENES

Dr.Trapty Agarwal, Associate Professor

Department of Engineering, Maharishi University of Information Technology, Uttar Pradesh, India
Email Id- trapty@muit.in

ABSTRACT:
A dangerous malignant tumor with more than 70 distinct forms, lymphoma puts the body's lymphatic system in grave peril. The immune system's regulatory hub, the lymphatic system, plays a crucial role in the immune response to foreign antigens and tumors. Numerous genetic variations have been linked to lymphoma in studies, however it is still difficult to pinpoint the pathogenic processes at play. We used the Gene Ontology and KEGG pathway enrichment analyses of genes associated with and unassociated with lymphoma in the current research. Next, features were filtered and ranked using the Boruta, max-relevance, and min-redundancy feature selection techniques. The decision tree model was then used to generate classification rules by applying features that had been previously chosen and rated using the incremental feature selection procedure. The findings support those of recent publications and show that our predicted characteristics, such as B-cell activation, negative regulation of protein synthesis, negative regulation of mast cell cytokine production, and natural killer cell-mediated cytotoxicity, are related to the biological process of lymphoma. Future studies on the molecular causes of lymphoma will benefit from the fresh viewpoint that this work offers.

KEYWORDS:

Activation, Immune System, Incremental Feature, Malignant.

INTRODUCTION

A serious subclass of human malignancies, lymphoma is one of the main cancer subtypes affecting the lymphatic system. The lymphatic system controls the immune response to external antigens, bacteria, viruses, and even malignancies since it is the focal point of the circulatory immunesystem. The lymphatic system is a network of organs that runs throughout the body and comprises lymph nodes, the spleen, the thymus, and the bone marrow. Given that the lymphatic system has the potential to influence the whole body, lymphomas, which is the malignant transformation of the lymphatic system, is another serious kind of cancer that may affect the entire body.Clinicians have identified several lymphoma subgroups, such as chronic lymphocytic leukemia, cutaneous B-cell lymphoma, Hodgkin's lymphoma, and non-Hodgkin's lymphoma. Although lymphoma may take many different forms, the majority of people with the disease have similar symptoms, such as chronic tiredness, fever, and itchy skin. Even though the precise pathophysiology of lymphoma is still unknown, genetic differences and outside environmental factors including Helicobacter pylori and Epstein-Barr virus infection have been linked to the condition. Recent research has shown an association between lymphoma and genetic variants from many functional genes, including CASP10 [1], [2], ATM , RAD54L , BRAF , and CARD11 . It is still difficult to identify the pathogenic pathways based just on a gene set. Additional functional investigations, such as gene ontology and pathway enrichment analysis, may aid in illuminating the molecular underpinnings of lymphoma development and progression.For the first time, we examined and summarized the functional enrichment patterns of genes associated with and unassociated with lymphoma in this research. We aim to discover important functional enrichment words

contributing to the identification of lymphoma-associated genes using Boruta, max-relevance and min-redundancy, incremental feature selection, and decision tree algorithms. The found functional enrichment keywords have a connection to lymphoma pathophysiology. Overall, our study has revealed the first GO terms and KEGG pathways associated with lymphoma, establishing a novel method to investigate disease-associated pathogenesis at the functional level, and supporting earlier reports on the major biological effects of identified lymphoma biomarkers.Using machine learning techniques, we examined the functional enrichment patterns of lymphoma genes in this research. Figure 1 depicts the processes. DatasetWe compiled 1548 genes related with lymphoma for this investigation using the Diginetdatabase. The other human genes were classified as negative samples, while these genes were classified as positive samples. Positive and negative samples without GO or KEGG pathway information were eliminated since the aim of this research was to examine the functional terms of lymphoma-associated genes. There were still positiveand negative samples.

Feature Construction:

Gene expression and the differentiation of positive and negative samples should be determined using specific informative criteria. The properties of each gene in this research were based on the GO and KEGG enrichment scores.The link between a gene and a GO phrase is known as GO enrichment. Each gene and each GO word are given a score, which is sometimes referred to as the GO enrichment score. This score is determined by the hypergeometric test value of the set of genes in STRING that are directly next to it and another set of genes with GO annotations, and it is computed as follows:illustrates how we performed feature selection using the Boruta , murmur , and incremental feature selection algorithms. The murmur approach organised the features into a feature list, the Boruta method deleted irrelevant features, and the IFS merged several classifiers to get the ideal number of features.Technical issues might arise as a result of the dataset having a lot of characteristics. As a result, we used the Boruta algorithm to evaluate the significance of characteristics before choosing noteworthy features. The Boruta algorithm was created as a wrapper feature selection technique based on the random forest classification algorithm. From the original features, the algorithm generated shadow features at random, and it used a random forest classifier to separate the relevant characteristics from the less significant ones. The method progressively deleted features that had lower -scores relative to shadow characteristics based on the results of statistical tests . The "boruta" package from https://github.com/scikit-learn-contrib/boruta_py was used to develop the method[3], [4].

We sorted features according to their relevance using the murmur method to determine the level of importance for each feature. The informative characteristics chosen by this technique had the least overlap with one another and the greatest relevance to class labels. The approach used mutual information to compute the link between characteristics or classification labels. Where and denote the marginal probability densities of the variables, and denotes the joint probability density of the two variables, the MI values of variables and may be represented as follows. From the remaining traits, one by one, those that were most pertinent to class labels and least redundant with the others on the list were selected. The programmed was terminated if all characteristics were included in the list. The murmurprogrammed was downloaded and run with the default sett.Although the murmur technique rated the features according to relevance, it was still unclear which characteristics in the feature list were really necessary. The best features in the feature list were chosen using the IFS approach. IFS had produced a set of feature subsets from the list in the first stage. The first and second feature subsets, for instance, were made up of the top 5 and top 10 features in the list when the step size was set to 5, respectively. Next, the required classifier was trained using the training samples that were represented by features in each subgroup. In order to identify the classification model's

performance metrics, the classifier was subjected to 10-fold cross validation and the synthetic minority oversampling method. Performance measurements allowed for the identification of the best classification model.DT is a white box model that creates classification or regression models that are simple to understand, in contrast to other techniques like the support vector machine and random forest. To deepen our understanding of the model prediction process, DT constructs a tree structure in the IF-THEN style and produces understandable rules. Scikit-Learn's Python-based DT programmer was used in this investigation. Such a programmer expands the tree using the CART tree and the Gini index.In the created dataset indicated above, there is an imbalance between the sizes of the positive and negative samples, with the positive sample size being substantially lower than the negative sample size. In this study, we used the SMOTE method to deal with this problem. Using the kNN approach, the SMOTE algorithm examines and simulates a small subset of samples, adding the newly created samples to the dataset to create a new training set. The SMOTE programme used in this study was downloaded using the default settings for the parameters[5], [6].

DISCUSSION

The dataset was analyzed and important characteristics were chosen using the Boruta and murmur feature selection techniques. After applying the Boruta approach to the original dataset, 1075 features in all were kept. contains a list of these conserved traits. 1034 GO keywords and 41 KEGG pathways make up these properties. In order to rank these traits according to relevance, the murmur approach was used. In Table S1, results are also given.In order to gain the best features for identifying genes associated to lymphoma and other genes and to achieve the greatest number of features, a series of feature subsets were created when the step size was set to 5 from the murmur feature list. contains the categorization outcomes for the various feature counts. The number of features and they were used as the -axis and -axis, respectively, to plot IFS curves. The DT peaked at when the top 805 characteristics were employed, as shown in. As a result, we created the best DT classifier using these top 805 characteristics as our benchmark. Such a classifier has an ACC and MCC of 0.891 and 0.455, respectively. Additionally, the accuracy, SN, and SP were each 0.683, 0.908, and 0.378, respectively. Positive samples outnumbered negative ones by a wide margin, therefore accuracy was also not very great and SN was significantly lower than SP. Even if the top DT classifier's performance wasn't great, it may nevertheless provide fresh information that can help us distinguish between genes related with lymphoma and other genes.

The best DT classifier utilised 805 characteristics, the top 805 of which are included in Table S1. The remaining 764 characteristics were regarding GO keywords, while 41 of them were to KEGG pathways. The three categories of biological process, cellular component, and molecular function are known to apply to all GO keywords. shows the distribution of 764 GO characteristics among three groups. It is clear that BP GO words were more prevalent than MF and CC GO phrases.The DT is a white-box model that offers precise decision criteria and is useful for further research. So, utilising all of the examples, we constructed a DT using these 805 attributes. 799 decision rules were retrieved from this DT . In "Discussion," these principles are described in great depth.The essential biological effects separating genes linked with lymphoma from other genes were revealed by using the functional enrichment annotations of lymphoma-related genes to find a collection of functional enrichment words, such as GO and KEGG pathway terms. Using machine learning algorithms, we discovered a set of phrases connected to lymphoma. The following is a full description of these words.B-cell activation is described by the first functional enrichment term discovered. Early in 2002, University of California, Los Angeles researchers demonstrated that the activation of B cells has a role in the development and spread of lymphoma, even in HIV-positive individuals. Further evidence that B-cell activation is linked

to the pathophysiology and development of lymphoma was provided in 2018 by researchers from the University of the Western Cape in South Africa.

B-cell activation is therefore a functional biological process connected to lymphoma.The following functional enrichment word, refers to an intracellular anatomical structure and characterizes a cellular component as an old intracellular portion. Although there has been no direct evidence linking any intracellular structure to an etiology of lymphoma, structural variations linked to proteins that are involved with programmed cell death are particularly linked to Epstein-Barr virus-related lymphomas. This result is in line with what we expected.The generic GO word, which defines the inhibition of protein processing, was the second GO phrase to be discovered. Any procedure connected to peptide bond cleavage frequency and protein maturation effectiveness is summarized by this GO keyword[7], [8]. Recent papers claim that BAFF is a significant initiator of B-cell non-Hodgkin lymphoma. By being separated from the plasma membrane and converted into a soluble state, BAFF and its pathway are processed. In order to cause lymphoma, functional protein processing such as bond breaking may also be necessary.The following two GO words are and.

Early in 1982, a long-term in vitro culture of mast cells in mouse models verified that mast cell cytokines are connected to the development and maturation of mast cells and that these cytokines are valid in T-cell lymphoma, establishing the relationships between mast cell cytokines and T-cell lymphoma. Regarding the control of tolerance induction, this term refers to the physiological state in which immune cells do not respond to antigens or other stimuli. Tolerance occurs often throughout the development of lymphomas, particularly in B-cell lymphomas.Similar to this, although not at the top, we found KEGG pathways like hsa05202 and hsa04650. The optimum NKT cell-mediated cytotoxicity that T lymphomas are said to produce was first described in 1995, demonstrating the relationship between lymphoma and this route. Recent studies have shown that natural killer cells play a crucial role in the development of lymphomas.

The Massachusetts Institute of Technology researchers summarized disease-associated transcriptional regulation in 2013 and confirmed that T-cell lymphoma is related to transcriptional regulations, supporting our prediction for another KEGG pathway, transcriptional mis regulation in cancer.Quantitative Rules for Terms Associated with Lymphoma-Associated Genes in Functional EnrichmentIn addition to identifying biological processes linked to lymphoma, we developed quantitative criteria by using enhanced functional words. The following is a thorough analysis of the three best rules' major aspects.There are 59 characteristics in the first rule. Here, we've chosen two characteristics to talk about. The first characteristic chosen is the GO word which refers to the activation of B cells. As we have previously noted, this GO word is linked to lymphoma pathogenesis, supporting our hypothesis. Ageing is the following characteristic [9], [10]. Lymphoma's development and progression have been demonstrated to be correlated with ageing. Therefore, it seems sense to assume that ageing is a biological factor that determines whether or not lymphoma will develop.The following rule has 44 characteristics. The GO term the positive modulation of leukocyte-mediated immunity, is found as a potential candidate to be related with lymphoma in addition to B-cell activation andageing.

Our hypothesis was confirmed in 2019 by research from Shanghai RuiJin Hospital showing leukocyte-mediated immune responses are linked to a etiology of lymphoma. Furthermore, lymphoma has been linked to the negative regulation of mitophagy, and subsequent papers have confirmed this association. In general, such a quantitative rule may aid in the discovery of genes related to lymphoma.The third rule also contains a number of KEGG pathways and GO keywords that are related to lymphoma. Other than the GO words that are shared by the

two rules listed above, such as another anticipated GO term called characterizes the development of the bone marrow and has been linked to lymphoma. Recent articles state that a bone marrow biopsy is one of the primary techniques for clinical lymphoma diagnosis. Our hypothesis was supported by the close relationship between bone marrow development and lymphoma onset and progression.Overall, we developed quantitative principles for lymphoma prediction and discovered a set of functional enrichment keywords linked to the disease using machine learning models. The findings of our predictions may aid in advancing research into the basic pathological causes of lymphoma and provide us a new tool for examining the functional traits of complicated illnesses.

CONCLUSION

The purpose of this research is to uncover significant GO keywords and KEGG pathways for genes related with lymphoma. A machine learning strategy was used to identify a total of 805 important characteristics and 799 quantitative rules, which has been supported by current study findings. This research advances our knowledge of the pathogenic processes that underlie lymphoma and gives us additional resources to examine the disease's functional traits.

REFERENCES:

[1] L. Q. Zheng, S. Y. Li, and C. X. Li, "Expression profiling analysis of autophagy-related genes in perineural invasion of cutaneous squamous cell carcinoma," *Oncol. Lett.*, 2018, doi: 10.3892/ol.2018.7971.

[2] H. Wang, Y. Wang, H. E. Jinshan, C. Diao, S. U. N. Junying, and J. Wang, "Identification of key gene networks associated with fracture healing using ?SMA-labeled progenitor cells," *Mol. Med. Rep.*, 2018, doi: 10.3892/mmr.2018.9029.

[3] B. Luo, Y. yao Gu, X. dong Wang, G. Chen, and Z. gang Peng, "Identification of potential drugs for diffuse large b-cell lymphoma based on bioinformatics and Connectivity Map database," *Pathol. Res. Pract.*, 2018, doi: 10.1016/j.prp.2018.09.013.

[4] A. Zaravinos, P. Kanellou, G. I. Lambrou, and D. A. Spandidos, "Gene set enrichment analysis of the NF-κB/Snail/YY1/RKIP circuitry in multiple myeloma," *Tumor Biol.*, 2014, doi: 10.1007/s13277-014-1659-9.

[5] M. Kanehisa and S. Goto, "KEGG: Kyoto Encyclopedia of Genes and Genomes," *Nucleic Acids Research*. 2000. doi: 10.1093/nar/28.1.27.

[6] H. Ogata, S. Goto, K. Sato, W. Fujibuchi, H. Bono, and M. Kanehisa, "KEGG: Kyoto encyclopedia of genes and genomes," *Nucleic Acids Research*. 1999. doi: 10.1093/nar/27.1.29.

[7] "The Kyoto Encyclopedia of Genes and Genomes—KEGG," *Yeast*, 2000, doi: 10.1002/(sici)1097-0061(200004)17:1<48::aid-yea2>3.0.co;2-h.

[8] E. Altermann and T. R. Klaenhammer, "PathwayVoyager: Pathway mapping using the Kyoto Encyclopedia of Genes and Genomes (KEGG) database," *BMC Genomics*, 2005, doi: 10.1186/1471-2164-6-60.

[9] K. Wu, Y. Yi, F. Liu, W. Wu, Y. Chen, and W. Zhang, "Identification of key pathways and genes in the progression of cervical cancer using bioinformatics analysis," *Oncol. Lett.*, 2018, doi: 10.3892/ol.2018.8768.

[10] M. Yang, H. Li, Y. Li, Y. Ruan, and C. Quan, "Identification of genes and pathways associated with MDR in MCF-7/MDR breast cancer cells by RNA-seq analysis," *Mol. Med. Rep.*, 2018, doi: 10.3892/mmr.2018.8704.

CHAPTER 2
USE OF ANTHROPOMETRIC DATA IN THE MEDICAL SCIENCES

Dr. Nisha, Assistant Professor

Department of Science, Maharishi University of Information Technology, Uttar Pradesh, India

Email Id- nisha.kumari@muit.in

ABSTRACT:

The concept of morphometry is presented as a quantitative method for gathering data on variations and changes in organism shapes that illustrate the connection between the human body and sickness. Anthropometric techniques were used by scientists from every culture up to the present to study the human body. Because of these factors, anthropometric information is often used to detect or track illness. Anthropometry, a subfield of morphometry, is the study of the dimensions and population variability of the parts of biological forms. The examination of biological shapes quantitatively is another definition of morphometrics. Over the last twenty years, the discipline has advanced quickly to the point that we can now differentiate between classic and more current geometric morphometrics. A higher quantity of morphological information is now protected by advancements in imaging technology, which also makes it possible to analyses this data. Radiography is the oldest and most widely utilized of these techniques. Due to advancements in this field, internal organ screening using CT and MRI has also begun. Today, morphometric measures are often utilized in medical practise for illness diagnosis, monitoring, and therapy. Additionally, the usage of these new metrics in cosmetology is growing daily.

KEYWORDS:

Geometric, Imaging Technology, Morphometry, Variability.

INTRODUCTION

The human body has been measured for a variety of purposes since antiquity. Human body measurement was mostly used in the ancient world for figurative painting. In the end, anthropologists and the naturalist community both used the technique to recognize the fundamental physical traits of humans. The brief handbook Anthropometric by Johann Sigismund Esholt, which was published in the 17th century, is where the word anthropometric first arose in the scientific community. The handbook seems to be the oldest documentation of research into the human body for academic and therapeutic objectives. In order to learn more about variations and changes in the forms of organisms that defined the connection between the human body and sickness, a quantitative method was established. According to Esholt'stheory , anthropometry may be a useful tool for measuring several aspects of life, including physiognomy, the arts, and ethics. The portrayal of the tools used in clinical settings became crucial for the medical industry in the second half of the century as there was a high need for counting and measuring the human body. One of the earliest devices in the discipline was the palilogies, created by Sanatoriums at the University of Padua, which measured pulse rate. Famous French anatomist Jean-Joseph Sue, Swiss physiognomist Johann KasparLavater, and German naturalist Johann Friedrich Blumenbach all produced significant study on several measurement-related topics in the 18th century [1], [2]. With the encouragement of these academics, "the season of measurers" commenced, and practitioners began to trust in the usefulness of statistics. Anthropologists offered human research approaches and transformed into "anthropometers" by using mathematics, geometry,

and statistics. The skull, which the anthropologists regarded to be the most significant component of the body, had previously been the subject of their research. Several areas adopted the anthropometric approach as a result of Adolphe Queenlet's study in the 19th century. This practise for the development and validation of racial typologies was enhanced at this time by the new notion of human variability.In the West, artists of ancient civilizations first used measurements and described the human body; nevertheless, early modern military organizations demanded more systematic body measurements and records, which later acquired prominence. The standard method for determining if someone is suitable for military recruitmentespecially young menbecame the assessment of their height. As the relevance of public health measures increased during the 19th century, anthropometry emerged as a fresh instrument for clinical procedures and taxonomy. Anthropometry was employed to determine environmental factors that affected infant development in the 19th and 20th centuries by measuring things like weight, circumference, height, and skinfold thickness .The medical literature on nutrition and physical development provided as a useful theoretical source since ancient anthropometric research was a relatively new idea. As a result, it was thought that one of the greatest sources for summarizing the state of general health in a society was the biomedical literature of the World Health Organization.Anthropometry was used in a number of clinical settings that made use of devices such the manometer, sphygmograph, hemocytometer, hemoglobinometer, and spirometer to monitor physiological and developmental human growth . The interplay between a number of intricately intertwined concepts, such as food contamination, illness, hypoxia, and pollution, as well as psychological stress, led to the requirement for these metrics . According to factors primarily related to socioeconomic level and poverty, body size was an indication of the standard of living. Given that aspects including culture, society, behavior, and the political economy played significant but distant roles in the outcomes of development and body size, anthropometric practices might be employed as a tool for social welfare [3], [4].

The Evolution of Anthropometry Historically:

All cultures have been fascinated by the human body throughout history. The repercussions of this curiosity have been particularly well captured by artists in their creations.Famous painters employed masculine characters in their artwork in the ancient Egyptian, Greek, and Roman civilizations in an effort to express concepts like beauty, morality, independence, military force, and authority .The representation of bodily parts using reciprocal proportions piqued the imagination of painters in earlier times. According to artists, the human body depicted as an ideal human figure" had a certain ratio between each of its components. These ratios were regarded as canon throughout history. Due to the lack of standardized measuring units like the metre, centimeter, or millimeter, any part of the human body might be selected for measurement and proportioned to the other parts. Thus, each specific component of the human body might be referred to as a "unit of measurement" . Numerous modules, including foot length, hand length, and head height, were included in these measuring units .Studies of the "human body" in the fields of sculpture and painting as well as studies of anatomy in the medical sector have been conducted throughout history. Scholars analysed the "human body" in the three most well-known ancient civilizations using the ideas of canon and modules .Scholars in Egypt undertook the first recorded dissections with the intention of learning . The module used in the oldest cannons was "length of feet" . Egyptian artists drew human figures with heights six times greater than the length of their feet on the walls of the pyramids; however, when the artists realised that the proportions did not correspond to reality, they changed the height of taller human figures to a height equivalent to seven feet. They proportioned the horizontal lines based on height and the vertical lines based on the breadth of the human body, according to our current understanding of

mathematics.Polykleitos was the most well-known artist of this time period. The earliest known artistic anatomy book was written by Polykleitos, who analyzed the human body. The famous academics explained the proportions he employed between different body parts and the breadth of the hand as well as the inequalities using the width of hand as a module. Multiple equalities were utilized for the first time in depictions of the human body's longitudinal, oblique, and transversal dimensions throughout the era of Greek culture[5], [6].

DISCUSSION

Furthermore, some equality was stated when a human figure in the college posture was put in a square frame. Roman artists and academics further extended studies of the "human body." Human paintings often used a square frame because notables of the time, including Leonardo da Vinci, believed that the human figure in the standing posture had an equal length and breadth . By fusing art and anatomy and covertly using mathematics, artists of the Roman Empire continued these studies .These guidelines and dimensions served as the foundation for several works by great Renaissance painters like Leonardo da Vinci and Albrecht Dürer. Human body-related works were created in accordance with guidelines that were thought to reflect traditional anthropometrical assessment methods . Leonardo da Vinci, a well-known Renaissance artist, had interests in both the arts and sciences. He did corpse dissections and meticulously recorded his measurements, notes, and drawings like a scientific researcher would. He worked on a drawing by Vitruvius, and after thorough research of this work, he showed his success in this area. For the first time in history, he examined the human face, head, neck, and other connected parts in depth, mostly following the Polykleitos theory. In fact, one of his most well-known pieces was the Vitruvian man. Durer was a multi-talented architect and artist who contributed to the disciplines of anatomy and mathematics. He was German-born and studied both the male and female forms from an artistic and scientific standpoint. His study, however, was dependent on the use of live models and reviews of the literature since dissection at the time was not permitted in Germany. In his work, he has also explored the locations of the internal organs and shown the spleen's projections. His very exact calculations were shown in his most well-known pieceAdam and Eve.

The idea of the "average" masculine form was created after the 19th century based on extensive measurements. Due to his use of anthropometric techniques, the French physician and painter-sculptor Paul Richer conducted one of the most thorough and scientific investigations of the post renaissance period in the early 20th century. He picked "height of head" as the module and showed the front and rear views, describing the "average human figure" based on thorough measurements as opposed to the "ideal human figure." The medial and lateral views of the extremities were also used to describe human anatomy .The study of the dimensions and population fluctuations of the constituent parts of biological forms is known as morphometry, a subfield of anthropometry . The study of variations and changes in the shapes and sizes of organisms is the focus of the area of morphometrics, which is also known as the quantitative analysis of biological forms. Over the last twenty years, the subject has advanced quickly to the point that we can now differentiate between classic and more contemporary geometric morphometrics .Even as an abstract representation, in classical morphometrics it is impossible to recreate the original form's shape using the common data matrices of distance measurements. Neither the analysis nor archiving of the general form is done. For instance, a researcher can be aware that many measures utilise the same landmark, but the multivariate analyses do not take this knowledge into account. As a consequence, it cannot be anticipated that the analyses will be as effective as they might be if that data were taken into consideration.In the past, morphometrics defined forms known as landmarks by applying multivariate statistical analyses to sets of conventional measurements between locations having biological and anatomical implications. The structures' lengths, widths, and

separations from certain landmarks—which are referred to as the points of correspondence on each matching item within and within populationswere often represented by these measures. Angles and ratios have sometimes been employed .Numerous challenges persisted even after multivariate morphometrics, quantitative morphology, and multivariate statistics were merged. As an example, a number of methods for size correction were put out, although there were intense discussions on the best approach . It was crucial since various size correcting techniques produced somewhat varying outcomes. Second, the evaluation of the homology of linear distances was challenging since there weren't enough homologous points to define numerous distances . Thirdly, since the data did not indicate each distance measurement's position in relation to the other distance measurements, equivalent sets of distance measurements may be produced from two distinct forms. Even though it is an abstract representation, traditional morphometrics does not enable retrieving the shape of the original form from common data matrices. The whole form was not included in the archives or analysis. Even though a researcher may be aware of the common landmark that numerous measures share, multivariate analyses do not use this information. Analyses won't be as effective as the condition where information was utilized in as a consequence[7], [8].

Modern Geometric Morphometrics:

Biometricians started using multivariate statistical analyses on sets of conventional measures in the 1960s and 1970s. In terms of preserving morphological data and enabling its analysis, geometric morphometric approaches are more reliable than conventional morphometric methods. There must be equal attention on the two elements for morphometrics to live up to its promise of integrating geometry with biology. It is important to keep biology in mind while developing and employing morphometric approaches, and the quantitative findings must be easily understood by using biological principles .In geometric morphometrics, the original shape—which is chosen as a reference shapeis transformed to determine the biological shape. Although the concept was appealing and promising for the examination of biological forms, it lacked an analytical process when Thompson first introduced it in 1942. Applications for morphometric analysis based on Thompson's theory became feasible with the development of computers. To reflect the geometry of the structure under study, data are recorded . This information is presented as the coordinates of morphological landmark points in two- or three-dimensional space. Standard univariate and multivariate statistical studies may then be performed using the parameter estimates of the fitted function as variables . The coordinates are far more helpful than conventional measurements, and they may be used to calculate standard distance measurements . Concise encoding of all information in any subset of lengths or angles between landmarks is attainable using landmark coordinates. Complete preservation of geometric information from data gathering is the term used for analysis and visualization that use coordinate-based methodologies. Geometric morphometrics covers comparisons between biological shapes by gathering data on the locations of various points used as landmarks. Given that points are distributed uniformly throughout an organism and have some biological significance, a collection of homologous points and landmarks may provide details about various biological life forms .

The development of effective statistical techniques based on models that are used to examine the shape variation of all configurations that correspond to morphologic landmark locations is one of the fundamental advantages of geometric morphometrics over conventional approaches . In fact, recording landmarks is often the most effective method for analyzing the shapes of whole biological parts or creatures in biological or biomedical investigations . Examining an organ or organism's geometrical characteristics is a common topic of research

in medicine. The quantitative or qualitative assessment of predetermined values is known as statistical analysis in these investigations; lately, the appearance or form of a certain organ or organism has been employed as the input data for the creation of imaging methods . Measurement values are often included in quantitative or qualitative data sets used for statistical analysis. Recently, the look or form of an organ or organism has started to be employed as input data due to the advancement of imaging technology . The statistical analysis used in these investigations involves measuring the provided values either quantitatively or qualitatively.For more than 50 years, bone density has been evaluated with some caution using qualitative morphometric approaches. Aiming to describe the degree of bone loss, grading systems for the spine and proximal femur were created. It is advised to include a number of reference radiographs since the usage of such methods may result in extremely subjective judgements. X-ray imaging of the spine or proximal femur often uses quantitative morphometric methods. These procedures, however, needed certain measuring criteria in order to provide a quantitative evaluation of the degree of bone loss .

The human body has been the subject of several studies throughout history, particularly those that sought to discover the anatomical, physiological, and pathological characteristics of the internal organs. Among these investigations, the ones that focus on internal organ imaging techniques are particularly beneficial . German scientist Wilhelm Conrad Rontgen saw radiating rays when high-voltage electric current went through a Crookes tube while working with cathode ray tubes in 1895; Rontgen called them unknown rays. After 15 minutes of irradiation, Rontgen captured a picture of his wife's hand on December 22, 1895. These rays were determined to be florescent light flashes caused by extremely high frequency electromagnetic waves. X-rays may partly penetrate hard substances like bone while also passing through soft tissues. This procedure made it possible to capture inside perspectives as photographs from living things. After presenting his invention to the Physical Medicine Society in Germany, Rontgen used irradiation on black paper and a glass photographic plaque coated in plastic to create photographs of his own upper and lower teeth two weeks later. These pictures were the first ones used in radiography. During these tests, Rontgen also got the first medical X-ray radiography in history. On December, Röntgen formally reported his significant finding. The dentist Frank Harrison observed skin peeling and hair loss in his patients as a result of using X-ray radiography, even though possible radiation concerns related to the use of X-rays had been disregarded .EsatFeyzi and Osman Rifat, two medical students, used X-rays for the first time in Turkey's medical sector. Radiography was used by both classes to identify bullets in injured troops during the Ottoman-Greek war . M. conducted one of the first investigations on X-rays. Hubert. In this investigation, Hubert assessed the physiological and pathological worth of kidneys gathered from various animal species. The X-ray sensitivity of human tumor cells was investigated by Rich et al. Examples of roentgenological examinations of pulmonary function were given by Rich et al. and Taoka and Shilova, respectively.Johann Radon suggested the first quantitative CT measurement.Hounsfield used thin and weak X-rays to scan a segment, and after computer analysis, by analyzing the signals in the scintillation chamber, the result was converted into a picture. Anywhere in the body might provide a cross-sectional picture using this method. Due to its design and operating principles, CT is more effective in imaging bone tissue than soft tissues, according to investigations on the accessibility of tissues and body areas to the machine. This discovery was a significant advancement for the imaging of malignant tumors and the brain.As a three-dimensional nonprojectional approach, quantitative computed tomography is used to measure bone mineral density in the spine, proximal femur, forearm, and tibia. The ability to distinguish between cortical and trabecular bone, the fact that degenerative changes in the spine cannot alter the volumes of interest, and the capacity to ascertain 3D geometric parameters are only a few of its benefits over other densitometricmethods.The earliest efforts to acquire pictures with the MR technology began

in 1920 with Wolfgang Pauli's discovery of spin-based physic resonance. Physics researchers Bloch and Purcell were the first to carry out quantitative observations in this subject. In their studies, they showed that the magnetic field had an impact on atoms with a single nucleon in their core and that the orbit of the atomic cores varied in reaction to the magnetic field. This discovery was first only used in the context of physics. Paul Lauterbur finally got a clean MR picture in 1970. Hawkes et al. made the initial diagnosis with this technique in 1980. Currently, the MR method is widely used both worldwide and domestically because to its capacity to provide quick, high-quality pictures of internal organs and its generally low risk of adverse effects .Currently, using a variety of programmed following the frequent use of MRG has made it feasible to directly calculate the measurements of morphometric quantitative area forms. This technique has a significant role in the area of medicine since it can image in several planes, doesn't need ionizing radiation, and is used to diagnose the mediastinum.The form of an anatomical area in the human body may be determined by mathematical analysis. Optic measurement techniques are used in conjunction with 3D imaging technologies to make these assessments. For quantitating data in the intricate anatomical systems of the human body, these techniques are extremely crucial. The evaluation of this data's reliability and security has improved people's health and quality of life [9], [10].

The PET/CT modalities make up the triad of imaging modalities that is now most often employed. These imaging techniques are also capable of identifying precise tumor sites and biological characteristics, which are crucial for making a diagnosis of cancer in patients .Anthropometric measures are crucial for assessing a person's morbidities in society and for conforming to its standards. The practise of medicine must always evolve and reinvent itself in order to maintain human health. As new information about the human body was learned throughout history, anthropometric measures improved until they attained the standards used today. Improvements in measuring parameters and methodologies have unavoidably resulted from the introduction of several new measurement instruments for clinical usage and primary investigations in recent years .Artists evaluated the human body in great detail throughout the Greek, Roman, and Ancient Egyptian periods. Using mathematical techniques , Renaissance artists produced perfect ratios in their works. Leonardo da Vinci's usage of the golden ratioin his drawings continues to be the accepted standard for aesthetic excellence. This ratio compares the ratios of disproportions present on the face using anthropometric data and ratios .Over the last several years, there has been a significant propensity towards plastic surgery. Congenital deformity correction and a variety of potential body changes are among the interventions associated to this topic. The detection of these imbalances relies on human body anthropometry, particularly that of the face. Therefore, for a more objective assessment of human bodies, more standardised and purpose-driven assessments in the area of plastic surgery are crucial .Anunfavourable aspect brought on by intrinsic ageing and extrinsic UV damage is the employment of imaging methods in face cosmetics . In cosmetic dermatology, a reduction in the severity of wrinkles has emerged as a crucial evaluation criterion for determining the efficacy of rejuvenating procedures. To analyses wrinkles, many quantification techniques have been developed. A deeper knowledge of face wrinkles may result from a comparison of contemporary scales and 3D photos, which may further clarify the relationship between clinical evaluation and evaluation utilising biophysical measurement techniques. In order to compare clinical assessments with 3D fringe projections, Lumbering et al. looked into face wrinkles. The SWIRL technique was used as an illustration by Jiang et al. . The use of this technique marks a step towards a deeper comprehension of the actions and alterations brought about by prescription and over-the-counter wrinkle treatment treatments, as well as surgical and medical procedures. Breast cosmetics is a different area of medicine that makes use of imaging methods. However, the idea of breast size itself is still debatable. The proper measurement, whether subjective reporting, cup size, mammographic

evaluation, or three-dimensional imaging, is yet unknown. Breast volume and breast density must be separated. Mammography and ultrasound are helpful imaging methods for evaluating rebuilt breasts in symptomatic situations. Another crucial diagnostic method for breast cancer is magnetic resonance imaging of the breast. Planning for therapy and illness staging are two scenarios when its effectiveness is evident. The size and number of malignant lesions in the breast may be determined with the greatest accuracy using MR imaging compared to the other two preoperative imaging modalities. The investigations of Fairman et al. were the first to evaluate the tumor-to-breast volume ratio determined by MRI and to link it with the kind of surgery chosen for the patient. Ymaz et al. reviewed the findings of Boletes et al. and Fischer et al. to assess the relative accuracy of magnetic resonance imaging relative to mammography and ultrasonography for the assessment of the extent of breast tumors. They suggested that the sensitivity and specificity of US and MRI exams for detecting local recurrence were higher than clinical examinations. Additionally, MRI is crucial for planning treatments and is more objective for assessing how tumoral lesions respond to systemic therapy. Using 3D imaging and automated measures adds a new level of complexity to surgical planning. Indeed, research indicated that the cosmetology uses the portrait 3D platform.Today, visual recording is a significant component of clinical practise and medical education in many domains, including cosmetic surgery. The newest development in breast plastic surgery is perfect for 3D imaging. For assessing breast volume and simulating breast augmentation, the portrait 3D breast imaging system offers a highly repeatable 3D tool.

CONCLUSION

The fact that geometric morphometric approaches are more accurate than conventional morphometric methods is one of the primary justifications for statistical shape analysis's extensive usage in medicine. A higher quantity of morphological information is now protected by advancements in imaging technology, which also makes it possible to analyse this data. There is optimism that improvements in diagnostic and screening technologies may eventually have a favourable effect on therapy. Additionally, there has been an increase in the use of various therapeutic techniques for aesthetic purposes.

REFERENCES:

[1] S. M. S. Islam *et al.*, “Mobile phone intervention for increasing adherence to treatment for type 2 diabetes in an urban area of Bangladesh: Protocol for a randomized controlled trial,” *BMC Health Serv. Res.*, 2014, doi: 10.1186/s12913-014-0586-1.

[2] A. Ostovar *et al.*, “Bushehr elderly health (BEH) Programme, phase i (cardiovascular system),” *BMJ Open*, 2015, doi: 10.1136/bmjopen-2015-009597.

[3] S. Baharampour, J. Nazari, I. Dianat, and M. Asgharijafarabadi, “Student’s Body Dimensions in Relation to Classroom Furniture,” *Heal. Promot. Perspect.*, 2013, doi: 10.5681/hpp.2013.020.

[4] N. Utkualp and I. Ercan, “Anthropometric measurements usage in medical sciences,” *BioMed Research International*. 2015. doi: 10.1155/2015/404261.

[5] A. Kyrozis, A. Ghika, P. Stathopoulos, D. Vassilopoulos, D. Trichopoulos, and A. Trichopoulou, “Dietary and lifestyle variables in relation to incidence of Parkinson’s disease in Greece,” *Eur. J. Epidemiol.*, 2013, doi: 10.1007/s10654-012-9760-0.

[6] R. P. Timsina and P. Gogoi, "Anthropometric study of cephalic index among medical students in Nepal," *J. Kathmandu Med. Coll.*, 2014, doi: 10.3126/jkmc.v3i2.11229.

[7] T. Deborah, "Dietary Supplement Use among a Population of University Students in Italy: Correlations with BMI, Dietary Habits and Sport Activities," *Int. J. Nutr. Food Sci.*, 2014, doi: 10.11648/j.ijnfs.20140302.19.

[8] O. I. Olasunbo *et al.*, "iMedPub Journals An Evaluation of Primary Healthcare Centers (PHC) Services : The Views of Users Abstract," *Indian J. Gerontol.*, 2016.

[9] NCT03423966, "Smartphone Pedometers and Body Mass of Overweight and Obese Clients," *Https://clinicaltrials.gov/show/nct03423966*, 2018.

[10] M. A. Abolfotouh, "Biobanking experience in Saudi Arabia," *Biopreserv. Biobank.*, 2016.

CHAPTER 3
ANALYSIS OF GENDER ON SPORT SCIENCES JOURNAL EDITORIAL BOARDS

Dr.Trapty Agarwal, Associate Professor

Department of Engineering, Maharishi University of Information Technology, Uttar Pradesh, India
Email Id- trapty@muit.in

ABSTRACT:
This research examines the representation of women and men on editorial boards of publications that fall within the Journal Citation Reports category of Sport Sciences. This research offers, as far as we are aware, the first measurement of the gender split on editorial boards in the field of sport sciences. A database of editors of journals in the field of sport sciences was compiled. Using the programmed Gender data included in the statistical software R, the gender of these editors is deduced from their first names. According to this report, women hold 23% of the 4,596 editorships. If we concentrate on the most significant editor of the magazine, the so-called Editor in Chief this percentage drops to 10%. However, the proportion of women on editorial boards is positively connected with having a female EiC. There was no discernible link between the journal's impact factor and the percentage of female editors on its editorial board. In addition, the majority of women who work as Epics for journals in the first and second quartiles do so alongside males.

KEYWORDS:

Manuscripts, Representation, Underrepresentation, Wealthy Nations.

INTRODUCTION

It is commonly recognized that women are underrepresented in scientific occupations. In wealthy nations, just one out of every three scientists are a woman. Some writers demonstrate how research articles written by women are less likely than those written by males to be read, disseminated, and referenced, as well as to be covered by the media.In fact, a number of studies have shown that women have a harder time becoming eminent scientists than males do. The gender gap is obvious, and it only becomes worse as we advance in our scientific careers and see how few women editors there are in senior roles in the scientific hierarchy.It is important to note that academic publication, including partnerships, reviews, citations, and media attention, disadvantages women. Women who work with males are less likely to acquire money because men are more willing to do so. Furthermore, a tiny percentage of publications published in more prominent journals include women as the first or final author, which is likewise low in terms of chance. Men are less likely to comply with requests from female editors to review manuscripts because they are less likely to be asked to submit papers to journals or serve as reviewers and, as a consequence, are less likely to be requested to do so. Additionally, since women's articles must meet higher requirements of peer review, it takes longer for them to publish their studies. Given the underrepresentation of women in the scientific community on so many levels, it seems to reason that the editorial boards of scholarly publications would similarly exhibit this underrepresentation. It is clear how the editorial boards of scientific publications have influenced the advancement of knowledge. The editorial board is in charge of organizing their review of the papers submitted to journals and choosing which ones will be published in such journals[1], [2]. The editors have a significant role in maintaining the journal's high standards and shaping the discipline's future course. Being a member of an editorial board is a sign of great recognition in the academic

world. Editorial jobs are seen as honorable and powerful.This article's goal was to give a quick overview of the gender distribution on the editorial boards of journals that fall under the category of Sport Sciences. Since this composition had never been analyzed in this field of knowledge, it is important to emphasise how new the subject matter of this paper is.The absence of female role models for younger generations, the gender wage gap, and other issues may all be caused by the fact that women are underrepresented in science across the board. It is thought that the gender disparity should be lessened in order to favour the portrayal of women since the editorial board position in scientific publications is crucial for career progress.

It is suggested:

Encourage various publishers to create policies that favour the participation of critical editorial boards in journals in order to attain this goal.Assure the involvement of women in this subject in research by allocating resources and providing incentives for their participation.In order for this to occur, it is crucial to first discuss how women are currently positioned in each scientific discipline. According to the research, women make up 23.13% of the editors of journals in the area of sport sciences.The contrast between the gender and sex ideas is as follows. The latter is decided by nature; male or female sex is a person's birthright. However, gender, whether it be male or female, is a learned trait that may be influenced via education. Gender is the process through which people who are biologically distinct become women and men via the acquisition of traits that each culture categorizes as being feminine or masculine. Gender, in this sense, refers to how the masculine and feminine are constructed psycho-socially.In 2016, a research revealed that the proportion of women in the academic area of mathematics gradually dropped as studies became more challenging and specialized, with very little female participation in editorial positions for mathematical sciences journals. According to the study's findings, there is a greater underrepresentation of women on editorial boards for journals in the mathematical sciences than there is in the whole field. The research was intended to be extrapolated to the situation of women in sport sciences. Given that sports have historically been a domain for males, there are numerous parallels between the proportion of women in mathematics and this statistic.This study examines the gender representation on the editorial boards of 83 journals that fall within the SCIE category of sport sciences that are part of JCR. The information was acquired between December 2020 and September 2021, and these journals are published by 39 different publishers. While it's true that information on online editorial boards might alter at any moment, this research offers a snapshot of the editorial boards' gender makeup at that time. We are aware of no previous analysis of this gender mix in this field of expertise. It is crucial to examine the gender distribution of the various editorial boards for a variety of reasons[3], [4].

The underrepresentation of women on editorial boards will have an impact since they may provide a unique viewpoint and wealth of expertise to the sports industry.Being a member of the editorial board offers chances for intellectual development, professional advancement, and participation in decision-making. Anybody who isn't on the editorial board isn't eligible for these advantages or obligations.Women's growth in the field of sport sciences may also be aided by the inclusion of women on journal editorial boards.Female editors act as role models for young people.Gender representation on editorial boards of publications in fields of expertise like mathematics, medicine, or political sciences has been the subject of prior research. Due to the vast number of journals in this discipline, Amazon Mechanical Turk was employed in research where the gender of the mathematics journal editorial board was examined. This infrastructure, which uses technology, can do simple tasks that a machine cannot. Murk makes it simpler for people and organizations to contract out their processes

and duties to a dispersed labor force that can do these tasks electronically, from straightforward data validation and research to more ethereal tasks like survey participation or content moderation.

DISCUSSION

9.3% of the 13,067 editors in this survey were women, whereas 8.9% were males. It was unable to determine the gender of the editor for the remaining 0.8%. In addition, out of 435 publications examined, 51 did not have any women on their editorial boards.The gender breakdown of editorial boards for medical publications is examined in Morton and Sonnad's work . Eighty-three percent of the 3,473 editors that made up the sample of the 39 editorial boards were males. Ref. focuses on demonstrating the representation of women on the editorial boards of the 60 top-ranked worldwide journals in the area of medical research. Only 15.9% of EiC posts, according to the findings, are held by women. The disciplines that need the most accountability include critical care, anesthesiology, or radiology, all of which have lower representation percentages of women on editorial boards. A woman has never held the post of EiC in any of the publications in these categories.When the editorial boards of 119 psychiatric publications were examined, it was discovered in Ref. that women made up just 30.4% of the editorial boards. This paper comes to the conclusion that there are less women on the editorial boards overall in publications where women hold more powerful positions. It has been shown that women hold 23% of associate editor roles and 18% of EiC posts in political science.

According to Fox et al.'s research, gender perspectives in the field of ecology are approached differently. It investigates a set of data from the peer review process for all papers submitted to the journal Functional Ecology between January 2004 and June 2014 to ascertain how the gender of the editor influences the recruitment of a gender-balanced pool of reviewers and how the gender of their viewers influences responses to review invitations and the grade assigned to reviewed manuscripts. If the editor was a male, there was a smaller percentage of women editors chosen to be reviewers; also, the longer the editor's tenure and reputation in the position, the lower the percentage of women editors invited to be reviewers. Men who were offered to review were less likely to accept if the editor was a woman, whereas women who were requested to review reacted identically regardless of the editor's gender. From 1998 to 2009, Mauleón et al.'s research focuses on examining the gender of the members of the editorial boards of 131 top-tier Spanish scientific publications. This analysis comes to the conclusion that while the proportion of women on the editorial boards of the 131 journals varies by field, it is always under 30%. In 1998, there were only 8% female chief editors, increasing to 21% in 2009. It's fascinating to examine how regional differences affect the presence of women on editorial boards. The authors of Mazov et al. concentrate on the lack of women in senior editorial board positions in national Earth scientific publications whereas women hold these positions in international journals. Additionally, Table 1 in Metz and Harzing demonstrates a gender disparity between European and American journal editorial boards[5], [6].It is clear that there is interest in creating indicators based on the gender gap of the scientific journals given the significance of scientific journals in the research system and the fact that they serve as the primary communication channel. The editorial board's membership may be used as a gauge of the gender balance in science.Theorganization of this article is as follows. The procedure for gathering data and drawing conclusions on the editor's gender is described in the Methodology section. The statistical findings of the survey are discussed in the section titled "Statistical Analysis and Results," where comparisons across journals and publishers on the percentage of female editors are also made. The Conclusions, Discussion, and Limitations and Future study Lines sections respectively present conclusions and future study directions.We combined information from the 83 journals in the Journal

Citation Reports category of Sport Sciences . Based on the information provided in the journals on the website, the editorial board members' information was gathered between December 2020 and September 2021. 2018 is the year for which JCR data is being used. To ascertain the percentage of women in each editorial position in the publication, many hypothesis tests were run. With the use of the collected data, a thorough comparison of the various editorial numbers was conducted.The study's conceptual framework focuses on compiling the editorial board members of the journals falling under this category. Each individual appears in our database under the editorial position they now hold, whether it be on one or more journals; in other words, the data are maintained for all the journals in which they currently hold editorial positions. To prevent database duplication, the lowest rank for editors who held several jobs at the same journal was removed. For instance, if "Jane" appeared in the position of Editor in Chief, the highest post, and in the generic position of "Editorial Board," "Jane" was retained solely in the Editor in Chief position.

The following details were gathered:

1. Short form of the journal's name.
2. Editor's first name.
3. The editor's last name.
4. The journal's fifth quartile.

It is important to note that this procedure must be done manually since it is impossible to mechanically remove every editor from every magazine. This is because the editorial board of each publication uses a variety of storage formats, from highly structured HTML web pages to PDF files. Therefore, creating a computer code to retrieve such information is impossible.The Physicalist Medizing Rehabilitations Medizing journal's editorial board There was no way to access Koror Medizing. As a result, this journal was not included in the study, making 82 journals total. After building the database, we went on to guess the gender of the editors based on their first names.Following the collection of the appropriate editor's name, the following phase included determining the editor's gender based on the first name. A one-to-one search of the gender of the editors on the website takes a long time since the first database included over 5,000 entries.The R statistical programmed version 4.0.5's Gender data package was used to identify the gender of the editor based only on his or her first name. Several writers have used a programmed similar to this one called genderize.io in R to guess people's gender in the past.Its goal is to group character strings according to gender. These character strings are categorized using historical datasets. A census gathers details on residents, including name and gender. R employs a number of these publicly accessible censuses to infer the gender attached to a character string. Given a character string, this package estimates whether the characters are masculine or female. The U.S. Census or Social Security listing from 1932 to 2012 is used by the package Gender data to give this likelihood. Gender data offers the associated probability of gender for each first name given based on frequency counts of that gender in the census.The fundamental issue with these data sources is their data liability. Although neither the precise number of sources used nor the overall number of profiles has been disclosed, the genderize.io database uses information from many open profiles[7], [8]. Additionally, there is no assurance that the initial name and gender sections on each profile include accurate and truthful information. But it is reasonable to presume that the majority of individuals provide their gender and given name truthfully. Using given names that were previously used in other social media accounts, making them seem to have received confirmation from other users, is another approach to confirm the gender.There are unisex first names. This first name fits both the masculine and female genders since it is classified as unisex. For instance, "Andrea" is traditionally a man's name in Italy but a woman's name in the United States. The database has unisex names like "Ja,"

"Robin," "Stephane," and "Toni," among others. When the gender inference approach fails in certain circumstances, the gender is manually assigned by doing a direct search of this editor on the website. In fact, we have determined that an editor's gender is easily identifiable when the likelihood connected with his or her first name surpasses 0.85 utilizing prior findings.The previously described database, which was found through manual search, was analysed using the hypothesis testing approach. This approach involves utilising significance tests to assess the chance that a claim is accurate and the level at which we would accept it as true. All of this has a rich mathematical foundation that must be well understood. Understanding the mathematical ideas behind the creation of these tests is crucial, but it's also crucial to know how to utilise each test correctly.

A schema for the test of hypotheses includes the following phases once the data have been gathered:

Using the sample distribution of an acceptable test statistic, identify the size of the crucial zone.To calculate the test statistic's value using the sample data.To determine if the test statistic's value falls within the crucial zone; if it does, the null hypothesis is accepted, and the alternative hypothesis is accepted if it does not.Based on frequency counts, Figure 1 displays the corresponding probability for gender. For every editor with a gender probability higher than 0.85, we accepted the projected gender. Below this cutoff, we personally verified the editor's gender. Following this process, we looked at 4,596 editors in our database and discovered that 23-13% of the 4,596 editorial roles are occupied by women.In the first and fourth quartiles, proportions slightly below 0.23 were reported. We conclude that there are no significant differences between the proportion of women editors in journals of the first and fourth quartile and the overall proportion of women editors because a -value greater than the significance level 0.05 was obtained for both the first and fourth quartiles.The estimated percentage of female editors in the second quartile was 0.237, and the p-value was greater than 0.05, indicating that there was no statistically significant difference with.However, there were 26.68% fewer women on the editorial board in the third quartile. The previous test of comparative proportions was used to determine if this percentage was considerably greater than. The third quartile of journals had an editorial board percentage of women editors that was considerably greater than the overall editorial board proportion when the test was run, yielding a -value of 0.0082.The impact factor and the percentage of female editors on journal editorial boards were compared using the Pearson coefficient, which is a measure of linear dependency between two quantitative random variables. There is no discernible relationship between the impact factor of the journal and the percentage of female editors on the editorial board, since the value found for this correlation coefficient was 0.0255. Another coefficient, which is not always linear, was produced to assess the degree and direction of correlation between two ranking variables. The findings and conclusions are identical to those obtained with the Pearson coefficient because of the Spearman coefficient, whose value in this instance is 0.06137443.demonstrates that no direct correlation between the impact factor factors and the percentage of female editors on the editorial boards of the 82 journals could be discovered.For example, Kay et al. discovered relationships between journal impact factors and editor authority in sport sciences journals. In certain other fields, there is also a connection between the standing of journals and the number of women serving on their editorial boards [9], [10].

CONCLUSION

In this research, the editorial boards of 82 journals in the sport sciences category were analysed for their gender makeup. Only one of these 82 journals has no women on its editorial board, which equates to a rate of 1.2% of journals. This percentage is lower than that found in Ref. , when it was found that 11.72% of the mathematical journals included in the

JCR lacked any female editorial board members.The proportion of women editors overall in the Sport Sciences category examined in this work was, which is higher than the proportion of women editors overall on the editorial boards of mathematics journals and medical journals andpsychiatry.According to this research, there are no significant variations in the percentage of female editors and the percentage of female Emerita on the editorial board. Emeritus membership on an editorial board of a publication could offer a window into the past. Therefore, the fact that there are still 23% of women on editorial boards shows that the current situation is comparable to the past.

REFERENCES

[1] F. Lebreton, R. L. Peralta, J. Allen-Collinson, L. C. Wiley, and G. Routier, "Contextualizing Students' Alcohol Use Perceptions and Practices within French Culture: An Analysis of Gender and Drinking among Sport Science College Students," *Sex Roles*, 2017, doi: 10.1007/s11199-016-0652-8.

[2] J. T. Costello, F. Bieuzen, and C. M. Bleakley, "Where are all the female participants in Sports and Exercise Medicine research?," *Eur. J. Sport Sci.*, 2014, doi: 10.1080/17461391.2014.911354.

[3] M. Martín Horcajo, "The contribution of sexual difference feminism to the analyses of gender within sport," *Rev. Int. Sociol.*, 2006, doi: 10.3989/ris.2006.i44.30.

[4] L. L. Aull and D. W. Brown, "Fighting words: A corpus analysis of gender representations in sports reportage," *Corpora*, 2013, doi: 10.3366/cor.2013.0033.

[5] P. L. Wanneberg, "The sexualization of sport: A gender analysis of swedish elite sport from 1967 to the present day," *Eur. J. Women's Stud.*, 2011, doi: 10.1177/1350506811406075.

[6] J. Hall and B. O'Mahony, "An empirical analysis of gender differences in sports attendance motives," *Int. J. Sport. Mark. Spons.*, 2006, doi: 10.1108/ijsms-07-04-2006-b008.

[7] J. Müller, S. Müller, J. Stoll, K. Fröhlich, C. Otto, and F. Mayer, "Back pain prevalence in adolescent athletes," *Scand. J. Med. Sci. Sport.*, 2017, doi: 10.1111/sms.12664.

[8] E. Esteve, M. S. Rathleff, C. Bagur-Calafat, G. Urrútia, and K. Thorborg, "Prevention of groin injuries in sports: A systematic review with meta-analysis of randomised controlled trials," *British Journal of Sports Medicine*. 2015. doi: 10.1136/bjsports-2014-094162.

[9] J. Adriaanse, "Gender Diversity in the Governance of Sport Associations: The Sydney Scoreboard Global Index of Participation," *J. Bus. Ethics*, 2016, doi: 10.1007/s10551-015-2550-3.

[10] J. A. Senne, "Examination of Gender Equity and Female Participation in Sport thesportjournal.org /article/examination-of-gender-equity-and-female-participation-in-sport," *Sport J.*, 2016.

CHAPTER 4
IRANIAN MEDICAL SCIENCE STUDENTS' CRITICAL THINKING CAPACITY

Dr.Trapty Agarwal, Associate Professor

Department of Engineering, Maharishi University of Information Technology, Uttar Pradesh, India
Email Id- trapty@muit.in

ABSTRACT:
One of the most important goals of the educational planning system at medical sciences colleges across the globe is to promote critical thinking. Determining the amount of critical thinking abilities and propensity for critical thinking among medical science students is crucial. The purpose of this systematic research was to assess the critical thinking skills of Iranian students studying medical sciences. Methods. A search was done in the databases of PubMed, Web of Science, Scopus, ERIC, and Magi ran to find published papers in the topic of critical thinking in Iran. The search was conducted without regard to a deadline using the terms critical thinking, medical sciences, and Iran in both Persian and English. The Newcastle-Ottawa Scale was used to evaluate these publications once the articles had been chosen using the PRISMA flow diagram. Results. Eighty papers were ultimately chosen for the final study after the quality of the searched articles was assessed. 12,578 students made up the whole sample of the articles. The findings showed that, of 51 studies in the area of critical thinking abilities, 48 reported these skills at a low level among students of medical sciences, 2 at a medium level, and just 1 at a high level. Thirty-nine papers in the subject of critical thinking disposition rated their degree of inclination as low, eleven articles at medium, and five publications at high. Conclusion.

KEYWORDS:

Century, Distinguish, Propensity, Scopus.

INTRODUCTION

A key tenet of universities in the third century is critical thinking. Critical thinking is now seen as a new role of colleges, among others like entrepreneurship. Critical thinking is a crucial component of developing skilled labor in the era of information explosion and the shift from an industrial to a knowledge-based society. We are exposed to a significant amount of information each day as a result of the expansion of information and communications. As a result, critical thinking enables people to distinguish between reliable and false information and provide accurate assessments of occurrences. One of the most crucial requirements and skills for surviving in the current world is critical thinking. Students majoring in the health sciences should have critical thinking skills since they are one of the foundational elements of healthcare systems and will need to use them to solve problems and make choices. Today, it is stressed that the teaching-learning process should take critical thinking into account as a crucial skill in the decision-making process for diagnosis and treatment. Just as with the case of providing educational infrastructure, critical thinking can have an impact on the improvement of the quality of the teaching–learning process. One aspect of thinking, as well as a mode of thinking, is critical thinking[1], [2]. A logical and argumentative concept is represented by critical thinking when it results from a regular, structured mental process. The manner we make decisions and the things we must believe are the main points.The identification, evaluation, reasoning, judgement, and decision-making processes are all made easier with the help of critical thinking, which is a crucial data analysis ability. Critical

thinking requires both the temperament and the ability to think critically. The cognitive component of critical thinking is formed through skills, while the emotional component is formed by inclination. The components of analysis, inference, and assessment make up the essential cognitive abilities that underpin critical thinking.Analysis is the capacity to identify objectives across several areas and their connections. The capacity to identify reliable empirical components and supporting data in order to draw conclusions about a phenomenon is another definition of inference. Validating many viewpoints on a phenomenon is the definition of assessment.Studies stress the value of critical thinking abilities. The capacity to make decisions and critical thinking abilities are considerably positively correlated, according to 2016 research on Iranian students. This research found that having the ability to think critically is one of the most essential requirements for having professional competence and making the right decisions. Inference and scientific reasoning among students were shown to be considerably positively correlated, according to another research published in 2018. One of the elements of critical thinking skills, decision-making, was shown to strongly positively correlate with self-efficacy views in a 2013 research. Additionally, research conducted on Australian students revealed a strong link between academic achievement and critical thinking abilities. Additionally, 2017 research found that educating pupils to think critically considerably enhanced their problem-solving abilities.The ability to think critically is referred to as having a critical disposition, which encompasses the qualities of being open-minded, truth-seeking, analytical, methodical, critical self-confident, inquisitive, and having mature judgement. Open-mindedness: Individuals that exhibit this trait are tolerant of other worldviews and respect the rights of others. Truth-seeking traits: These individuals are courageous enough to ask inquiries and are right in their informational pursuits. Analytical: The propensity for the thoughtful examination of phenomena and the application of logic is indicated by being analytical. Systematic traits: People that possess systematic traits use an organized approach to analyses events and phenomena. These individuals have a high degree of focus. Critical self-confidence: People who possess this trait have faith in their own talents and abilities. Being curious: People that are curious have a propensity for learning new things and enjoying novel experiences. Judgement maturity: Cognitive growth is a significant sign of judgement maturity. People that possess this trait base their decisions on clear and straightforward criteria [3], [4].

According to Ricketts, characteristics of critical thinking include inventiveness, mental conflict, and cognitive maturity. Mental conflict: Mental conflict is a sign that you're looking for possibilities to apply logic in different contexts. Creativity is a sign of a person's aptitude for curiosity and desire to learn the truth. Cognitive maturity is characterized as understanding the intricacy of topics, respecting other people's ideas, and being aware of one's own biases as well as those of others.The link between critical thinking and other factors has been the subject of several research. According to 2003 research conducted among Canadian students, the ability to think critically is crucial for developing critical thinking abilities. Additionally, a strong correlation has been shown between Korean nurses' propensity for critical thought and their clinical proficiency. Another research published in 2017 found a substantial correlation between Malaysian teachers' propensity for critical thought and academic self-efficacy. Additionally, research conducted among Turkish students revealed that social and emotional learning areas were greatly improved by critical thinking tendencies. Additionally, 2017 research found a statistically favorable correlation between problem-solving skills, a propensity for critical thinking, and the desire for empathy[5], [6].

Several research on the critical thinking abilities of medical science students were undertaken in Iran, with varying degrees of success. Therefore, a thorough analysis of these investigations is required. Therefore, the current research intends to give a thorough and

systematic overview of studies completed in this area in order to provide a clear and accurate image of the critical thinking capacity of medical sciences students in Iran.

DISCUSSION

The study's inclusion criteria included the publication of articles in both Persian and English, the accessibility of the articles' abstracts and full texts, the conduct of research in Iran, the originality of the articles, and the articles' applicability to the study's goal and main research question. Duplicate article titles, letters to the editor, and review articles were among the exclusion criteria.A few articles were subjected to the PRISMA flow diagram application, as shown. The method for looking for and choosing articles was created with the study's goal in mind. Out of the 486 Persian and English items that were retrieved during the preliminary search, 114 were removed due to duplication. Following that, 285 articles were removed after being reviewed for their titles and abstracts. The whole text of 87 articles was examined in the last phase, and 7 items were removed. Finally, the research contained 80 publications. The Newcastle-Ottawa Quality Assessment Scale was used to evaluate the quality of these papers . Students studying medical sciences were the intended audience in the publications under review. Allied health professions are referred to as medical sciences. Students specializing in health sciences are referred to as medical sciences majors in Iran.

The topic selection procedure, comparability, and outcomes are the three criteria used by the Newcastle-Ottawa Scale to rate papers. The publications were graded according to this scale, with 0 being the lowest quality research and 9 being the highest quality study . Studies with a score below 4 were considered to be of poor quality. The researchers created a checklist with the following components to extract data from the chosen studies: the author's name, study title, study design, sample, sampling technique, data collecting instrument, and findings.

486 items were found after scanning both Persian and foreign databases. The articles were arranged using the Endnote-10 programmed. 285 items were eliminated using this programmed because they were redundant and useless. The researchers then looked through 87 articles' whole texts. Eighty of the 87 papers were ultimately appraised for quality, and seven articles were eliminated. In this respect, 3 studies were disqualified for having been previously published in other journals, 2 articles were disqualified for not mentioning critical thinking, and 2 articles were disqualified because the findings were ambiguous and it was unclear how the grading was done. The findings were then shown on eight axes, including the author's name, the year of publication, the research design, the sample size, the sampling technique, the results, and the language of the publications.Features of the research regarding Iranian medical science students' critical thinking that were evaluated.

The findings showed that the whole 80-article collection was released between 2004 and 2018. 12,578 students made up the sample for all 80 articles. The majority of the samples in the 60 research were female college students. The language of publishing was Persian, with 69 articles appearing there, and English, with pieces the features of the research materials and techniques are shown. A census method was reported as the sampling method in articles, followed by the convenience method in 10, the random method in 8, the stratified random method in 19, the systematic random method in the cluster random method in the purposive method in 1, and the no sampling method option inarticles.The cross-sectional approach was used in 65 papers, 13 articles used the quasiexperimental method, one research used the longitudinal method, and one article used the causal-comparative method.The examination of the articles revealed that critical thinking was a topic in 29 of the 80 articles examined. In the total number of studies on critical thinking disposition, the California Critical Thinking Disposition Inventory was employed in 15 papers and 14 research, respectively[7], [8]. The

California Critical Thinking abilities Test, Form B was used in 46 of the 51 papers on critical thinking abilities, while the Watson-Glaser Critical Thinking Appraisal was utilized in 5 of the 51 articles . The range of possible scores for the and the Ricketts' Critical Thinking Disposition is. Therefore, the cut score and the range of scores described in psychometric research were used in this study to measure the degree of critical thinking in students.We came across two sorts of articles while researching the chosen articles. Several publications concentrated on developing critical thinking abilities, and others on developing a critical thinking disposition.

As a result, the quantity of critical thinking is described in this article in terms of abilities and personality.Along with the critical thinking variable, 42 factors were applied to the articles under study. 16.66% of these were concerned with academic success or performance, while 9.52% dealt with emotional intelligence. Additionally, 7.14% of the publications examined the factors associated with problem-solving learning and self-efficacy individually. Additionally, 4.76% of articles looked into achievement goal orientation, information literacy, self-esteem, team-based learning, metacognition, self-directed learning, learning styles, and clinical decision-making variables, while 2.38% looked into occupational therapy, team-based learning, ICT, mental health, metacognition, conflict management styles, creativity, entrepreneurial characteristics, decision-making ability, metacognition, and flipped classrooms.

The answers to the second and third questions in the current research revealed that, in 48 articles, students' critical thinking abilities were lacking. In two articles, their critical thinking abilities were on the average, whereas in only one piece, they exhibited above-average abilities. When it comes to the tendency towards critical thinking, 13 articles had a low or ambivalent disposition, 11 had a moderate disposition, and 5 studies had a high or positive disposition.According to the findings of this systematic review, students of medical sciences had poor critical thinking abilities in the majority of research. Studies were also carried out in other nations to gauge pupils' critical thinking. In this respect, the findings of a research conducted in the United States in 2009 showed that pharmaceutical students' critical thinking abilities were at a desired and above average level.

The critical thinking abilities of Canadian physiotherapy students were found to be above average and desirable in another research conducted in 2004. Higher critical thinking abilities were identified in nursing students than in the research carried out in Australia.Regarding Iranian students' poor critical thinking performance as compared to students from other nations, we argue that the Iranian educational system does not take improving students' critical thinking into account. Thus, one of the most significant difficulties facing medical educators and educational planners today is the development of students' critical thinking abilities.Given that children can learn critical thinking, it should be prioritized in curriculum design to teach them this skill.

The upper stages of Bloom's cognitive domain, such as analysis, synthesis, and evaluation, should be stressed in order to improve students' critical thinking skills in higher education curricula. The right teaching strategies should be used in order to foster the development of critical thinking abilities within the confines of the medical education curriculum. One of the most significant factors that should be taken into account for the teaching of critical thinking in this respect is the transition from teacher-centered models to student-centered models. Additionally, encouraging students to engage in class debates, shifting towards problem-based learning, and using active learning practices are all excellent ways to promote critical thinking in the classroom.The majority of research on pupils' critical thinking abilities found that it was at a low to moderate level. According to the findings of a research conducted in

Turkey in 2016 on nursing students, the students' capacity for critical thought was subpar. According to the findings of a different research done in Ireland in 2018 , first-year nursing students had a higher proportion of critical thinking disposition. The critical thinking disposition of students was at a high level, according to a 2019 research on medical students in China . Another study's findings on Chinese medical students revealed a favorable attitude towards critical thinking.In the critical thinking disposition, consideration is given to the person's attitude, intentions, and different concerns and subjects as well as how they are being thought about. Without a critical thinking mindset, it is thought that critical thinking abilities cannot be developed.

Additionally, a critical disposition does not always follow from possessing critical thinking abilities, and people who possess a critical disposition may not necessarily be critical thinkers. As a result, it is important to completely comprehend the importance of critical thinking as well as the topic of critical thinking. Critical thinking abilities and critical thinking disposition, in our opinion, are interrelated. Without a critical thinking disposition, critical thinking abilities are meaningless and cannot be used in real-world situations by pupils. Additionally, if an educational system fosters students' propensity for critical thought but lacks the necessary technical, cultural, and instructional infrastructures, that propensity will eventually wane.

According to the findings of studies on critical thinking done in Iran, researchers utilise four main techniques more often than other instruments to gauge talent and propensity for critical thought. These instruments include the Watson-Glaser Critical Thinking Appraisal, the California Critical Thinking Skills Test, the Ricketts Critical Thinking Disposition Inventory, and the California Critical Thinking Disposition Inventory. The most crucial instrument for gathering data is a questionnaire in research that use a quantitative approach. Therefore, while selecting the assessment instruments, consideration should be given to psychometric indices, the quantity of questionnaire questions, response times, and compatibility with respondents' sociocultural features. For an accurate diagnostic of critical thinking abilities and the propensity to think critically, researchers should employ the qualitative technique and semistructured interviews.

It can be said that curriculum components such as the objective, learning content, teaching methods, learning activities, and learning assessment should be designed in a way to facilitate the process of critical thinking with regard to the promotion of critical thinking in health sciences students in Iran. The design of the teaching-learning process in the classroom should allow the instructor to act as a facilitator and provide the students the chance to voice their opinions. Students should take an active part in their education and bear the bulk of the responsibilities. Along with educational considerations, a society's sociocultural traits and situations also have an impact on how critically a community's members, including students, think. It is possible to say in a single line that a community's sociocultural structures must be ingrained with the spirit of critical thinking.There were several limitations to the current investigation. There may have been studies completed that matched the goals of the current investigation but were not included in this analysis because they were not published. Additionally, owing to language restrictions, we could only take into account papers that were published in Persian and English for our analysis. The quality of the research in the present investigation varied, which can have an impact on the reliability of the findings. Another restriction on the current research is the inconsistent reporting of papers. The goal of the current research, like many qualitative investigations, was to get a thorough grasp of a topic. The ability of the present research to describe the existing state of critical thinking abilities and the propensity to think critically among Iranian students pursuing health professions was therefore its most significant strength. The study's ability to pinpoint

characteristics connected to critical thinking is another virtue. Future study will thus be able to focus more on the connection between these factors and critical thinking. The results of this research by itself are insufficient for substantial planning and decision-making on critical thinking in health students. Nevertheless, it is feasible to plan and choose to encourage critical thinking in students, according to the findings of research on critical thinking in Iranian students as well as the results of the present study[9], [10].

CONCLUSION

The rate of critical thinking among Iranian students studying medical sciences was examined in this systematic review. Critical thinking was measured in two areas: critical thinking abilities and critical thinking character. The findings showed that Iranian students studying medical sciences lacked critical thinking abilities. The ability of the students to think critically was similarly low and moderate. Future research should thus concentrate on examining and finding effective elements in encouraging critical thinking in students in light of the significance and requirement of critical thinking for students of medical sciences. It is advantageous to offer seminars and critical thinking training courses because critical thinking may be taught.

REFERENCES;

[1] S. S. M. Mahmoodabad, H. Nadrian, and H. Nahangi, "Critical thinking ability and its associated factors among preclinical students in Yazd Shaheed Sadoughi University of Medical Sciences (Iran)," *Med. J. Islam. Repub. Iran*, 2012.

[2] M. Pouralizadeh, H. Khankeh, A. Ebadi, and A. Dalvandi, "Factors influencing nursing students' clinical judgment: A qualitative directed content analysis in an Iranian context," *J. Clin. Diagnostic Res.*, 2017, doi: 10.7860/JCDR/2017/25753.9822.

[3] F. Rahnama and M. Mardani-Hamooleh, "Iranian Nursing Students' Perceptions Regarding Use of Concept Mapping: A Content Analysis," *Res. Dev. Med. Educ.*, 2017, doi: 10.15171/rdme.2017.008.

[4] H. Karimi Monaghi, M. Rad, and M. Bakhshi, "Do the New Methods of Teaching in Medical Education have Adequate Efficacy?: A Systematic Review," *Strides Dev. Med. Educ.*, 2013.

[5] F. Haghani, B. Aminian, F. Kamali, and S. Jamshidian, "Critical Thinking Skills and Their Relationship with Emotional Intelligence in Medical Students of Introductory Clinical Medicine (ICM) Course in Isfahan University of Medical Sciences.," *Iran. J. Med. Educ.*, 2011.

[6] P. Abolghasem, L. Dehghankar, S. E. Badiee, M. Jafarisani, H. Tadayyon, and A. Khalafi, "Studying the Association of Quality of Life and Happiness among University Students," *Nov. J. Humanit. Soc. Sci.*, 2016, doi: 10.20286/nova-jhss-050201.

[7] A. A. Rezaee, "Iranian Domestically Designed ESAP Textbooks and Students: A Critical Thinking Perspective," 2016.

[8] L. S. Johnson, *Winning Debates*. 2018.

[9] B. Igel *et al.*, “the Fall and Rise of Strategic Planning” *Manag. Decis.*, 2015.

[10] G. Sedek *et al.*, “RELACIÓN ENTRE DEPENDENCIA EMOCIONAL E INDEFENSIÓN APRENDIDA EN MUJERES VÍCTIMAS DE VIOLENCIA INTRAFAMILIAR,” *J. Abnorm. Psychol.*, 1978.

CHAPTER 5
NANOTECHNOLOGY: A REVOLUTION IN BIOMEDICAL SCIENCES

Dr.Vikas Kumar Shukla, Assistant Professor

Department of Science, Maharishi University of Information Technology, Uttar Pradesh, India

Email Id- vikash.shukla@muit.in

ABSTRACT:
At the intersection of the physical sciences, molecular engineering, biology, biotechnology, and medicine, recent research on nanoscale biosystems has produced one of the most active scientific and technology sectors. Improved comprehension of living and thinking systems, ground-breaking biotechnology techniques, the creation of novel medications and their targeted administration, regenerative medicine, neuromorphic engineering, and the creation of a sustainable environment are all included in this field. Research on nanobiosystems is a top priority in many nations, and its importance to nanotechnology is predicted to grow in the next years. The motivation for nanomedical research is the recognition that the nanoscale has certain features required to address significant medical issues and unmet medical demands. The importance of the most recent nanotechnologies and nanoscience on human health is examined in the current review. The study discusses the potential it presents and offers advice on how to handle significant advancements in these fields.

KEYWORDS:

Administration, Biosystems, Comprehension, Nanotechnologies.

INTRODUCTION

Significant scientific and technical advancements in a variety of sectors, including medicine and physiology, are expected to be produced via nanotechnology and nanoengineering. They can be broadly categorized as the science and engineering involved in the design, synthesis, characterization, and application of materials and devices whose smallest functional organization is on the nanometer scale, ranging from a few to several hundred nanometers, in at least one dimension. In terms of size, a nanometer is one billionth of a meter, or three orders of magnitude, smaller than a micron. For example, a DNA molecule is 2.5 nm long, whereas a sodium atom is 0.2 nm.The spatial and temporal scales being considered directly determine the potential effects of nanotechnology: materials and devices engineered at the nanometer scale imply controlled manipulation of individual constituent molecules and atoms in how they are arranged to form the bulk macroscopic substrate. This implies that, as a consequence of the control over their molecular synthesis and assembly, nanoengineered substrates may be made to display extremely particular and regulated bulk chemical and physical characteristics.These materials and devices can be created to interact with cells and tissues at a molecular level with a high degree of functional specificity for applications in medicine and physiology, enabling a level of technological and biological system integration that was previously unachievable. In order to bring together the necessary collective expertise needed to develop these novel technologies, traditional sciences such as chemistry, physics, materials science, and biology have come together to form the emerging field of nanotechnology[1], [2]. The relevance of nanoscience and the most recent nanotechnologies for human health are examined in this study.

The study discusses the potential it presents and offers advice on how to handle significant advancements in these fields.There are several intricate and very effective "machines" in living cells. They are made up of large molecules, such as proteins. They participate in almost all cellular functions, including information exchange, metabolism, and chemical transport. New tools made possible by nanotechnologies allow us to see the functioning of these machines down to the atomic level, even inside of live cells. For instance, it is feasible to quantify the pressures that bind hormones and other trigger compounds to their receptor proteins, which serve as switches in the cell membrane, using atomic force microscopes. Quantum dots may be used to label biomolecules. The route taken by the biomolecules in the cell may be accurately tracked because to the strong light of a particular wavelength that these nanocrystals produce. Finding out about fundamental biochemical and biophysical processes in both healthy and sick cells is a major focus of this study. This information may serve as the foundation for the creation of fresh preventative measures and treatments. Along with this essentially knowledge-expanding study, several potential uses for nanotechnologies in medicine are also being investigated. In particular, there is a lot of research being done in the areas of imaging, sensing, targeted medication administration, and gene delivery systems. Applications in areas like tissue medical implants and disinfection are also the subject of more investigation. There are presently few clinical uses, in part due to strict safety regulations. However, scientists have high hopes for nanomedicine, particularly in the long run.As our understanding of the human genome and of the products of protein expression has greatly increased, we are increasingly able to link illnesses to aberrations at the molecular level. Theoretically, this opens up the prospect of getting a diagnosis very early onand maybe even beginning treatmenteven before the disease's earliest symptoms manifest. As a result, prevention is getting more attention in medicine. An excellent example of this is newborn metabolic illness screening. To find these molecular biomarkers, the medical community has access to an expanding set of scientific instruments. The influence of nanotechnologies will likely be seen in this sector earliest. The diagnostic study may be carried out in a lab using samples from the human body, or it can be done on the patient themselves. This difference is crucial because the tools/agents in the latter scenario must adhere to stricter standards.

To evaluate gene expression, or the amount of RNA produced in sick tissue, or to determine the version of a certain gene a person has, research into patients' genetic material is possible. There are several versions of many human genes that only vary by one nucleotide pair. SNPs, or single nucleotide polymorphisms, are what they are. The related protein variations may vary from one another by a single amino acid and subsequently show a significant functional difference. SNPs impact a person's susceptibility to chemicals, including medications, and are the cause of a wide range of hereditary illnesses. This relates to both their adverse effects and therapeutic impact. Major opportunities are provided by genetic research for discovering gene types that predispose a person to certain illnesses and for improving the match between a patient's specific needs and the medications recommended to them.Since a few years ago, DNA chips used for DNA analysis have been available. Although they are often utilised in scientific and biological research, clinical application is uncommon. The chips consist of a base-sequence-differentiated microarray containing hundreds to thousands of single-strand DNA molecules. The location on the chip where the DNA from a tissue sample that has been tagged with a radioactive or fluorescent substance attaches to the chip DNA may be used to identify the DNA from that sample. Since 2003, the Dutch Cancer Institute has used a DNA chip to use gene expression patterns to forecast the spread of breast cancers[3], [4]. Finding individuals who might benefit from further chemotherapy after the cancer has been surgically removed is now much simpler than it formerly was because to this information. Leukemia diagnostic chips as well as chips to diagnose cancers of the mouth and throat are being developed. Originally a product of microtechnology, DNA chips and other biochips are now being miniaturized, much like computer chips. The production of the chips as well as

improving their detection sensitivity and dependability depend increasingly on nanotechnologies .Quantum dots are used in a novel nanotechnological analytical technique. The identification of DNA in a sample is based on its interaction with DNA molecules of known composition that are contained in micrometer-sized polymer spheres containing different quantum dot mixes, each of which produces a distinct spectral bar code. This approach has been utilised by American researchers to examine SNPs in genes that produce the cytochrome P450 family of enzymes, which are involved in the body's breakdown of chemicals, including medications. Multiple SNPs may be studied concurrently in huge numbers of samples using this approach.In principle, pushing DNA molecules through membrane nanopores using an electric potential difference is another way to determine the makeup of the molecules. The temporal profile of the electric current passing through the pores may be used to determine the base sequence. This technique has now been utilised by researchers to pinpoint a mutation in an HIV gene that causes the virus to become resistant to a certain treatment. This technique, which is still under development, might lead to a considerably quicker approach than what is now available for figuring out the base sequence of DNA. In order to do this, a chip would need to have hundreds of pores.

DISCUSSION

Patients are administered contrast agents or radiopharmaceuticals in the case of in vivo diagnostics. These agents may be used to image pathophysiological alterations and functional changes, such as variations in blood flow in cells, tissues, and organs, thanks to their unique features. The phrase "molecular imaging" is often used since modern imaging methods are more and more focused with illuminating molecular indicators of disease processes, such as a receptor protein on a cancer cell's surface. To do this, a carrier molecule or particle is additionally given a molecule that selectively attaches to the biomarker, such as an antibody, in addition to a contrast agent. Techniques based on ultrasonic vibrations, radioactive chemicals, magnetic resonance imaging, and fluorescent substances have all been created, each with its own contrast agents and imaging tools. Each has its own limitations as well as potential uses. Early illness identification is made feasible and information on suitable treatments is provided by molecular imaging. Imaging is also excellent for assessing, monitoring, and enhancing the delivery of therapy. Numerous opportunities exist for developing new and better imaging methods thanks to nanotechnologies.Perfluoro hydrocarbon nanoparticles with a lipid layer have a variety of applications. As an ultrasonic contrast agent, they are suitable. They may also be used for MRI or scintigraphy imaging if gadolinium compounds or radioactive materials like technetium-99 are mixed with the lipid layer of the nanoparticles. The particles may make pathogenic alterations in blood arteries evident with the correct targeted chemical. The application of the nanoparticles as a contrast agent for the diagnosis of atherosclerosis, thrombosis, and angiogenesis is presently being explored. Within a few years, a clinical investigation is anticipated to begin [5], [6].MRI contrast agents made of superparamagnetic iron oxide nanoparticles are increasingly being employed in clinical settings. They build up in the liver, spleen, and lymph glands following intravenous delivery, making it possible to study those organs. According to patient-based studies, they may also make cancer metastases in lymph nodes more detectable. The particles may be utilised to label live cells when combined with dendrimers. Such magneto dendrimers enable, for instance, the observation of cell transplantation-related processes such as cell migration and division. The technique, which has previously been used successfully on lab animals, may prove to be helpful in stem cell treatment in the future. For usage as contrast agents, gadolinium dendrimers are also being researched. The launch of the first of these agents is nearly complete. They may be used to examine blood arteries, kidneys, liver, or lymph glands depending on their size and solubility in water or fat.Fluorescent colorants are administered orally or intravenously and then accumulate, for example, in tumours, in optical

imaging methods. When laser light is used to irradiate the cancer cells, they glow. This approach can only be used to image tumours in or just below the skin or in tissue, that is, accessible via an endoscope, since the laser light cannot penetrate deep into the body.New optical techniques based on the utilization of nanoparticles are the subject of extensive research that has been going on for a while. The development of quantum dots has reached its most advanced level. Compared to colouring chemicals, these nanocrystals fade less rapidly over time and do not interact with cell components. Additionally, it is feasible to have quantum dots of several colours glow when exposed to laser light of the same wavelength, enabling multiplex applications. Nanoparticles have previously been employed effectively in cell cultures and lab animals to colour biomarkers on the surface of cancer cells, to track the development of cell lines in a frog embryo, and to highlight blood arteries and lymph glands in mice. The latter use is anticipated to eventually increase the likelihood of tracking cancer metastases. Due to their tiny size, nanoparticles may readily infiltrate even the tiniest compartment of the cell, which is the basis for all of these applications.

There is now research being done to determine if a wide range of nanoparticles are suitable for use as a delivery mechanism. Depending on the active material that has to be carried, the target organ, and the administration technique, different particles will work best. Some particles, including nanoparticles made of solid fat or polymer, seem to be suitable for carrying a variety of chemicals. Other nanoparticles, particularly inorganic ones, have less potential for use. The majority of delivery methods now under development are used to deliver proteins, peptides, genetic material, and anti-tumor medicines. Since the middle of the 1970s, polymer nanoparticles have been used as active ingredient delivery devices. Only in the early to mid-1990s did researchers start to investigate the potential of various systems, such as solid fat nanoparticles, dendrimers, fullerenes, and nanocrystals of the active ingredient. There are numerous different drugs with delivery methods available today, and many are still undergoing clinical research. In this categorization, magnetic nanoparticles come in top place. Magnetic micro- and nanoparticles have been used since the late 1970s. Magnetically sensitive microspheres were used in the research of Widder et al. to deliver anticancer medications. Since the time of these experiments, several groups have used small animal studies to show the effectiveness of this technique. Despite the fact that magnetic targeting has been effective in a lot of these experiments, there have only been a few clinical trials to yet. Lubbe et al. carried out the first phase I clinical study using magnetically focused medication delivery in 1996.Based on electrostatic interactions between phosphate groups attached to the particle surfaces and amino sugars contained in the medication, epirubicine was complexed to nanoparticles in this research. Similar to the previous studies, further clinical trials have been carried out with encouraging outcomes, pushing magnetic nanoparticles as a new tool for treating a range of disorders.Even though there are still considerable challenges to be addressed, the future for medication delivery systems is predicted to be bright. Development of techniques to improve the targeting of delivery systems for target cells, to more accurately control the bioavailability of active substances in the target tissue, and to more effectively transport active substances to their intended locations inside cells are all challenges[7], [8].Nanoparticles may sometimes serve as an active ingredient in addition to serving as a delivery method. Metal-containing nanoparticles may be heated using near-infrared radiation or a fast-oscillating magnetic field to cause the cancer cells to die once they have entered the circulation or have been injected directly into it. This pertains to studies that have been done so far utilizing lab animals. Similar applications may also be conceivable for single-wall carbon nanotubes. In vitro research has shown that the tubes are specifically taken up by cancer cells when coupled with folic acid as a targeted molecule. The tubes may then be heated using near-infrared light in order to destroy these cells. Healthy cells seemed to absorb few, if any, nanotubes and were unaffected by the radiation from near-infrared sources.Similar to this, hyperthermia has been used in cancer

treatment using the temperature enhancement that happens in a magnetic nanoparticle system under the effect of an external high frequency magnetic field. When a cancer is heated by an external alternating magnetic field, magnetic material is deposited within the tumor to provide magnetically mediated hyperthermia. Recent studies have focused on magnetic nanoparticles in addition to the clinical use of macroscopic magnetic implant "seeds" for specific cancer types because of their potential for beneficial heat generation and the possibility of direct tumor targeting through blood circulation.

In addition to the potential for very localized heat creation, the use of magnetic nanoparticles gives the chance to self-regulate the temperature increase by using a magnetic material with an appropriate Curie temperature. It is always better to use the least quantity of MNP necessary to obtain the temperature improvement required for a particular application. This is crucial in situations where the concentration of the target is extremely low, such the targeting of cancers by antibodies.Recent in vitro and in vivo investigations have shown that silver nanoparticles possess inherent antiplatelet characteristics, suggesting the possibility of their being used as antithrombotic medications in the future. To characterize the fibrinolytic behavior of these nanomaterials in different clinical states as diabetes, stroke, and myocardial infarction, further research is already being done.

Artificial joints, like artificial hips, typically last ten to fifteen years until issues arise, necessitating further surgeries due to wear or implant loosening. Nanotechnologies could be able to assist solve these issues. The implants, which are often comprised of titanium or cobalt and chromium alloys, may have a small coating of a nanocrystalline structure added to them. Nanocrystalline structures are tougher and smoother than regular crystal structures, making them more resistant to wear. Additionally, the artificial socket, which is typically composed of a unique form of polyethylene, would last longer as a consequence of reduced wear. Additionally, the layer would guarantee enhanced biocompatibilitythe ability of the body to better accept the implant. Diamond, metal ceramic, and hydroxyapatite are three materials that are now being investigated to see whether they are suitable for use as coatings. The latter substance is a naturally occurring component of bone, which is composed of 30% organic fibers and 70% of the mineral hydroxyapatite. Long utilized as an implant coating, hydroxyapatite may now be applied in layers with nanometer-sized grains as opposed to micrometer-sized ones thanks to improved manufacturing techniques. Due to their nanocrystalline structure, they resemble the natural hydroxyapatite found in bone more closely. Thus, biocompatibility is aided. Even the surrounding bone tissue's development and fusion may be promoted by the layer. In vitro studies have shown that bone-forming cells adhere better and deposit more calcium on nanoscale materials than on traditional materials with micron-sized grains . This is most likely due to the greater protein intake that promotes cell adhesion. These nanoparticles also help osteoclasts, cells that break down bone, perform better. The development and maintenance of good bony tissue, and therefore a strong link between the implant and the surrounding bone, depend on the proper, coordinated action of both kinds of cells. For implants that are connected without the use of bone cement, this is crucial. Patients are actively testing implants that include hydroxyapatite layers with nanostructures; the first patient to get an artificial hip with such a coating was at the Maastricht University Hospital in 2000. To hasten bone tissue healing, hydroxyapatite nanoparticles may also be injected directly into broken bones. A few medications that function on this premise have recently been approved for use. The development of implant coatings using metal- and diamond-based nanostructures is still in its early stages.

Their primary advantages are hardness, smoothness, resistance to corrosion, and strong adhesion to the implant.By adding a nanostructure to the implant-making material, it is possible to enhance the mechanical characteristics and biocompatibility of implants.

Applying a thin coating of titanium dioxide with nanopores makes this feasible. The ability to make the layer such that metal ions having an antibacterial function, like copper ions, are released gradually is an additional benefit of this method. This lessens the possibility of bacterial infections, which are a common side effect of implants . Another option is to use a sintering method to create the implants from titanium dioxide or aluminum oxide nano powders. Organic polymers having a nanostructure and composite materials made of organic polymers with titanium, aluminum, or hydroxyapatite nanoparticles or carbon nanofibers mixed together are promising substitute materials.

The organic polymers' benefit is that it allows for the formation of new bone tissue as they progressively degrade. Studies are also being done on the viability of using carbon nanotube scaffolds to create bone.The orthopedic applications are the ones that are most likely to be utilized on patients, but other tissues, including cartilage, muscle tissue, nerve tissue, and vascular tissue, are already being grown in vitro using biodegradable scaffolding of nanofibers made of organic or synthetic polymers. The nanostructure's objective in this instance is to mimic the extracellular matrix in nature. Recently, scientists were successful in regenerating brain tissue in vivo utilizing nanofibers. Within a few weeks of being injected with scaffold-forming nanomaterial, young and adult hamsters that had lost their sight due to deliberate brain injury recovered it. In the future, it could potentially be able to heal injured human nerve tissue using this technique. Stents are an entirely distinct kind of implant.

They are tiny woven-thread tubes that are used to widen blood arteries. Frequently, inflammatory responses take place, which cause the blood artery to close once again. Stents with an aluminum oxide covering that has nanopores are used to treat this issue. They may be treated with a radioactive material to keep the stent from clogging. The pores make sure that there is enough room for radioactive material and that it may be released very gradually. Animal tests are still required to prove the use and safety of these stents. The lotus effect, which is being studied for its potential use, is utilised to avoid clotting reactions by coating the inside of stents with titanium compounds to prevent blood proteins from changing conformation when they come into contact with the wall of the stent .Active implants are those that include an energy source. On the basis of their intended use, they may be split into two classes. Implants for dispensing medications are under the first category. Examples include insulin and morphine pumps.

They have long been put to use. Implantable microchips for the storage and regulated release of active ingredients have also been in development for a while. The fact that the medications are delivered directly to the area where they are needed and may, if necessary, be supplied at different rates are two advantages of this kind of medication administration. A biosensor that reacts to physiological indicators might also manage the release. The first system of this kind will shortly undergo patient testing.Neural prosthesis, which are designed to replace or restore nerve functions, make up the second category. For instance, they repair damaged neural pathways, provide muscular impulses, or take the role of senses. This group of devices includes cochlear implants, pacemakers and defibrillators, bladder stimulators, deep-brain stimulators, and peroneus stimulators.All of these are still in use today and some have been for many years with patients. Retinal implants, on the other hand, are still being developed to help individuals with damaged retinas regain their vision. This has been the subject of much investigation in recent years in the US, Germany, and Japan.

Even though there have been significant advancements and the first clinical trials have begun, there are still some significant challenges to be solved. Before "artificial retinas" are as widespread as the other brain implants, it will certainly take some time. Numerous research teams in the US have been working on neuroprocessingdevices that can be controlled by

thoughtfor a while. The motor cerebral cortex, which registers the electrical impulses related to thinking, is fitted with one or more electrode-equipped chips to do this. The term "brain-machine interfaces" is another name for these artificial brains. They have now been successful in teaching rats to use their brain power to move handles, and they have taught monkeys to control a computer's cursor or a robotic arm.

A few years ago, an electrode was placed in the cerebral cortex of an amyotrophic lateral sclerosis patient to allow him to use a computer. A paraplegic man had a neuroproteins installed in 2004. He can use his mind to control a computer's cursor, play video games, turn on a light, and choose a TV station. The research results were presented at the American Academy of Physical Medicine and Rehabilitation's annual conference in Phoenix in October 2004. The long-term objective is to provide patients the ability to use arm or leg prosthesis or possibly regain control of their paralyzed limbs.

In contrast, it also turned out to be able to remotely control mice by giving electrical stimulation to the areas of the brain responsible for touch and pleasant sensations. These so-called robot rats might be used as mobile biosensors, landmine detectors, or to look for victims buried under the wreckage of demolished homes. All of these active implants are crucial microtechnology byproducts, but nanotechnologies may have a significant impact on their advancement. By altering the surface at the nanoscale, research is primarily focused on enhancing functioning, fixation in the surrounding tissue, and biocompatibility. For instance, nano porous electrodes with a surface intended for retinal implants are being developed.

For optimal signal transduction from the electrodes to the tissue, this nanostructure increases the surface area of the electrodes by 100. Neuroprocessing' microelectrodes, which record electrical impulses in the brain, often only function for a short period of time. Although the surrounding tissue is injured and nonconductive scar glial-cell tissue develops, they often do not become faulty. In vitro studies have shown that a nano porous surface structure decreases glial-cell adhesion and encourages the development of nerve cell outgrowths. The fact that nerve cells are inherently immersed in an extracellular matrix with a nanostructure of microtubules and laminin may account for the stimulating impact on the cells.

Coatings that release medications gradually may be used to treat infections or rejection responses. with Germany, cochlear implants are already covered with an antimicrobial coating made of silver nanoparticles. Nanotechnology has also contributed to active implants in other ways, for as via drug delivery membranes built into microchips and more energy-efficient batteries.Silver's ability to disinfect has long been recognized, but with the development of organic antibiotics, silver's effectiveness in eradicating harmful bacteria has diminished. Antibiotic resistance among germs is on the rise, which has rekindled interest in silver as a disinfectant. On silver ions, the antibacterial action is based.

They disrupt the cell membrane, prevent cell division, and inhibit the enzymes needed for oxygen consumption. Due of the variety of operating processes, it is unlikely that bacteria would acquire a resistance to silver. Due to its extensive surface area in touch with the environment, silver is particularly useful in the form of nanoparticles. The particles also have the benefit of being easily integrated with other materials, such as polymers and globular or fibrous proteins.

When fresh silver ions are needed, the nanoparticles serve as stores and continuously release them. Such antimicrobial coatings may aid in lowering the number of infections when used on implants or medical devices. Utilizations for catheters, cochlear implants, and bone

cement are now being researched. There are currently antimicrobial wound dressings on the market that include nanocrystalline silver[9], [10].

CONCLUSION

The potential for the interdisciplinary area of nanotechnology to transform health care via the discovery of new molecules and the manipulation of those that occur naturally is astounding. All nations in the globe might benefit from nanobiotechnology's offshoots.Medical nanodevices might be regularly implanted or even injected into the bloodstream in the future in order to monitor health and automatically assist in the repair of systems that vary from the usual pattern. The creation and cooperation of research teams in related domains is essential for the ongoing development of biomedical nanotechnology.

Such partnerships must continue both worldwide and at the level of the specialty sector. Successful international cooperation encourages a global perspective on research and bring together the advantages for humanity as a whole. However, since there will inevitably be multiple failures and significant delays, nanotechnology in medicine confronts significant technological challenges. This is due to the extensive multidisciplinary effort required to manufacture nanoscale biological or therapeutic devices.

REFERENCES:

[1] S. K. Sahoo, S. Parveen, and J. J. Panda, “The present and future of nanotechnology in human health care,” *Nanomedicine Nanotechnology, Biol. Med.*, 2007, doi: 10.1016/j.nano.2006.11.008.

[2] M. Fakruddin, Z. Hossain, and H. Afroz, “Prospects and applications of nanobiotechnology: A medical perspective,” *Journal of Nanobiotechnology*. 2012. doi: 10.1186/1477-3155-10-31.

[3] P. Tatli Seven, I. Seven, B. Gul Baykalir, S. Iflazoglu Mutlu, and A. Z. M. Salem, “Nanotechnology and nano-propolis in animal production and health: an overview,” *Italian Journal of Animal Science*. 2018. doi: 10.1080/1828051X.2018.1448726.

[4] B. Singh Sekhon, “Nanotechnology in agri-food production: An overview,” *Nanotechnology, Science and Applications*. 2014. doi: 10.2147/NSA.S39406.

[5] K. Ramachandraiah, S. G. Han, and K. B. Chin, “Nanotechnology in meat processing and packaging: Potential applications - A review,” *Asian-Australasian J. Anim. Sci.*, 2015, doi: 10.5713/ajas.14.0607.

[6] R. Hardman, “A toxicologic review of quantum dots: Toxicity depends on physicochemical and environmental factors,” *Environmental Health Perspectives*. 2006. doi: 10.1289/ehp.8284.

[7] E. C. Dreaden, A. M. Alkilany, X. Huang, C. J. Murphy, and M. A. El-Sayed, “The golden age: Gold nanoparticles for biomedicine,” *Chem. Soc. Rev.*, 2012, doi: 10.1039/c1cs15237h.

[8] M. Dimitrijevic *et al.*, “Safety Aspects of Nanotechnology Applications in Food Packaging,” *Procedia Food Sci.*, 2015, doi: 10.1016/j.profoo.2015.09.015.

[9] R. Kanaparthy and A. Kanaparthy, “The changing face of dentistry: nanotechnology.,” *International journal of nanomedicine*. 2011. doi: 10.2147/ijn.s24353.

[10] M. I. El Sabry, K. W. McMillin, and C. M. Sabliov, “Nanotechnology Considerations for Poultry and Livestock Production Systems - A Review,” *Annals of Animal Science*. 2018. doi: 10.1515/aoas-2017-0047.

CHAPTER 6
THE FUNCTION OF AN EXOSKELETON SIMULATION OF SENESCENCE IN HEALTH SCIENCES

Dr.HimaniKulshrestha, Assistant Professor

Department of Science, Maharishi University of Information Technology, Uttar Pradesh, India

Email Id- himani.kulshrestha@muit.in

ABSTRACT:
There are ongoing difficulties in the development of human capital in the field of health. In the changing situations, new technologies might help people develop more compassionate attitudes. We created a learning tool that featured a senescence simulator and studied the effect it had on healthcare students' perceptions and attitudes. Methods. The experience was described via the roles of the patient and carer in a cross-sectional comparison research that evaluated newly acquired information and self-perception using a semi structured survey that was given before and after the presentation and intervention utilizing the simulator. To determine the demographic characteristics of the various student groups and the variations between them, the data were statistically analyzed. Using statistical software, the data were analyzed to determine the demographic traits and differences between the groups of students in their pre- and post-intervention answers. Results. 53.1% of the 256 participants who completed the pre-intervention survey assessed the health system to be insufficient for addressing the needs of older people, and 93.8% identified cognitive decline as a serious handicap. Only 59.8% of respondents said that the educational criteria for providing senior care are being met by the existing academic training. 98.9% of the participants said that the simulator improved their empathy, which altered how they saw things.

KEYWORDS:

Compassionate, Demographic,Self-Perception, Senescence.

INTRODUCTION

Senescence is a physiological process that affects all living things. It includes various cell-level homeostatic systems, tissue atrophy, and subsequently diminished function, which raises the risk of comorbidities and associated consequences.In 2030, there will be 1 older person for every 6 persons, according to World Health Organization predictions, and by 2050, there will be twice as many adults over 60. since of this, and since older people are the major users of health services and the bulk of the healthcare spending, the future demand for care of older persons creates considerable problems for the healthcare system.This epidemiological shift is a result of the demographic change and has an influence on public health. As a result, health sciences education programmed and curriculum should be strengthened. Traditional approaches are educational and situational in character, but up until recently, experiential tactics had been steadily added that allowed us to see all that occurs to the older adult patient via various sensory modalities. This helps not only to reinforce learning but also to increase the sensitivity of health care consumers' approaches in various investigations and educational situations in the health sciences[1], [2].The potential impact of these tools on the standard of care for individuals in the geriatric field is shown through a variety of instances applied to students of medicine, pharmacy, and particularly nursing.According to earlier research, encouraging empathetic behaviors via innovative pedagogy has a more substantial positive effect on learning than using conventional

approaches. The use of the simulator today provides trainees in medicine, nursing, physical therapy, cognitive rehabilitation, and all other healthcare professionals with a singular experience that may lead to changes in behavior towards a more tolerant and compassionate approach to the care of geriatric or patients with chronic illnesses.The use of simulation methodologies may lead to better basic geriatric care and enhance the educational focus of aspiring professionals on this population-segment that is becoming older . For example, high- and low-fidelity mannequin simulators, virtual reality, gamification, and metaverse are new technical resources for education that are supported by the pedagogies of cognitive-behaviorism, constructivism, and connectivism.In the current research, we created a learning method and evaluated its impact on health science students' perceptions of their education. This was accomplished via the employment of an exoskeleton that simulates ageing and an educational science programmed on senescence. Under particular situational conditions, in vivo was used to identify and test the most prevalent functional limitations of the geriatric patient.This cross-sectional comparative quasi-experimental educational intervention research evaluated the effectiveness of a senescence simulator that was specifically constructed for us by a quasi-experimental trial. From March to June 2021, the intervention was delivered in scheduled sessions to randomly chosen representative groups of students pursuing various professional fields in the health sciences at the University of Guadalajara, Mexico's second-largest public university.Even though the representative groups were chosen at random, the course instructors formally invited at least one group from each degree course and field to participate. A volunteer carried the entire exoskeleton with the assistance of a helper who would act as the role of the carer. The dynamics involved applying a preassessment via Google form in place, followed by a brief slide presentation with information related to senescence and physiological changes brought on by ageing and a demonstration video. The scenario required participants to carry out certain simple actions as standing, sitting, climbing stairs, picking up small things, and signing a paper. The event was then over when the post assessment was given to everyone via the Google form platform. The whole operation was anticipated to take 30 minutes[3], [4].There were 11 questions total in the preintervention survey and 7 items total in the postintervention survey. On a Likert scale with a maximum possible score of 5, the surveys included both multiple choice and closed-ended items. To determine demographic information, differences between the groups, and variations before and after the intervention, the obtained data were statistically analyzed.Basic demographic information, including age, gender, and occupation, as well as a comparative analysis of groups were used in the statistical analysis to find differences between the preintervention and postintervention surveys that were statistically significant at the contingency level. For the analysis of pre- and post-survey, knowledge of adult disabilities, and analysis of responses by gender, age, and degree, chi-square and Fisher's test were used. The results are presented that showed an impact under statistically significant evidence.Under record the Research Ethics Committee evaluated and approved this research. It was carried out in accordance with institutional policies and national laws, such as the "Mexican General Health Law on Research," and was deemed a risk-free experiment for participants. In every instance, permission was gained with full knowledge, and the information given was private and anonymous. Only those who took part in the video instruction gave their consent for it to be used in the presentation. We created the instructional-style movie with the assistance of a skilled technical team, and instructors and students who had received prior training to operate the simulator helped us build it in accordance with the contents. It was delivered in the audience's native tongue, and a pilot plan that demonstrated coherence and validity with the protocol's goals and correlation with the survey's questions was included .

DISCUSSION

Each study group's classroom was where the tactic was really used. Due to the pandemic, some groups received prepared instructional videos that explained the exoskeleton application dynamics and the required activities in detail. Only 50% of each group received the real-time application in presentation form. Students who worked together voluntarily and at direct request participated in the lesson video filming. The University of Guadalajara only has one health sciences institution, and all of the participants were chosen at random based on their professional disciplines and class schedules before being invited personally by their instructors. This tactic was given as an alternate practise with optional and open involvement; it is not a formal component of the curriculum design.The preintervention and postintervention questionnaires were used as part of the assessment of senescence-related instructional material and the practical application of the exoskeleton. While the other half took on the role of a carer to carry out the various tasks suggested, the other half of the health science students carried the simulator to feel the various physical limitations found in the elderly.With groups of students pursuing diverse health science degrees, including medicine, nursing, nutrition, physical education and sports, psychology, and radiology, the educational tutorial preintervention was carried out utilizing online instructions using Google. Being a regular student in good standing at the time of the survey and pursuing a degree in the health sciences were requirements for participation. Students who did not take the surveys and those who were not enrolled in a programmed leading to a degree in the biomedical sciences at the time were targeted by the study's exclusion criteria.The primary dependent variables were: a shift in perception and understanding of older people's physical and cognitive limitations; the generation of a favorable impact on professionalism to provide better care for older people; and a reconsideration of the choice to pursue a graduate or specialized degree in geriatric care. Application of the educational intervention and knowledge reinforcement including the use of an exoskeleton imitating physical ageing were two independent factors[5], [6].

Software from IBM's Statistical Package for the Social Sciences was used to statistically analyses the study's demographic data. Demographic data were examined for central tendency measures, and when a value for contingency tables was taken into account, chi-square, Fisher's exact, and Student's t-tests were employed to determine the statistical significance between the groups. Knowledge of adult disabilities, an analysis of responses by gender, age, and degree, and results with a statistically significant impact are all analyzed using chi-*square* and Fisher's test.The preintervention and postintervention questionnaires yielded and answers, respectively, of which and were eliminated owing to the exclusion criteria.The participants' median age was years, and of them were men. students, from physical education and sport, , from nursing, from medicine, from nutrition, from psychology, and from radiology were among the students whose study areas were represented.A total of individuals intended to pursue a specialized or graduate degree, and thought it would be an option. In addition, when given a hypothetical scenario, only individuals thought of pursuing a graduate or specialized degree focused on providing care for the elderly; instead, picked pediatric care, chose adolescent care, and chose adult care.Overall, participants said they had cared for an older senior, and 70 knew about the average fall rate in this demographic, whereas 79 people did not. When it came to participants' understanding of the common impairments affecting older persons, cognitive decline stood out since of them acknowledged it. Following this, osteoporosis and cataracts were cited by and participants, respectively. Table 1 provides a summary of all the outcomes.Based on the Likert scale, the assessment of whether the existing health system effectively satisfies the demands of this population produced the following results: Participants' responses ranged from indifferent todisagreeing.

In terms of whether training is enough for managing and meeting the demands of the older population, of the participants thought it was, while 46 just agreed. The main social issue that older persons encounter, according to participants, is desertion. This is followed by intolerance, discrimination, and violence, which were mentioned by,and participants, respectively.A second survey was given to the participants after the educational intervention to assess the knowledge and self-perception awareness the students had gained as a result of the intervention. In the educational session, the constraints experienced by the older population were discussed. Only participants knew about all of these restrictions, while 202 knew about only a handful and 22 had no idea what they were.The 5-score Likert scale methodology was used to determine the responses to the following questions. and participants felt that the intervention had changed their perspective of and empathy for the elderly population. 203 participants and completely agreed when asked if the intervention improved their professionalism in delivering better care to the older population. When asked whether they would modify the way they cared for the older population in the future, of the participants with past experience in caring for older individuals said yes, and said they would make some changes.Additionally, and participants agreed when asked whether they would think twice about obtaining a graduate or specialized degree in the field of care for elderly people.participants and agreed when asked whether the participants had received enough knowledge from the institution about the care of elderly persons. Lastly, participants and participants completely agreed that the simulation-based exoskeleton was helpful for health sciences education for the care of elderly people.

Results are the key factors used to gauge how well students responded to the educational intervention in terms of their degree.According to statistical analysis, the majority of participants across all age and degree categories listed cognitive decline, osteoporosis, cataracts, and diminished motor abilities as the most common indicators seen in older people.Only 10.5% of participants in the preintervention survey considered working in a profession related to the older population, whereas 76.2% and 22.7% reported a change in their perspective and sensitivity towards the older population in the postintervention survey. Additionally, after receiving the intervention, 79.3% of the participants reported a favorable influence on their schooling, and 14.5% reported reconsidering pursuing a specialized degree related to the care of elderly people. It was a significant finding in this study that participants with earlier knowledge of senescence and the professional care of older people than participants in the other age groups were more likely to reconsider pursuing a graduate or specialized degree related to the care of the older population.In contrast, we found that in the analysis by the professional field group, nutrition and psychology students had higher awareness of the fall risk in the older population than did nursing and medical students. In contrast to medical, radiology, and physical education students, nutrition, psychology, and nursing students said that the health system is not sufficiently effective in serving the demands of the older population.The most pertinent problem in teaching and creating sensitivity about the care of older population has been developing a simulator to produce an immersive educational technique to boost knowledge and self-perception connected to the elderly.The present research included multiple steps, the most crucial of which was providing senior participants with educational interventions in the form of health science information sessions[7], [8]. At this point, the complementary application of this approach in the present through an experiential essay helps to sensory feel the changes present in the evolution of senescence, representing a transcendent educational opportunity for the development of empathy as a key axis of health care. To implement this plan virtually as well, audiovisual and digital technologies have to be created during the pandemic stage.According to other authors, we were able to track the project's progress and gauge the effectiveness of this educational intervention using semi structured preintervention and postintervention surveys, the responses to which were statistically analysed. We did this by designing the

aforementioned strategy and distributing it randomly to students from various fields related to the field of health sciences.The perception of and sensitivity towards the older population, the effect of the intervention on the participants, future professional goals, knowledge, attitude, and likelihood that the participants would pursue graduate degrees in fields related to the study, assistance, and rehabilitation of older adults were some of the most important factors that were evaluated.The majority of participants regarded the health system as lacking and in need of additional development when analyzing the perception of the health setting and the services offered to the elder population, who are seen as being vulnerable. This also holds true for the health sciences education in this subject, which 59% of participants rated as sufficient.

In the comparison investigation, higher perceptions of sensitivity and knowledge of the physiological constraints of the elderly group were found. In a similar vein, the participants believed that the intervention's experience had improved their sense of professionalism in the care of the elderly population.The fact that 14.5% of the participants said they would think twice about getting a degree in the care of the elderly is evidence that these results inspire students to modify their behavior. Compared to the group of students over the age of 20, this percentage is larger among the younger participants, i.e., those aged 18 to 20. Last but not least, 90.2% of the participants said the intervention was helpful and relevant to the curricular frameworks.The notion of creating models with a deeper impact on academic and professional education for the management of the older population is highlighted by the assessment of attitude and behavior changes using new techniques.In terms of teaching, this approach creates information about ageing, indicates the degree of understanding of patients' requirements, and helps to encourage more sympathetic behaviors in the care of these instances.Due to logistical and scheduling constraints, not all participants were able to physically wear the simulator. The preintervention and postintervention survey questions did not have the same wording in the predevaluation and post evaluation, despite the fact that they shared the same research goals and variables. This restricted the potential of performing more extensive comparative statistical analyses across the groups. In fact, research using an observational or simulation-based methodology would be more suitable, but this option was constrained by the unavailability of simulator clothing for every participant. To capture the confidence of self-perception, an alternative, more focused technique to analyses the qualitative factors would be more effective[9], [10].

CONCLUSION

The results of this research support the significance of taking into account additional options in the area of health sciences education and their impact on proactive processes and behavior changes, knowledge, and attitudes of those working in this sector. Senescence simulators and other educational tools provide an experience intervention that improves knowledge and attitudes towards older people. It served as an effective teaching method to reinforce caring behavior as a hybrid educational strategy during the pandemic disaster. The senescence simulation gave the participants the opportunity to broaden their educational and professional goals to include ageing population care.

REFERENCES:

[1] J. Lee, M. Lee, and J. Bae, “Development of a Hand Exoskeleton System for Quantitative Analysis of Hand Functions,” *J. Bionic Eng.*, 2018, doi: 10.1007/s42235-018-0066-0.

[2] J. C. Godoy, I. J. Campos, L. M. Pérez, and L. R. Muñoz, "Nonanthropomorphic exoskeleton with legs based on eight-bar linkages," *Int. J. Adv. Robot. Syst.*, 2018, doi: 10.1177/1729881418755770.

[3] N. Li *et al.*, "Bio-inspired upper limb soft exoskeleton to reduce stroke-induced complications," *Bioinspiration and Biomimetics*, 2018, doi: 10.1088/1748-3190/aad8d4.

[4] C. Chisari *et al.*, "Training and assessment of upper limb motor function with a robotic exoskeleton in chronic stroke patients," *Gait Posture*, 2014, doi: 10.1016/j.gaitpost.2014.05.055.

[5] M. B. Näf, A. S. Koopman, S. Baltrusch, C. Rodriguez-Guerrero, B. Vanderborght, and D. Lefeber, "Passive back support exoskeleton improves range of motion using flexible beams," *Front. Robot. AI*, 2018, doi: 10.3389/frobt.2018.00072.

[6] L. M. Mooney, E. J. Rouse, and H. M. Herr, "Autonomous exoskeleton reduces metabolic cost of human walking," *J. Neuroeng. Rehabil.*, 2014, doi: 10.1186/1743-0003-11-151.

[7] S. Toxiri *et al.*, "Rationale, implementation and evaluation of assistive strategies for an active back-support exoskeleton," *Front. Robot. AI*, 2018, doi: 10.3389/frobt.2018.00053.

[8] S. Galle, W. Derave, F. Bossuyt, P. Calders, P. Malcolm, and D. De Clercq, "Exoskeleton plantarflexion assistance for elderly," *Gait Posture*, 2017, doi: 10.1016/j.gaitpost.2016.11.040.

[9] J. R. Koller, D. A. Jacobs, D. P. Ferris, and C. D. Remy, "Learning to walk with an adaptive gain proportional myoelectric controller for a robotic ankle exoskeleton," *J. Neuroeng. Rehabil.*, 2015, doi: 10.1186/s12984-015-0086-5.

[10] F. Sylos-Labini *et al.*, "EMG patterns during assisted walking in the exoskeleton," *Front. Hum. Neurosci.*, 2014, doi: 10.3389/fnhum.2014.00423.

CHAPTER 7
THE MITOCHONDRION AT THE CROSSROADS OF BIOLOGICAL AND PSYCHOSOCIAL SCIENCES: PATHWAYS TO AGEING

Dr.HimaniKulshrestha, Assistant Professor

Department of Science, Maharishi University of Information Technology, Uttar Pradesh, India

Email Id- himani.kulshrestha@muit.in

ABSTRACT:
There is compelling evidence that ageing is influenced by both biological and psychological factors. However, we still have a limited grasp of how biological and psychological elements interact dynamically across the life span. The interaction of personal factors, behavioral factors, and psychosocial experiences in perinatal, childhood, and adulthood must be determined, for instance, in order to determine how health across the ageing continuum is influenced by these factors. With a focus on the mitochondrion, this research seeks to identify possible places of crossover between biological and psychological variables. Cellular organelles called mitochondria are essential for cellular senescence. Chronic psychosocial stress exposure and mitochondrial dysfunction brought on by genetics have very comparable biological effects; both put people at risk for poor aging-related health conditions and early death. Our capacity to translate research into practical applications that can be used throughout the life course to optimize ageing will continue to improve as we explore the interactive nature of the factors resulting in pathways to normal healthy ageing as well as those leading to morbidity and early mortality.

KEYWORDS:

Compelling,Evidence,Morbidity,Psychological.

INTRODUCTION

From the age of roughly 30 years old forward, people progressively lose their maximum functional ability due to the unavoidable process of ageing. Some hardy people age over one hundred years and beyond after a steady deterioration that lasts many decades. These centenarians are remarkable because they have both healthy bodies and brains and little physical deterioration. The frailty syndromedefined as a lack of general strength and an unusual susceptibility to disease or other infirmity affects many people in their 60s and 70s, though, and they frequently experience more rapid functional declines. These people also frequently have multiple age-related morbidities, including cardiovascular disease, neurodegenerative diseases, diabetes, and cancer. With an average life expectancy of 81 years old in North America, most people fall somewhere in between these two extreme possibilities.As more people live longer, life expectancy has increased significantly during the previous century. The majority of early deaths from acute illnesses are prevented by advances in medical technologies and preventive medicine, and people with chronic, life-threatening conditions are living longer as a result. Fries' compression of morbidity theory states that when death is successfully delayed, morbidity is postponedorcompressedto later ages[1], [2]. The prevalence of age-related disorders has grown or even stayed consistent over the last several decades, which has had a considerable impact on health care expenses. Changes in political and social health policy will be required to address societal concerns given that an unprecedentedly high percentage of the population is anticipated to reach 60-80 years of age in the next two decades. To meet the imminent societal necessity of adopting

older health-improving techniques at low cost, comprehensive frameworks including the diversity of elements capable of potently modifying the human ageing process may be necessary.A fundamental issue in longevity is why some people live a long time while others pass very young. Another crucial question relates to morbidity: Why is ageing linked to a higher prevalence of practically every kind of illness, including malignant, metabolic, and degenerative disorders? A more general question may be asked as illness incidence, mortality, and lifespan are all linked variables in the same ageing equation: What are the factors that affect how quickly people age?Although the effects of biological and psychosocial variables on ageing are widely known, it is still not obvious how psychosocial factors affect cellular ageing and ultimately result in the ageing of the whole organism. Physiological systems that have the potential to serve as important junctures for the convergence of pressures imposed by biological and psychosocial variables are the subject of the selected examination that follows. It will be easier for researchers to create multilevel therapies that minimise the deterioration in physical function brought on by ageing if they understand how this physiological integration occurs.The coordinated operation of several organs and physiological systems is essential for physical health and function because it enables an organism to maintain a dynamic equilibrium while adapting to ongoing environmental challenges. Ageing may result in a failure to respond to stressors. Suboptimal organ function may thus be caused by senescence-induced reduction of cell numbers and/or optimal functioning. For this reason, cellular ageing indicators like the length of the nuclear DNA telomere are sometimes utilised as a measure of ageing. These are the chromosomes' protective caps, and their shortening is often utilised as a precise and close diagnostic of cellular senescence[3], [4].

The ageing process is influenced by biological variables. Mitochondria are a crucial component of mammalian cells. The main location of cellular adenosine triphosphate generation, the regulator of cell death via apoptotic signaling, and the largest source of reactive oxygen species inside the cell are all provided by these dynamic subcellular organelles, which also contain their own circular DNA. The mitochondrial theory of ageing, which holds that, over time, mitochondrial DNA accumulates oxidative damage from ROS, which negatively impacts mitochondrial function, leads to cellular dysfunction, organ failure, and ultimately results in age-related disease, is one of the most closely scrutinized hypotheses in ageing research. Transgenic mice with improved protection against mitochondrial oxidative damage have provided evidence in favors of this notion. These mice, which overexpress a mitochondrial-targeted catalase, have a somewhat longer lifespan and are resistant to age-related insulin resistance. This notion, however, is flawed by the data now available, and the majority of the evidence for a direct contribution of ROS to ageing has been correlated. Additionally, there are instances in both vertebrates and invertebrates when the usual inverse relationship between ROS production and longevity is broken. Although ROS-induced damage has not always been causally linked to ageing, ageing cells and the blood of aged people exhibit a general shift in intra- and extracellular redox state towards more oxidized levels, which may have significant ramifications for redox-sensitive signaling pathways and their impact on the ageing process.Contrarily, a wealth of experimental data points to a general involvement for mitochondria in the ageing process. For instance, PolGmutator mice, which have a defect in the proof-reading component of the mitochondrial DNA polymerase gamma that causes an abnormally quick accumulation of mutations in the mitochondrial DNA, display several traits resembling an accelerated ageing phenotype, such as greying of the fur, loss of muscle and brain mass, and kyphosis. This suggests that aging-related symptoms including organ malfunction and early death might result from mitochondrial DNA damage. It should be highlighted that it's unclear if this model accurately simulates how people age naturally. Similar to this, it is debatable if ROS control how quickly people age. The integrity of mitochondrial DNA is threatened throughout ageing,

which may contribute to cellular senescence and, in turn, to the increasing functional alterations in organs that characterize the ageing process. However, its precise cellular and physiological effects are yet unknown.

DISCUSSION

Exercise and physical activity are strong stimuli that raise mitochondrial content and function, similar to calorie restriction. The age-related deterioration in organ system function, including that of the brain and muscles, is slowed down by physical exercise. It is known that those who engage in increased physical activity have reduced rates of age-related illnesses and death as well as better management of chronic conditions already present. Additionally, endurance training stops the skeletal muscle loss, brain shrinkage, and premature aging-like traits seen in Poleg mutator mouse models. The opposite is also accurate. Physical inactivity decreases mitochondrial function and content and increases metabolic risk and insulin resistance.Age is when the aforementioned physiological dysregulations are most often seen. For instance, sedentary older people had reduced mitochondrial content than young people, but not active older people. Finally, it has been shown that dietary lipid intake affects the membrane composition of brain mitochondria and lessens oxidative damage to these organelles with age in rats. As a result, variables that affect mitochondrial function might affect the occurrence, development, and survival of age-related diseases.The conclusions presented in this section are in agreement with the idea that biological processes control how old we become. There are many more justifications for this idea. Among these are the principal cause of ageing, which is the loss of molecular fidelity with time, as well as the newly found connection between mitochondrial function, telomere length, and cellular senescence[5], [6]. We must acknowledge that evidence suggests that the rate of ageing is not solely determined by single biological factors, such as how many calories are consumed, which genetic polymorphism an individual has inherited, and how much physical activity is performed. This is because each of the factors listed above appears to modulate the ageing process in small but significant ways. Instead, the pace of ageing for a specific person in real-life circumstances must ultimately be decided by the dynamic and reciprocal interaction of these and many other elements, as detailed below.Psychological and social factors are also significant moderators of the ageing process related with mortality, despite the fact that ageing research has often been dissected using the biological scalpel. For instance, lifestyle and psychological traits may affect lifespan in people. Pessimism and nervous personality characteristics were linked to unfavorable age-related health outcomes, such as higher cancer incidence and all-cause mortality, according to research done on coronary heart disease patients. It has been suggested that negative emotions might negatively impact resilience and survival. Deterioration in negative affect was also a powerful predictive factor of long-term death in coronary heart disease patients.Contrarily, centenarians with an active lifestyle and certain personality features have greater mental health status on average, which is a positive indicator of ageing. People with more favorable self-views of ageing likely to live roughly seven years longer than people with less positive perceptions of ageing, according to a twenty-year prospective population research. Similarly, one of the most effective statistical predictors of morbidity and mortality is self-rated health, which refers to how a person subjectively judges his or her health. It should be noted that SRH often performs better statistically than clinical and biological measures of health in predicting death. Similar to this, high socioeconomic level is linked to multisystemic physiological profiles that are more favorable, which forecast decreased rates of illness and death with ageing. Additionally, there is evidence that protective psychosocial characteristics, such as control beliefs and the strength of social support, help maintain functional ability more effectively as we age. These findings clearly imply that a number of psychosocial variables have an influence on physiological routes to ageing and distal outcomes like mortality and longevity, even if they

do not explicitly show a causal relationship between psychosocial factors and longevity.Similar impacts of psychosocial variables may be seen on closer-to-home biological ageing indicators. Shorter telomere length in blood leukocytes of unmarried middle-aged men and women indicates that not having a mate is linked to faster cellular ageing. Epel and colleagues' similar studies show that mental stress is linked to faster telomere shortening. Psychosocial factors may hasten cellular ageing, as shown by the links between depression and mortality, cellular senescence, and accelerated ageing rates. Collectively, these results show that psychological factors may have an impact on morbidity and mortality as well as positively and negatively affect ageing.As was previously established, mitochondria affect how cells operate. Impairments in mitochondrial function brought on by genetic variations/mutations or other pressures like physical inactivity may hasten the ageing process. The synthesis of new mitochondria is modulated by a number of hormones, including those involved in the body's stress reactions to psychosocial stresses, and these hormones may change critical aspects of mitochondrial function. In fact, thyroid hormones, the steroid hormone estrogen, catecholamines secreted by the sympathetically-innervated adrenal medulla, the glucocorticoid hormone cortisol downstream from the hypothalamic-pituitary-adrenal axis, and several cytokines all influence mitochondrial DNA transcription and mitochondrial biogenesis[7], [8].

In fact, the mitochondrial DNA sequence contains putative response elements for a number of hormonal receptors, including those for insulin, thyroid and glucocorticoid hormones, and estrogen. Some of these receptors have even been discovered in the mitochondria of various cell types. These "stress" hormones have an immediate positive impact on mitochondrial biogenesis and function. However, long-term exposure to these hormones' elevated levels, which can be brought on by psychosocial stressors like depression, social isolation, and violent or abusive environments, can result in decreased mitochondrial mass and correspondingly higher levels of mitochondria-derived ROS. When generated at high rates over an extended period of time, these mitochondrial outputs harm cellular components synergistically and accelerate cellular senescence.Mitochondria function at the nexus of biological and psychological elements to impact ageing processes. The composition and function of mitochondria in the body's tissues are influenced by biological and psychosocial variables that interact dynamically and in both directions. Depending on the length of exposure, the same causes might have opposing impacts on mitochondrial function. For instance, although chronic stressors tend to downregulate mitochondrial biogenesis and function, acute stressors tend to increase them. Factors at the mitochondrial level affect mitochondrial activity and might impact how responsive mitochondria are to upstream biological and psychological effects. The outputs that mitochondria generate have an impact on cellular function, gene expression, and cellular senescence as a result of several individual and environmental variables. As a consequence, the combined and synergistic effects of several biological and psychological variables ultimately decide the routes to ageing.Psychosocial variables may affect a person's lifestyle in addition to the direct impacts they have on mitochondrial function, such as how often they exercise and how idle they are. For instance, lower levels of physical exercise are linked to poor self-perceptions of one's physique and unfavorable influences from family and friends. Similar to this, those with depression or other mental diseases also have a propensity to be less physically active. Physical inactivity may subsequently harm both physical and mental health, making inactive young people more likely to experience depression in later life.Physical exercise reduces inflammation and age-related chronic illnesses while also having a good impact on mitochondrial function. It may even act as a protective buffer against the damaging effects of ongoing stress on telomere length. Actually, the positive effects of exercise and physical activity on the hormonal system, on psychological and cognitive aspects, as well as on metabolic regulation, suggest that exercise and physical activity are beneficial. Indeed, it has

been shown that increasing physical fitness reduces the hormonal, physiological, and psychological signs of chronic stress. Therefore, physical exercise and psychosocial variables may combine to affect mitochondrial function and moderate the effects of chronic stress on the body.Mitochondria are particularly well suited to function as major integrators that synergistically impact biological and psychosocial variables since they affect cellular ageing and are susceptible to stress hormone levels. As was previously said, research in the psychosocial sciences has shown significant connections between how people feel, their social settings, and how these things affect mortality and lifespan. More research has to be done on how these variables affect and work with biological factors, however. Numerous new results, including those mentioned above, have encouraged academics to concentrate on the interconnections between biological and psychological influences that affect the ageing process. Conclusions drawn from research that do not take an integrative tack run the danger of being one-dimensional and hence challenging to apply to many real-life circumstances, as people age under the combined effect of influences of various kinds.

In the study of ageing and other fields, interdisciplinarity and even transdisciplinarity have become essential components. Both the Canadian Institutes of Health Research and the National Institutes of Health in the USA have built institutes on/of ageing that have wide mandates that unavoidably transcend conventional discipline boundaries. Even if certain challenges are best solved using a single discipline's methodology, other situations need the fusion of numerous disciplines in order to fully grasp the complexity of the processes at work . This is especially true as we age . Similar to this, the field of developmental psychopathology has developed into a highly "interdisciplinary field that seeks to elucidate the interplay among the biological, psychological, and social-contextual aspects of normal and abnormal development across the life coursedriven by the impetus to grasp and impact the complexities of mental health at different stages of development. Regarding the conceptual, theoretical, and practical approaches to follow in order to reach such a degree of integration within a subject, Cicchetti and Toth's articles are especially instructive. They emphasize the need of a focus on the natural process of development that results from the interdependence throughout time of many biological and psychological elements, as well as the significance of cross-disciplinary discussion in particular.To put it another way, the ageing process is influenced by a number of interactive forces that are inherent to the individual and forces that are inherent to the psychosocial environment and that continuously and progressively interact over long periods of time. Therefore, ageing must be seen from an oncogenic viewpoint rather of being only concerned with end results. Instead, it would be advantageous for ageing research to be influenced by a viewpoint that emphasizes the variations and interactions among biological and psychological processes that occur across the lifetime and throughout stages of human development. In order to further hypothesis-testing research on healthy ageing as an interdisciplinary process, Ryff and Singer developed five conceptual hypotheses that are listed below. Similar to how mental health and disease develop from a person's lifetime of experiences in adolescence, childhood, and adulthood, ageing must also be a highly experience-dependent process in which a person's biology both shapes and is shaped by their experiences[9], [10].The notion that ageing is experience-dependent has significant ramifications for the research questions that are presented, such as: How do certain events/factors at various life stages interact to modify the pace of ageing? This implies that events accumulated throughout pregnancy, childhood, adolescence, and later life affect paths to ageing. This could be mediated in part by alterations in the stress system across the life course: induced alterations in neurological substrates that signal stressful information as well as neurobiological and allostatic processes involving inflammation and oxidative stress. Therefore, as Epel hypothesized, psychological stress and metabolic stress may be a potent combination that accelerates cellular ageing.In several age-related chronic diseases, epigenetics, which involves the laying of relatively stable imprints

on the genome that affect gene expression and cellular function over time, is emerging as a potential point of intersection between biological and psychosocial processes. It is known that epigenetic marks are altered in aging and in several age-related disease states such as cancer, neurodegenerative, and autoimmune diseases, as well as type 2 diabetes. The altered epigenome could therefore mediate the experience-dependent modulation of the aging rate and age-related morbidities across the life span. In addition, mitochondria themselves have a flexible medina epigenome and the ability to produce strong signals that have the potential to influence the nuclear epigenome. As a result, these organelles are well suited to serve as a crucial interface between the environment and the genome. It is a hypothesis that unifies knowledge about the health effects related to genetic variations, calorie intake, physical activity/inactivity, and neurobiological substrates of psychosocial stress into a unified framework for ageing research, even though it has not yet been empirically supported.

Together, the reviewed literature shows that a growing number of biological, behavioral, and psychosocial as well as psychosocial factors influence the ageing process. Biological factors include medina haplotypes, hormones, genetic polymorphisms affecting cellular signaling pathways, and factors epigenetic imprints. The challenge lying ahead of researchers in this field lies in the exploration of the intersection points linking these multiple levels of analysis spanning several disciplines. For example, what physiological processes interact with the psychosocial effects of being married, of meditating regularly, or of experiencing psychological well-being and sense of purpose in life, which ultimately culminate in reduced telomere shortening? What combination of elements lead to resilience and successful adaptation to aging? And what are the combinations leading to age-related risk and ill-health? Interdisciplinary initiatives aimed at describing the interactive biopsychosocial processes that link these multiple levels will yield new knowledge of the pathways to aging, which in turn will inform effective prevention and intervention strategies. Network perspectives inspired from systems biology allowing modeling of complex nonlinear interactions among the studied variables may prove useful in this endeavor. Similarly, building comprehensive theories of aging will require the combined efforts of researchers from different disciplines contributing diverse complementary expertise, perspectives, and approaches to study aging.Effective strategies for promoting healthy aging will need to be individualized. The perfect individualization of treatment and prevention of age-related disorders may appear as an unattainable utopia at this point in time. This is particularly the case because up until now, our knowledge of the dynamic interplay between the different biological and psychosocial levels of analysis is still fragmentary, which impedes discoveries about the complex processes from which individual-specific pathways of aging emerge. A well-known principle in biology and developmental psychopathology is that of equifinality, whereby multiple distinct pathways lead to the same outcome. The reciprocal principle is that of "multifocality," whereby the same set of pathways lead to different outcomes. Likewise, the source of interindividual differences in aging trajectories undoubtedly lies in the interplay of several interdependent pathways of which there is no single universal right combination that can be prescribed.Means must be developed to distinguish between optimal and suboptimal rates/trajectories of aging. From the onset, it can be established that optimal aging is characterized by a slow progressive decline in physiological functions, maintenance of well-being for the majority of the lifespan, and only a short period of very poor physical health leading to death. But what are the biomolecular sings of optimal adaptation to the passing decades? What are the normative oncogenic trajectories, or healthy biological and physiological signatures of successful aging? Having answers to these questions will enable researchers to more accurately distinguish dysfunction from normal function in different aged organ systems. Ryff, Singer and colleagues have established biological correlates and a conceptual framework aimed at deciphering the biological and psychosocial underpinnings of resilience, positive health, and successful aging. Building such a knowledge base of normal

molecular, cellular, physiological, and psychosocial signatures of aging may also translate into more refined means to detect predecease or preclinical deviations from normal adaptation and to prevent age-related diseases.Thus far, despite the fact that more resources are being invested to study specific aspects of the normal pathways leading to healthy aging, relatively little data is available to address pressing questions about healthy aging. A noteworthy exception is the MacArthur Studies of Successful Aging, which have collected a rich dataset spanning multiple biological and psychosocial levels over several years, thus providing an exceptional design for longitudinal evaluation of the biological-psychosocial interactions for a large cohort of elderly individuals. Future smaller-scale integrative research initiatives should build from the strengths and experience of this and other such longitudinal endeavors.

CONCLUSION

As a conclusion, we should respond, "There are undoubtedly many different pathways to healthy ageing," in response to the question, "What are the pathways that impact individuals' rate of ageing?" These pathways must be reliant on interactions between forces functioning at several levels of function, such as biological, behavioral, psychosocial, and spiritual elements, rather than on a single component acting alone and independently. Understanding the developmental nature of "pathways to ageing" is an interdisciplinary undertaking that calls on ageing researchers to collaborate in order to learn about and improve our understanding of the points where our respective fields converge. The intricacy of biological-psychosocial interactions that are involved in health processes must be understood by biomedical scientists, and psychosocial researchers must understand the underlying biological variables that have the potential to influence individual responses to psychosocial difficulties. This may be accomplished through identifying and experimentally evaluating possible places of crossing between the biological and psychological sciences, as well as the collaborative interdisciplinary research accomplishments that follow.

REFERENCES:

[1] M. Gugnoni, V. Sancisi, G. Manzotti, G. Gandolfi, and A. Ciarrocchi, “Autophagy and epithelial–mesenchymal transition: An intricate interplay in cancer,” *Cell Death and Disease*. 2016. doi: 10.1038/cddis.2016.415.

[2] A. R. Lima *et al.*, “Dynamin-related protein 1 at the crossroads of cancer,” *Genes*. 2018. doi: 10.3390/genes9020115.

[3] H. M. Gao, H. Zhou, and J. S. Hong, “Oxidative stress, neuroinflammation, and neurodegeneration,” in *Neuroinflammation and Neurodegeneration*, 2014. doi: 10.1007/978-1-4939-1071-7_5.

[4] D. E. Green and D. H. MacLennan, “The Mitochondrial System of Enzymes,” in *Metabolic Pathways*, 1967. doi: 10.1016/b978-0-12-299251-3.50008-2.

[5] NA, “Textbook Section 15.1 Seven-Transmembrane-Helix Receptors Change Conformation in Response to Ligand Binding and Activate G Proteins,” *Ncbi.Nlm*, 2002.

[6] V. D. Longo and M. P. Mattson, “Fasting: Molecular Mechanisms and Clinical Applications Valter,” *Tepeapulco, región en Perspect.*, 2012.

[7] D. L. Galvan, N. H. Green, and F. R. Danesh, “The hallmarks of mitochondrial dysfunction in chronic kidney disease,” *Kidney International*. 2017. doi: 10.1016/j.kint.2017.05.034.

[8] V. Shoshan-Barmatz, E. N. Maldonado, and Y. Krelin, “VDAC1 at the crossroads of cell metabolism, apoptosis and cell stress,” *Cell Stress*. 2017. doi: 10.15698/cst2017.10.104.

[9] V. Shoshan-Barmatz, D. Ben-Hail, L. Admoni, Y. Krelin, and S. S. Tripathi, “The mitochondrial voltage-dependent anion channel 1 in tumor cells,” *Biochimica et Biophysica Acta - Biomembranes*. 2015. doi: 10.1016/j.bbamem.2014.10.040.

[10] F. Minibayeva, S. Dmitrieva, A. Ponomareva, and V. Ryabovol, “Oxidative stress-induced autophagy in plants: The role of mitochondria,” *Plant Physiol. Biochem.*, 2012, doi: 10.1016/j.plaphy.2012.02.013.

CHAPTER 8
THE IMPACT OF APPLIED SOCIAL SCIENCES ON PUBLIC HEALTH APPROACHES RELATED TO OBESITY STIGMA

Dr. Nisha, Assistant Professor

Department of Science, Maharishi University of Information Technology, Uttar Pradesh, India

Email Id- nisha.kumari@muit.in

ABSTRACT:
The stigma associated with obesity is widespread, and it is seen as a serious public health issue. Due to this marginalization, fat people are considered a special population. Weight bias develops in part as a result of the popular sources' attribution of the cause of obesity to certain lifestyle elements. It's possible that this doesn't truly represent the realities of fat people or how they see their health and quality of life. For applied social scientists like anthropologists or sociologists, who study the lived and embodied experiences of this mostly discredited community, there may be a significant role to play. Planning public health interventions might benefit from this innovative study. By conducting this research, applied social scientists may contribute to the creation of a public health strategy that is non-stigmatizing and represents the needs of all people in terms of health. Such a strategy would draw on the strengths of applied social research, which include problematizing the taken for granted examining the banal, and creating emic understandings of marginalized communities.

KEYWORDS:

Attribution, Marginalized, Stigma Associated,Sociologists.

INTRODUCTION

The stigma around obesity and unfavorable preconceptions about fat persons are pervasive and detrimental to the health, dignity, and quality of life of obese people. By arguing that the occurrence of obesity is almost completely reliant on personal choices, conventional media and biomedical representations of fat people contribute to this stigmatization. Furthermore, depending on their gender, class, ethnicity, and other social positions, obese people may have a variety of overlapping social roles and identities. Such intersecting dynamics may exacerbate the marginalization that fat people already face.Media and biomedical representations of obesity typically use the terms crisis or epidemic. Anenergy balance model of causation is used to explain the complex and multilayer a etiology of obesity, although this model falls short in explaining weight trajectories. Public health nearly always advises weight reduction despite the often-documented ineffectiveness of diets for weight loss[1], [2].A limited emphasis on weight reduction, an excessively simplified understanding of how obese people live, feel their bodies, the settings they occupy, and the options available to them in achieving health, happiness, and a full life may cause interventions to fail. Additionally, despite the fact that health is said to be the ultimate aim, these programmed usually emphasize weight and characterize fatness or greater weights as inevitably problematic. Given that the people often targeted by such campaigns may vary from dominant groups in terms of culture and socioeconomic status, this is particularly crucial. To provide really helpful and sensitive programming, these many aspects may have an impact on people's priorities, life styles, and conceptions of their health. The lived experiences of obese people may be best explored by qualitative social scientists with training in ethnographic approaches, such as anthropologists or sociologists. They might help create a public health

plan that takes into account the priorities and way of life of every person and is carried out in line with a autogenic, optimistic, and comprehensive concept of health promotion. In-depth, qualitative social science research has the potential to significantly improve programmed delivery, which is covered in this essay. As Warin and Gunson point out, there hasn't been much effort put into gathering the experiences and viewpoints of real fat individuals, even within the growing disciplines of critical obesity research. Programming that meets the requirements of several marginalized communities may be created by genuine interdisciplinary cooperation as opposed to public health researchers, programmers, and qualitative social scientists working in separate silos. Importantly, such a strategy would support humane and fact-based policy and programming rather of relying on preconceptions.

Healthcare System Challenges:

Planning successful and considerate public health care delivery requires an understanding of how patients and providers both see health-related issues and how these actors must negotiate these perspectives in a care-setting environment. Despite evidence that obese people may have metabolic health, obese people tend to live longer than "normal" weight people, as do obese people in chronic disease populations, and fit obese people compared to unfit "normal weight" people. Biomedical research almost always views obesity as a health crisis.Healthcare professionals and trainees, even those with specializations in obesity or nutrition-related practise, exhibit moderate to high levels of weight bias. According to a recent systematic evaluation of doctors' opinions on treating adult obesity, treating obesity is crucial. Despite having little genuine understanding about treating obesity, they were confident in their abilities. Patients' disobedience and lack of ambition were blamed by doctors for their perceived failure to effectively treat obesity, which is consistent with their overall perception of overweight and obese people as lethargic. Foster and colleagues found comparable findings in two nationally representative American surveys. Physicians shared the opinion that obesity therapy was unsuccessful, had little regard for the looks and compliance of fat patients, blamed lifestyle factors for the disease's occurrence, and demanded more pay for treating obese patients. Similar to earlier research, doctors in New York State complained that trying to manage obesity was frustrating. Their lack of self-efficacy in treating obesity, the degree to which obesity-contributing variables were beyond their control, and a perceived lack of compensation all contributed to their unhappiness[1], [2].

The views of doctors towards pediatric obesity are similar to those towards adult obesity. Doctors recommend dietitians and provide lifestyle recommendations because they think treating childhood obesity is crucial. They believe that their inability to cure obesity is mostly due to patients' disobedience and lack of drive. Regarding doctors' opinions on pediatric obesity, reimbursement seemed to be less of a problem.Studies have also provided more complex perspectives on the attitudes of professionals towards the treatment of obesity. For instance, a physician's BMI may influence how likely they are to advise fat patients. providers who thought their patients had a higher BMI than themselves were more likely to start weight reduction talks among primary care providers. Normal weight doctors were also more likely to be at ease giving the advice, believe it was their duty to serve as role models for normal weight people, and had doubts about the patients' willingness to follow weight-related advice from overweight or obese clinicians.

A record review and patient survey were used in different research carried out in New York City, and the findings point to minimal emphasis on obesity in practise. It was shown that doctors were somewhat reluctant to diagnose a patient as overweight or obese, to recommend weight reduction, or to send them to a nutritionist. Typically, this was at odds with what the

patient wanted. Most patients sought medical counsel and a referral to a dietician in order to reduce weight. According to qualitative research on the opinions of German doctors and patients about the therapy of obesity, clinicians were worried about the possible overemphasis on obesity. The extra strain on primary care facilities, the necessity for interdisciplinary approaches to obesity treatment, and the need of respectful, trusting relationships between practitioners and patients were all stressed by both doctors and patients. Both groups also mentioned the need for additional services and professional participation, provided by doctors or other providers, either independently of or within a primary care context.A recent discussion in the Canadian Family Physician magazine has shown that doctors may be adopting a more skeptical perspective on the conventional wisdom that recommends weight reduction for every obese patient. Bosomworth reviews the potential detrimental effects of weight reduction on mortality, morbidity, and quality of life. It is advised that obese people with metabolic health should work to maintain weight stability rather than gaining or losing weight. Given that losing weight is almost unattainable, an accompanying editorial promotes self-acceptance and good lives for obese patients. Baranova makes the case that the emphasis should be on avoiding obesity rather than trying to lose weight as a public health objective. Garrel asserts that obesity treatment is preferable to obesity prevention since the latter is generally beyond the practitioner's control. However, the planned course of action has very modest objectives. For the purpose of directing obesity therapy, Garrel uses the Edmonton Obesity Staging System. Based on these recommendations, Garrel is in favors of encouraging weight reduction only in obese people who also have comorbid diseases; otherwise, doctors should aim to avoid weight gain in all obese people. Treatment for obese patients with comorbid diseases would include managing such disorders, helping them establish reasonable weight goals, and informing them about risky weight reduction techniques. Compared to just anthropometric measurements, the EOSS offers a more complex understanding of obesity. It is possible that some fat persons are healthy and may not need therapy[3], [4].

DISCUSSION

Dietitians are also thought to be important in managing obesity. Dietitians are more often recommended by doctors than gastric bypass surgery or medication. Dietitians concur that they should be treated for obesity first. In a survey of 514 Canadian dietitians, almost 90% agreed that obesity was a factor in health problems and that overweight people should be urged to reduce weight. However, they also emphasized the use of health indicators other than weight in the management of obesity, and the majority of them suggested that their clients refrain from self-weighing. It's true that many dietitians had a favorable attitude towards the health-at-Every-Size philosophy; yet, there were differences in intentions to implement more regimented eating regimens and give up weight reduction as a goal. Additionally, some claimed that certain sizes went beyond what was healthy.The development of respectful and trustworthy relationships between clinicians and their obese patients seems to be crucial for developing therapies for obese people, according to the analysis of physician opinions on obesity. In view of obesity's probable intractability and possibly nonpathological character, these interactions must be maintained. To accomplish these goals, a deeper understanding of the health views, perceptions, and objectives of obese patients and doctors throughout the life cycle is essential. A better grasp of what it's like to see a doctor as a bigger patient might provide insightful information on sensitive care delivery and health-centric treatment philosophies.To enhance health and quality of life, it is crucial to raise awareness of the stigma that fat people face in both daily life and the healthcare system. To address a social justice problem that significantly affects a large population's health and quality of life, it is crucial to examine these concerns in detail. Researchers that use applied social science methods, like as ethnographers, may be

particularly skilled in examining this topic and learning from fat people about the potential oppression they face.People who are obese report experiencing a lot of weight prejudice in daily life. Both interpersonal interactions and institutional contexts, such as social gatherings, workplaces, and healthcare facilities, might include prejudice. In the American 1995–1996 National Midlife Development Study, 40% of larger people reported experiencing prejudice, making this inequality especially noticeable. Additionally, the proportional probability of women and younger persons suffering weight stigma was much greater.These results are consistent with observations of widespread stigmatizing views towards fat people around the globe. The public places a great emphasis on the individual's alleged causative involvement in the development of obesity, and this was the single best indicator of having a stigmatizing attitude. Planning for public health and the health of fat people are particularly impacted by how prevalent obesity stigma is in healthcare settings. Finding appropriate medical treatment may be more challenging for fat people if they are aware of these views. Social scientists might investigate these problems and try to use an in-depth, exploratory viewpoint from the standpoint of fat people's own. In the end, these investigations could help develop better public health and healthcare policies.The prevalence and severity of obesity stigma in the public are influenced by how obesity is portrayed in biomedical, media, and other popular narratives. Despite the lack of conclusive data, Gard and Wright found that the public was informed about obesity research in a manner that obscured the inherent ambiguity and imprecision of epidemiological studies and presented obesity as a health concern. This study is assumed to be indisputably objective and devoid of any moralizing, political, or ideological slant since it was produced inside a biomedical institution. Such a framework enables the rejection of other viewpoints as erroneous, regardless of their source: lay perspectives, embodied experience, or alternative epistemological research domains. It also rules out worries about how antifa prejudice may influence or harm this study[4], [5].

By portraying a homogenizing and blaming image of such persons' habits and experiences, these depictions run the risk of unintentionally silencing the source most crucial to understanding the public health programming requirements of obese individuals, namely fat individuals themselves. These opinions probably rely more on presumptions than actual information about the experiences of fat people. Multidisciplinary research that highlights the views of obese people and draws on their lived knowledge may improve public health initiatives.The unique moral standards of media pundits influence whatever aspect of life they choose to blame for obesity. These ideals are often linked and assumed to be particular to contemporary living, such as reduced family quality time or the laziness of today's youth. Similar to these narratives include the media's emphasis on evolutionary causes for obesity, which could give the public a false impression of the biological or archaeological evidence for human evolution. Regardless of the truth of these assertions, moralistic frames that paint contemporary lives as decadent, lazy, and glutinous continue to be used to support these and other arguments that portray a bygone period of no obesity and health. Children in particular are often the target of adult commenters' ire since they are seen as representing the alleged decline in society values and lifestyles. Instead of attempting to comprehend the viewpoints of the children themselves, child health prevention programmed that rely on this framing run the danger of stigmatizing, depriving, and injuring children.In media portrayals of the causes of obesity, the individualistic theory still predominates. These representations hold that both the origin and treatment of obesity are personal choices. This portrayal reinforces stigmatizing beliefs about fat people, who are seen as representing a reversible social and health burden that is shared in part by others. It also dismisses the possibility that fat people may be healthy, may want to emphasize health concepts that are more comprehensive and less weight-centric, or may have lifestyles that prevent them from investing in or practicing self-care. Lawrence has seen an interesting change in how obesity is covered in American media after 2003. Although the emphasis is still heavily on personal responsibility,

environmental influences, especially those related to the fast-food business, are receiving more attention. Sadly, this focus has had little to no impact on anti-fat sentiments. Although environmental dangers for obesity are recognized, it is still believed that people voluntarily take these risks, making them mainly responsible for their body size and deserving of criticism. Previously non-stigmatizing countries are now experiencing this prejudice. By working together to better understand the health and experiences of an often-disparaged group and addressing the health concerns that are most pertinent to them, qualitative social science researchers may be in a position to challenge common stereotypical assumptions about the lives of obese individuals.An even more severe figurative technique is the use of military analogies, in addition to referring to obesity as an epidemic or crisis. This discourse successfully portrays fat people as wartime targets or even domestic terrorists. In epidemiological studies that use techniques like social network analysis, words like "contagious" are also employed to describe obesity. The potential health-improving and stress-relieving effects of social support networks for people seem to be especially harmed by this approach. It may be quite alienating for fat people to have their relationship depicted as a danger for gaining obesity since obesity is something that is very dreaded[6], [7].

Stigmatization of obese people has been hypothesized to act as an incentive for weight reduction. The facts, however, paints a far grimmer picture; stigmatizing fat people is a useless strategy for lowering obesity rates. Stigma is more likely to result in unhealthy eating patterns and inactivity than it is to encourage healthy behaviors, which may potentially increase the incidence of both obesity and disordered eating. Additionally, it has been proposed that the apocalyptic language used to characterize the obesity pandemic may be a factor in the rise in eating disorders. The emergence of eating disorders has also been linked to strategies intended to reduce juvenile obesity.Stigma may harm physical and psychological health via stress-induced neuroendocrine dysregulation, which has been linked to detrimental psychological effects from weight discrimination. In American adults, Menig and colleagues discovered that the gap between desired weight and actual weight had a greater influence on mentally and physically unwell days than BMI, indicating that subjective body dissatisfaction may have a more powerful effect on health than objective fatness. Healthcare discrimination, resulting in subpar service, and subsequent avoidance of healthcare providers are likely to compound the negative health impacts of stigma-induced stress. The research on obesity, socioeconomic status, and mortality was also evaluated by Ernsberger. Through prejudice and discrimination impacting prospects for education, work, income, housing, and healthcare, obesity may increase the likelihood of poverty, downward social mobility, and consequent poor health .Therefore, weight stigma may be significantly more harmful to one's health than previously believed and far worse than "excess weight" .

It's important to note that stigma's effects could not go away with weight reduction. For instance, females who had previously been fat continued to experience the reduced self-esteem that is typical of teenagers who are chronically obese. Additionally, there is qualitative research that suggests that attempts to lose weight may lead to the deterioration of friendships along with corresponding behavioral, dynamic, and emotional changes. The "contagious" conceptualization of obesity could make this worse. This decline in social support may be an unrecognized process through which the stigma associated with obesity harms health, which may have previously been mistakenly ascribed to the weight itself.People may use a range of stigma management approaches in such a stigmatizing setting. One of these strategies might be making an effort to reduce weight as a penitential gesture and to lessen the fatness that oppresses obese people. Monaghan investigated the consequences of stigma on the lives of the male members of a slimming club in the United Kingdom using ethnography. These people, who differed in their acceptance of obesity as a stigmatized condition, used their stories about their weight problems as one strategy for

reducing stigma. According to some reports, this included making justifications that reduced personal accountability for fat, including allusions to a hereditary illness or environmental factors. Others used their love of eating or their pride in their strong size as justifications for their size. People who disagreed with the obesity epidemic either emphasized natural body variety or downplayed the significance of weight in terms of one's health. These stories are socially dependent, which is significant. While one account could be appropriate in one setting, other accounts might be more appropriate in other circumstances. Some people may decide to support the fat acceptance movement as a way to deal with stigmatizing circumstances. Planning autogenic, engaging, advantageous, and inclusive public health policies require an understanding of the daily consequences of stigma on people's lives, ways of living, and health. For instance, knowing why obese people choose to avoid places for physical activity that are especially stigmatizing may help public health planners create a setting that encourages people of all sizes to exercise in a way that is joyful and beneficial to their health.

The Value of Obese People's Perspectives:

According to the research, obese people face significant stigma and live in a society that is rife with unproblematized information about the dangers of being overweight. These facts are often conveyed in a way that presupposes personal responsibility for health, that obesity and good health are incompatible, and that pursuing wellness is morally required. People seem to have absorbed this rhetoric and enabled it to affect their thoughts and lives, to a greater or lesser degree. The prevalent mainstream weight discourse may have an impact on people's beliefs of their health, but physical notions of wellness may also play a role in this process. Due to somatic signaling or awareness of their lifestyles, fat people may not be receptive to popular obesity-related advertising, even while data shows that they may be healthy. Additionally, people may priorities other aspects of wellbeing above weight concerns, such as having fun or reducing food insecurity due to a lack of money. Despite the health risks linked to obesity, it is important to gain a better understanding of how obese people feel about their health and quality of life, what they priorities when it comes to their health, and what they believe would most improve their quality of life and wellness. Given the chronic nature of obesity, these beliefs may also change over time when various weight trajectories are encountered. Such information will be crucial in developing efficient and moral interventions when developing public health communications, programmed, and policies[8], [9].

It's also crucial to take into account the stigmatization of fat people's life, which may have a variety of repercussions. This includes include the social components of stigma's most at stake for actors in a local social world. For instance, stigma may prevent people from achieving their potential in terms of life chances, financial possibilities, and role fulfilment within their families or individually. This perspective on stigma also takes into account the psychosomatic nature of stigma as well as the psychobiological, moral-somatic, and moral-emotional pathways by which stigma may directly affect one's physical well-being. These findings on the perspectives and health of obese people will add to the wealth of work already done in theoretical understandings of the body, critical obesity and fat studies, and qualitative research on the discursive bodily and health perspectives of people of all sizes, for example.A public health paradigm that places a focus on weight has recently come under fire from groups. The Health-at-Every-Size strategy is one such project. Without an emphasis on weight reduction, HAES proponents encourage healthy lifestyle. The extremely low rates of long-term weight reduction and possible harm to one's physical and mental health that come with weight loss diets are criticized by HAES proponents. Lowered self-esteem, increased stress, fluctuating weight, and bone loss are some examples of these impacts. In addition, HAES proponents criticize the ethics of encouraging weight reduction given its poor rates of

success and potential risks, as well as the overestimation of the impacts of obesity on illness and death, the denial of the presence of healthy fat people, and the discounting of these persons' existence . Instead, the HAES movement champions the advantages of enjoying physical exercise and accepting one's physique. Practitioners of HAES recommend eating healthily using an intuitive eating model that is based on the body's natural indications for hunger and fullness. Independent of weight reduction, clinical studies of HAES lifestyle treatments have shown benefits in psychological, clinical, physiological, and behavioral parameters. Importantly, participants did not suffer negative effects, such as weight increase, and these outcomes were superior to those of intervention groups that focused on diet. The incorporation of actual insiders' opinions on the benefits and drawbacks of these revolutionary advances would be made possible by the participation of social scientists in public health strategic planning.

Critical obesity experts are often in agreement with HAES, or proponents for fat acceptance. These academics have voiced criticisms of the prevalent obesity narrative, often coming from professions outside of health. The scientific and epidemiological foundations of the prevalent concept of obesity as a serious health issue and a result of personal behavior have been called into question in studies that have been published. These scholars have brought up a number of issues, such as the use of terms like epidemic or crisis when discussing obesity, the moralization of a presumptive health issue and the ensuing ethical and stigmatizing implications of interventions and messaging, and the impact of the dominant obesity discourse on people's understandings of their bodies. Understanding the everyday lives of fat people, their attitudes on health, and how to organize the most effective therapies will be made easier with the help of the findings from these and comparable research.Compared to earlier, more colonially complicit periods of anthropology, the traditional concentration on the subaltern in study has grown more aware of and reflective of power relations. Today's concentration on stigmatized groups, such fat people, might benefit from growing anthropological strengths like the use of anthropology in social criticism and the emergence of critical ethnography. fat people and their supporters have organized opposition against prevailing obesity propaganda, despite the fact that fat people are often stigmatized in today's society. Male members of a slimming club in the United Kingdom were the subject of ethnographic research by Monaghan. This offered priceless insight into how stigma affected these people's lives and how they dealt with it. To address a kind of prejudice that may be harmful to one's life and health but has received little attention or condemnation, further research on how men, women, and children experience weight stigma is required. In this regard, ethnographers may be extremely helpful. Participant observation may be a useful method in identifying these stigmas, their impacts, and giving empirical evidence for enacting change. Such kinds of stigma may function primarily subconsciously. For health care professionals, public health experts, and members of the general public of all sizes, further ethnographic research on obese people with a focus on health and with applicable goals would be of immeasurable value.Collaboration between ethnographers and health researchers would thus benefit both fields' interests as well as, more crucially, the requirements of fat people. In areas where weight prejudice has been documented, such as health care facilities, gyms, workplaces, and educational institutions, ethnographers could investigate people's experiences there. By examining how obese people live their lives, the decisions they make, their priorities for wellness and quality of life, their contributions to society, and any biases they may have encountered, applied social scientists can put a human face on obesity and work to create a positive, life-affirming, and inclusive public health system that aims to reduce stigma and blame while promoting high quality of life for all.

By giving a better knowledge and problematization of taken for granted assumptions about fat people's health, lives, and behaviors, applied social science may improve the quality of

life for obese people. This exemplifies what Rabinow thinks is a fresh and especially important topic for anthropological investigation. theproblematization of serious speech acts and related behaviors, items, and categories. Through testing in these areas, anthropology may be able to transform cultural elements from being seen as natural to contingent to reflexive. In examining weight stigma, which is often seen as normal or even acceptable in present sociocultural settings, the problematization of taken-for-granted social attitudes and practices is especially pertinent.Prevalent beliefs imply that fat people are always sick, sluggish, indulgent, and willpower-less. Internalization of such narratives may result in people feeling unwell, undeserving, immoral, or powerless because of their physique or seemingly harmless lifestyle choices. Through ethnography or other in-depth study techniques, emic understandings of fat people's lives might result in a less-stigmatizing, healthier understanding of how obese people manage their daily lives. Such information might guide more sensible public health planning.

Future public health strategies may benefit greatly from this deeper knowledge. The definition of health for fat people, their priorities for wellbeing, and their experiences trying to live well lives would all be better understood. A patient-centered approach that is more in line with the lives and preferences of obese people would result from this viewpoint, which would also help counteract potentially traumatic memories of dieting or healthcare discrimination. It would also help forge bonds of trust between obese people, healthcare professionals, and public health officials. Any collaborative health initiative must achieve all of these goals in order to go forward. In this research project, applied social scientists may be particularly helpful in terms of communicating results and supporting progress, especially those with access to health practitioners and policy-related audiences. These people could distribute a criticism to influential parties who work in the health sector and have the power to bring about change.Participant observation of how obese people engage with the healthcare system is a specific opportunity for qualitative researchers to learn about the most difficult and promising parts of these patients' treatment. To pinpoint the effective, delicate, or problematic elements of current preventative programmed, critical ethnography may also be used inside them. Multisite ethnography may help obese people discover areas where they are stigmatized and locations where they might get assistance for caring for themselves.

Attempting a critical ethnography of the lived experiences of fat people would undoubtedly present difficulties. Biomedical, public health, and ordinary audiences have a vested interest in traditional obesity understandings. It could be challenging to carry out and communicate such studies. This may be especially true when attempting to convince others of its importance who are either generally ignorant of the prevalence, impacts, or who have internalized unfavorable prejudices about fat people. Additionally, researchers would need to represent the results of study participants honestly and correctly while also being self-aware of their own biases. These researchers would also need to work to develop constructive, understanding, and cooperative connections with a range of biomedical, lay, and public health audiences in order to disseminate information in a way that is most favorable to collaboration and reform. Researchers run the danger of only spreading criticism among those who are already opposed to the prevalent obesity discourse or who are unable to start reforming public health measures and communications.It would be very beneficial to encourage cooperation and partnerships between patients, clinicians, and decision-makers. In order to better address obese people's needs and priorities in terms of healthcare system allocation, address systemic and interpersonal discrimination, and establish weight industry regulations more in keeping with respect for consumers and truth in advertising, policy makers would be able to learn from patients' experiences and desires. These options, along with a plethora of others, would enable academics and public-health planners to discover what health goals are relevant to a population that has been unnecessarily pathologized and

stigmatized. It might pave the way for never-before-thought-of structural ifor fat people, exposure to the obesity discourse is probably inevitable. These people get a barrage of reminders every day about the danger they pose just by virtue of their size[10].

CONCLUSION

These dangers are believed to affect not just their own health but also other people's health, the long-term viability of the healthcare system, and even the future of civilization. They are also blamed by society for taxing the healthcare system and their alleged bad health. In this setting, widespread and generally accepted weight stigma has taken on a normalizing role. By receiving such information, obese people become a demographic deserving of particular care when designing public health initiatives in order to prevent the reinforcement of disparaging stereotypes. The opinions of fat people themselves about their health, ambitions, desires, and quality of life are inadequate, despite this oppressive emphasis on obesity.

Additionally, there have been little initiatives to close communication gaps between doctors and fat patients and to get a more complete picture of doctors' perspectives on obesity. They may be especially well-suited to assist in this endeavor given their commitment to comprehending emic views and proficiency with in-depth exploratory techniques like ethnography. Public health initiatives that are advantageous, inclusive, and stigmatizing may result, and everyone would gain significantly from them. improvements and the fulfilment of all local health demands.

REFERENCES:

[1] M. Hughes and C. Duffy, “Public involvement in health and social sciences research: A concept analysis,” *Heal. Expect.*, 2018, doi: 10.1111/hex.12825.

[2] R. Langford, C. Bonell, H. Jones, and R. Campbell, “Obesity prevention and the Health promoting Schools framework: Essential components and barriers to success,” *Int. J. Behav. Nutr. Phys. Act.*, 2015, doi: 10.1186/s12966-015-0167-7.

[3] J. K. Rosenthal, E. D. Sclar, P. L. Kinney, K. Knowlton, R. Crauderueff, and P. W. Brandt-Rauf, “Links between the built environment, climate and population health: Interdisciplinary environmental change research in New York City,” *Annals of the Academy of Medicine Singapore*. 2007. doi: 10.47102/annals-acadmedsg.v36n10p834.

[4] B. L. Riley, A. Kernoghan, L. Stockton, S. Montague, J. Yessis, and C. D. Willis, “Using contribution analysis to evaluate the impacts of research on policy: Getting to ‘good enough,’” *Res. Eval.*, 2018, doi: 10.1093/reseval/rvx037.

[5] R. C. Brownson, A. A. Eyler, J. K. Harris, J. B. Moore, and R. G. Tabak, “Getting the word out: New approaches for disseminating public health science,” *J. Public Heal. Manag. Pract.*, 2018, doi: 10.1097/PHH.0000000000000673.

[6] Z. J. Andersen *et al.*, “Newborns health in the Danube Region: Environment, biomonitoring, interventions and economic benefits in a large prospective birth cohort study,” *Environment International*. 2016. doi: 10.1016/j.envint.2015.12.009.

[7] “8.O. Workshop: Healthy and Sustainable Diets for European Countries,” *Eur. J. Public Health*, 2017, doi: 10.1093/eurpub/ckx187.630.

[8] J. A. Halepota and N. Shah, “An empirical investigation of organisational antecedents on employee job satisfaction in a developing country,” *Transform. Gov. People, Process Policy*, 2011, doi: 10.1108/17506161111155414.

[9] P. L. Rosenfield, “The potential of transdisciplinary research for sustaining and extending linkages between the health and social sciences,” *Soc. Sci. Med.*, 1992, doi: 10.1016/0277-9536(92)90038-R.

[10] M. Iles-Shih, C. Sve, R. Solotaroff, R. Bruno, and J. Gregg, “Health and illness in context: A pragmatic, interdisciplinary approach to teaching and learning applied public health within an urban safety net system,” *J. Public Heal. Manag. Pract.*, 2011, doi: 10.1097/PHH.0b013e31820f8e56.

CHAPTER 9
ALTIMETRIC ATTENTION SCORE AND CITATIONS IN THE HEALTH SCIENCES: A META-ANALYSIS

Dr. Nisha, Assistant Professor

Department of Science, Maharishi University of Information Technology, Uttar Pradesh, India

Email Id- nisha.kumari@muit.in

ABSTRACT:
The association between altimetric score and citations has been the subject of various contentious publications in recent years. To give a thorough statistical examination of the relationship between altimetric score and number of citations in the subject of health sciences, we performed a meta-analysis. Methods. Using the terms altimetric, citation, and "correlation," three online databases were thoroughly searched without regard to language from the earliest publication date accessible through February. Also searched were the top 100 results from Google Scholar, Open Grey, and World Cat for grey literature. We considered all health sciences papers that reported on this association. Utilizing Fisher's transformation of correlations, effect sizes were computed. On the basis of sample techniques and citation sources, subgroup analyses were carried out. Results. 8 of the 27 included publications include findings from many independent research. There were 35 studies totaling articles in the sample. With a 95% confidence range of 0.13 to 0.26, the total pooled effect size was 0.19. When effect size, citation source, and sampling technique were predicted somewhat in a bivariate manner, Web of Science outperformed Scopus and Dimensions in terms of effect size. A somewhat non-significant publication bias was shown by Egger's regression, and trim-and-fill analysis approximated one missing research in this meta-analysis. Conclusion.

KEYWORDS:

Association, Accessible, Citations, Regression.

INTRODUCTION

There are now new phrases like Twitter science stars and Kardashian Index due to the growing need for researchers to share their research results online. Quantification of the effect of research is made easier by the abundance of web-based technology. Alternative metrics, sometimes known as altimetric, are developing ideas that might supplement conventional bibliometrics based on citations. Social media sites like Twitter and Facebook, Google+ and Reddit, news organizations, scientific blogs, policy documents, patents, Wikipedia, video uploaders like YouTube, Stack Exchange sites, Puebloans, Faculty of 1000 Prime, and reference managers like Mendeley are all sources of altimetric data. The Altimetric Institution, Plum Analytics, and Impact Story are three companies that now provide altimetric data. One of these sources is used by a number of academic publishers, such as John Wiley & Sons, Inc., Journal of the American Medical Association Network, Taylor & Francis, Springer Nature, and Elsevier Publishing.The most popular supplier is the Altimetric Institution. A search of the Altimetric database revealed 122 million total altimetric mentions and more than 14 million research outputs with online attention among more than 27 million research outputs[1], [2]. The Altimetric Institution defines aaltimetric score as "a weighted count of all of the mentions Altimetric has tracked for an individual research output, and is designed as an indicator of the amount and reach of the attention an

item has received. When determining the altimetric score, it does not use an equal weighting value for each altimetric data resource. The work "Characteristics of and Important Lessons from the Coronavirus Disease 2019 Outbreak in China" for example, ranks in the top 5% of all scientific outputs according to altimetric. It was covered in 47 major news sites, 8 scientific blogs, 5745 tweets, 20 Facebook pages, 1 Wikipedia article, and 5 Reddit posts.Altimetric analysis is being taken into consideration by research funders and philanthropic institutions like the Welcome Trust and John Templeton Foundation. Director of Planning and Evaluation at the Templeton Foundation Steve Fitzmier commentedAt the Foundation's heart is a goal to both finance high quality research and to increase public involvement with the research we support. While looking at indicators like citations might be useful in determining influence, they only provide a partial view. . Research on the impact of the alcohol business on alcohol policy is an excellent illustration in support of the aforementioned claim. The investigation, funded by the Welcome Trust, claimed that multiple submissions to the Scottish Government distorted scientific findings in order to advocate policies that favored the alcohol industry. It was still uncited three months after it appeared in PLOS Medicine. However, altimetric showed that important figures, such as members of the European Parliament, representatives of international NGOs, and a sector manager for Health, Nutrition, and Population at the World Bank, had tweeted about the article, demonstrating its influence on global policy[3], [4].According to a Google trend study, "bibliometric" has garnered less attention globally over the last five years than altimetric. Traditional bibliometrics that are based on citations grow slowly. Only 50% of publications are mentioned, on average, in the first three years after publication or, in exceptional cases, 26 years. In contrast, popular altimetric data sources, like Twitter and Wikipedia, are updated in real time or daily, like Facebook and Google+. But among scholars, the connection between altimetric and citations is a difficult and contentious topic. This link has recently been the subject of numerous contentious publications; hence the goal of the current meta-analysis was to determine how closely this correlation relates to citations in the area of health sciences.The main result of interest in the current meta-analysis was the pooled correlation coefficient between altimetric score and citation counts in health sciences research.From the earliest publication date accessible through February 29, 2020, three online databases were systematically searched, without language restrictions, using the keywords altimetric citationand correlation, where the asterisk was used as a truncation symbol. Also searched were the top 100 results from Google Scholar, Open Grey, and World Cat for grey literature. Additionally, we thoroughly searched all listed research' references.This meta-analysis includes all research in the area of health sciences that examined the relationship between altimetric score and number of citations. For citation information, Web of Science, Scopus, Dimensions, Crossruff, and PubMed Central were regarded as trustworthy sources. Studies that did not provide sample sizes or precise correlation coefficients, citation counts from sources other than the Altimetric Institute, or studies from disciplines other than the health sciences were also not included were also removed.

Duplicates were eliminated when articles that could be eligible were found. Then, two writers independently examined each paper. During the screening stage, text mining was also done using the SWIFT-Review programmed. Abstracts related to related subjects are automatically categorized using machine learning methods in this programmed. Two authors independently extracted the data and entered it on a typical data collecting sheet. At each level, disagreements were settled using the Delphi method.

Utilizing Fisher's transformation of correlations, effect sizes were computed. To convert to a -score, use the following formula. Data were analyzed using the random-effects model if there

was statistical heterogeneity; otherwise, the fixed-effects model was used to pool the data. the metaphor and meteor R packages, and were used to conduct the meta-analysis. The random forest model, a machine learning approach, was used using the R package meta forest to investigate the relationship between moderators and effect size. The random forest model is a regression technique that produces a collection of decision trees made up of several distinct trees that work together as a unit, much like a forest. The subgroup analysis was based on the studies' sample techniques as well as their citation sources. The Abuja plot was used as a diagnostic tool to identify studies that had a significant impact on the overall findings and sources of heterogeneity. To measure publication bias, the regression-based Egger's test and the Begg's rank test were used. The number of papers missing from the meta-analysis was estimated using nonparametric trim-and-fill methodology.

The analyses included a total of 35 papers. Eight of the 27 included publications combine data from many independent research. For instance, Barbic et al. referred to two distinct investigations. They looked at the papers in the top 10 emergency medicine journals that were often mentioned as well as the rest of the medical literature, reporting the correlation coefficient and sample size for each category separately. Additionally, depending on the source of citations, several research contained a number of sub studies. For instance, three correlation coefficients, one for each of Web of Science, Dimensions, and Scopus, were reported by Markovich et al.Finally, and Supplementary Table S1 provide features of the 35 included studies and the seven eliminated research[5], [6].

DISCUSSION

publications from different fields of medicine made up the whole sample. Studies have employed a variety of databases to determine the quantity of citations, most often Web of Science and Scopus. In addition, among the included research, three distinct sampling techniques were identified. The correlation between altimetric score and number of citations was investigated for the following groups of articles: articles with the highest altimetric score, articles with the greatest number of citations, and all articles in a certain field and year . Almost all studies had positive correlation coefficients, although three of them had negative correlation coefficients.The pooled correlation coefficient was 0.19, and the pooled effect size was 0.19, with a 95% confidence interval presents subgroup analysis depending on the source of the citations as well as the study's sampling strategy. The studies with the greatest degree of correlation were those whose sample consisted entirely of articles from a particular field and year, followed by articles with the greatest number of citations and articles with the greatest altimetric score. The Web of Science group had the highest pooled correlation coefficient, with Scopus and Dimensions coming in second and third, respectively, when taking into account the source of databases for counting the number of citations.All of the included studies have a significant level of general heterogeneity. According to the Abuja plot, Heydari et al. had the most influence on the total meta-analysis output and heterogeneity.comprehensive evaluation of heterogeneity. Readers should be aware that the PubMed Central and Crossruff groupings only include one research.

According to bivariate partial prediction of the relationship between effect size, source of citation, and sampling strategy, Web of Science was the source of citations that had the largest effect sizes when compared to Scopus and Dimensions.

Bivariate partial prediction of the interaction between the magnitude of the effect, the citation source, and the kind of research is shown in a binned scatter plot. The 500 trees in the forest

and the minimum terminal node size of 5 were used to construct this graphic using a machine learning approach called random forests. Readers should be aware that each Crossruff and PubMed Central group consisted of only one article. So, they were taken out of the analysis for better explanation. For further information on sample sizes, please reef. The MetaForest_onlinewas used for the analysis.For the most-cited group, Egger's regression revealed publication bias, and for all included papers in meta-analyses, the result was slightly nonsignificant. In both the most-cited group and all included papers in the meta-analysis, nonparametric trim-and-fill analysis revealed that there may be one research that is missing.Using the Begg's rank test and the regression-based Egger's test, one may evaluate publication bias. Readers should be aware that the PubMed Central and Crossruff groupings only include one research.

Funnel plots for two groups that have publication bias, including the most cited group and all included research groups, using nonparametric trim-and-fill analysis. The number of studies that were missing was calculated using the linear estimator. The observed effect size for each of the studies that were included was and the observed + imputed effect size was 0.186. For the group with the highest number of citations, the observed effect size was and the observed + imputed effect size was 0.220. Please refer to Figure 6 for further information on assessing publication bias.

More than 3.8 billion people use social media regularly around the globe, according to estimates. Using social media to share information with other researchers, practitioners, and members of the public is becoming more common within the biomedical research community and professional healthcare professionals. Popular healthcare institutions and influential biological publications are active on Twitter; for instance, The Lancet has 463.6K followers and 15.1K tweets, while Mayo Clinic has 1.9M followers and 50.3K tweets. The number of articles after 2014 increased significantly, according to a PubMed search on June 24, 2020 using the search word altimetric. However, the query Isaltimetric score correlated with citations?" is still open.We believe that this is the first comprehensive meta-analysis to explain the relationship between altimetric score and citation count. This study's results indicated a modest, positive linear connection. However, it should be understood that altimetric is a relatively new idea among academics, and future growth in social media knowledge and use among researchers may exacerbate this association[7], [8].

There was significant heterogeneity in our meta-analysis, which we attempted to measure by doing subgroup analyses depending on the source of the citations and the sampling technique. Included studies were from a variety of areas of the health sciences, such as internal medicine, cosmetic surgery, urology, radiography, pharmacy, and dentistry, among others. The Lancet, The Journal of the American Medical Association, and The New England Journal of Medicine are a few examples of highly regarded periodicals in the domains of internal and general medicine. The papers published in these journals are extensively covered by news organizations and social media, and they have a significant online presence on Twitter. As an illustration, the December 2017 The Lancet article titled "Worldwide Trends in Body-Mass Index, Underweight, Overweight, and Obesity from 1975 to 2016: A Pooled Analysis of 2416 Population-Based Measurement Studies in 1289 Million Children, Adolescents, and Adults" is in the top 5% of all research outputs with the highest altimetryscore. There were 426 news articles from 323 sources, 16 scholarly blogs, 2818 tweets, 72 Facebook pages, 1 post on Google+, 1 post on Reddit, 1 Q&A thread, and 3014 Mendeley users who read about it. Since weight and fitness are hot issues, further investigation revealed that 68% of tweets were written by regular people. This condition cannot be compared to highly specialized, constrained areas of the health sciences like endodontology. Specialized topics seldom appear in news articles, are infrequently shared on

social media, and garner less internet attention in general. One could anticipate that medical papers on issues like obesity or cardiovascular illness would get greater internet interest and obtain better altimetric ratings. This might be the cause of the meta-analysis's considerable heterogeneity.It's important to recognize the limitations of the current meta-analysis. It should be noted by readers that correlation does not indicate causality. As a result, it was not possible to infer, only based on an observed connection, a cause-and-effect relationship between altimetric score and number of citations.

Future research should consider using newly created and emerging machine learning and deep learning algorithms to evaluate the significance and relative influence of the altimetric score and related data sources on citation patterns. Additionally, it is important to mention the year when the data for the altimetric score and the number of citations were compiled. It is anticipated that as more scholars adopt the altimetric idea, the number of citations and altimetric score would rise. To evaluate the interaction between the year of data collection and effect magnitude, we attempted to treat it as a moderator. The precise date of data collection, however, was not provided in some included research. Our analyses also revealed that the year of publishing was not a trustworthy variable since there can be a lag between the date of data collection and the date of publication. For instance, Chang et al.'s data was gathered in 2015, but the publications weren't released until 2019[8], [9].

We advise further research to monitor how the association pattern evolves over time in light of scientists' increasing usage of social media. We urge writers to disclose the following information precisely in order to aid future meta-analyses: the date of the data collection, the source of the citations and altimetricdata, the number of study groups and subgroups, the sample size for each group and subgroup, the precise value for each group and subgroup and the correlation assessment method, the selection criteria for articles, such as highly cited articles, and the type of included articles, such as original research.Here is an illustration showing the relationship between altimetric score and the quantity of citations in pandemic-related works sponsored by the National Institutes of Health.Using the search terms PubMed was checked. NIH funded. The Altimetric database was utilised to locate altimetric data. Dimensions database was used as a source for the citations. On December 13, 2020, all information was gathered and retrieved. 3961 articles produced 3266 with altimetric mentions in total[10].

CONCLUSION

The analysis comprised 35 papers altogether. Eight of the selected 27 publications have several independent investigations. For instance, Barbic et al. cited two separate investigations. They examined the publications on emergency medicine that were referenced the most often from the top 10 emergency medicine journals and the remainder of the medical literature, and they separately reported the correlation coefficient and sample size for each category. On the basis of the citations' sources, several research also comprised many sub studies. One each for Web of Science, Dimensions, and Scopus were the three correlation coefficients that Markovich et al. reported. In addition, Supplementary Table S1 and Figure 1 offer characteristics of the seven rejected studies and the 35 accepted research.

REFERENCES:

[1] A. Halimi, C. Mailhes, J. Y. Tourneret, P. Thibaut, and F. Boy, “Parameter estimation for peaky altimetric waveforms,” *IEEE Trans. Geosci. Remote Sens.*, 2013, doi: 10.1109/TGRS.2012.2205697.

[2] M. K. Barker, E. Mazarico, G. A. Neumann, M. T. Zuber, J. Haruyama, and D. E. Smith, "A new lunar digital elevation model from the Lunar Orbiter Laser Altimeter and SELENE Terrain Camera," *Icarus*, 2016, doi: 10.1016/j.icarus.2015.07.039.

[3] M. Martín-Neira, S. D'Addio, C. Buck, N. Floury, and R. Prieto-Cerdeira, "The PARIS ocean altimeter in-Orbit demonstrator," *IEEE Trans. Geosci. Remote Sens.*, 2011, doi: 10.1109/TGRS.2010.2092431.

[4] E. Y. Handoko and Hariyadi, "Merged envisat and jason satellite altimeters using crossovers adjustment to determine sea level variability," in *IOP Conference Series: Earth and Environmental Science*, 2018. doi: 10.1088/1755-1315/200/1/012035.

[5] M. J. Fernandes, L. Bastos, and J. Catalâo, "The role of multi-mission ers altimetry in the determination of the marine geoid in the azores," *Mar. Geod.*, 2000, doi: 10.1080/014904100273315.

[6] M. S. Gross and A. N. Rossete, "Sanitário , Utilizando-Se Geoprocessamento , No Município De Nova Xavantina , Mt," *Geografia*, 2011.

[7] H. Van Gysen, R. Coleman, and B. Hirsch, "Local crossover analysis of exactly repeating satellite altimeter data," *J. Geod.*, 1997, doi: 10.1007/s001900050145.

[8] A. Salgiriev, "The Northern Caucasus: Tribal-clan structure of the political elites as a factor of political tension," *Cent. Asia Caucasus*, 2016.

[9] D. Cirone and A. De Cristofaro, "ANCORA SULLA NOVA VIA VECCHIE IPOTESI, NUOVE PROPOSTE," *Archeol. Class.*, 2018.

[10] F. Lucchi *et al.*, "Antiche linee di riva tardo-Quaternarie sull'isola di Lipari (Isole Eolie) e mobilità verticale dell'apparato vulcanico," *Italian Journal of Geosciences*. 2001.

CHAPTER 10
IMPACTS, MASS EXTINCTIONS, AND EVOLUTION: LINKS IN PLANETARY SCIENCES

Dr. Nisha, Assistant Professor

Department of Science, Maharishi University of Information Technology, Uttar Pradesh, India

Email Id- nisha.kumari@muit.in

ABSTRACT:
The emergence of new domains as a consequence of technical advancements like the Earth observation satellite network, global positioning system, high pressure-temperature physics, tomographic techniques, and big data processing is expanding the research horizons in geophysics. With the discovery of numerous systems and a wide variety of exoplanets, planetary missions and improved exoplanet detection technologies have brought new focus to theories of planetary system formation, planet characteristics, the interior of the Earth, and geodynamics. This has highlighted the need for a deeper understanding of the Earth system, processes, and spatiotemporal scales. In this article, we examine the new links that have emerged as a consequence of developments in planetary sciences, geodynamics, high pressure-temperature physics, meteorite impacts, and mass extinctions.

KEYWORDS:

Advancements, Emergence, Geodynamics, Tomographic.

INTRODUCTION

In the 16th and 17th centuries, physics was a broad area of study, and substantial discoveries in what are today astronomy, optics, mechanics, gas chemistry, thermodynamics, and other fields came from many, widely dispersed studies. Along with many other discoveries, they resulted in the creation of the heliocentric model of the solar system, formulation of the laws of planetary motion, experimental and mathematical descriptions of pendular and parabolic motion, the law of universal gravitation, inertial reference frame and laws of motion, pressure-volume Boyle law, and the ideal gas law. Modern physics research continues to include a broad range of topics, which is reflected in the many fields of study and new frontiers.Integrative techniques in Earth system research are a result of a greater understanding of the importance of interactions among the Earth's components, including the atmosphere, hydrosphere, lithosphere, ionosphere, and biosphere. The interactions, component flow, and feedback mechanisms that function on various spatial-temporal scales and appear as the geochemical cycles, surface processes, and Earth's climate have been better understood as a result. Broad integrative methods are being produced as a consequence of recent developments in the study of the Earth's interior and exterior processes in the near-Earth environment and the solar system[1], [2].

Components of the Earth system that link the planet's deep interior, core, mantle, lithosphere, atmosphere, oceans, magnetosphere, and ionosphere to extraterrestrial processes like asteroid impacts, cosmic radiation, and solar winds (source: International Scientific Continental Drilling Programmed.Using technical and theoretical advancements like high performance computers, big data analysis, satellite observation systems, instrumentation networks, and planetary missions, researchers are able to answer both new and old issues. Exoplanet discoveries and planetary expeditions to the solar system provide Earth-based research a wide

framework, combining research and testing models and hypotheses. Here, we cover advancements in planetary sciences, high pressure mineral physics, meteorite impacts, mass extinctions, and geodynamics as well as the areas' burgeoning links.With Earth's top layer separated into numerous plates that are subject to large-scale plate movements, the discovery of plate tectonics in the 1960s and early 1970s gave rise to a new paradigm for Earth sciences. Plate tectonics linked magmatism, seismicity, mountain-building, and metallogeny in a cohesive manner by integrating surface tectonic processes with the Earth's core and deep energy sources. The idea combined the vast body of geological and geophysical data that has been collected over a long period of time about the continents with data that has just lately been discovered about the seas, specifically about mid-ocean ridges, fracture zones, and trenches. A worldwide synthesis of structural geology, stratigraphy, paleontology, petrology, geochemistry, seismology, paleomagnetism, geodesy, marine geology, and geophysics is the foundation of plate tectonics, which offers a kinematic framework.Plate tectonics has been very successful during the last three decades, inspiring transdisciplinary and multidisciplinary research. However, figuring out how the planet functions has remained difficult since the dynamics of deep and surface processes, mechanisms, and energy sources have only been partially studied. Convection, core-mantle, intraplate deformation, vertical movements, polar wandering, and plate driving forces are among the fundamental components of plate dynamics that are currently poorly understood.

The lithosphere, which is divided into multiple plates that move relative to one another at plate boundaries, may be modelled globally using plate tectonics. At subduction zones, oceanic lithosphere is produced at ridges and recycled back into the mantle. Instantaneous plate motion data is now available because to the development of regional and worldwide broadband seismological and GPS networks. This has made it possible to analyses plate kinematics in novel ways with better temporal and spatial precision. It is possible to analyses recent plate reorganizations and assess plate deformation and diffuse plate borders by building plate models that include geological and geodetic data. A high-resolution plate kinematic model is produced by the recent synthesis by Dements et al. using 27 plates, including six tiny plates that are not directly connected to the ridge system. Their findings support the rigid plate hypothesis and place limitations on the amount of plate deformation brought on by thermal contraction and large plate borders[3], [4].

The tectonic plates that make up the Earth's lithosphere move relative to one another. Divergent plate borders include seafloor spreading ridges, convergent plate boundaries include subduction zones, and transform plate boundaries include transform faults. Plate tectonic boundaries are. Structural data on normal and reverse faults and volcanic centers are included. A high-resolution global plate kinematic model that incorporates 27 plates.With ocean basins contracting and expanding over long time periods, plate movements have experienced significant alterations and plate reorganizations that are related to deep processes including mantle convection. Plate kinematics spanning the last 200 Ma have been reconstructed using geological estimates of plate motion based on marine magnetic anomalies, fracture zones, hotspot tracks, and paleomagnetic orientations. Tight constraints on plate movements and mantle convection during the Phanerozoic and Precambrian, including creation of supercontinent assembly and continental breakup, are provided by studies of oceanic plateaus, igneous provinces, orogenic belts, and volcanic arcs . The residual geoid long wavelength properties and the shear wave velocity zones in the deep mantle and core-mantle boundary provide evidence for the involvement of deep mantle structures in plate tectonics.

The difficult part is figuring out how to represent plate dynamics with the enhanced plate kinematic resolution. In general, little is known about the forces that govern plate motion,

their relationship to deep mantle processes, the makeup of hotspots, what happens to subducted lithosphere, and the activities at the core-mantle D″ zone. The deep structure, mineral composition, convection, physics of high pressure and temperature, and energy sources of the Earth are still important unexplored areas.Seismological investigations that image velocity anomalies, wave polarization, and seismic anisotropy characteristics in the mantle and core are making progress. Anomalies in seismic wave attenuation have been seen with depth and are consistent with geodynamic model predictions of mantle viscosity. Rheological qualities, which are studied in theoretical models and lab tests, have been connected to measurements of attenuation and other anelastic properties. Increases in pressure and temperature, as well as variations in physical characteristics, mineralogy, and phase transitions, are characteristics of the Earth's interior's layered structure. From roughly 24 GA in the crust to 364 GPa in the inner core, pressure rises. Recently, diamond-anvil cells, laser beams, noble gas graphite furnaces, and synchrotron sources have been used to measure the physical and compositional structural features of minerals at increasing pressures and temperatures. The lower mantle is mostly made up of perovskite, which is rich in Masion, down to a depth of 2900 km. Under core-mantle circumstances, this mantle mineral passes through a phase transition into denser post perovskite, which identifies the D″ layer's physical characteristics. At simulated outer and inner core conditions, with pressures and temperatures up to 257 GPa and 2400 K and 364 GPa and 5500 K respectively, iron and iron-silica alloys are studied. New information on the mineralogy and physical characteristics like anelasticity and plasticity, which are related from first principles calculations in constraining phase transitions and depth changes, is being provided by experiments on high pressure mineral physics[5], [6].

DISCUSSION

Convection may be tested using various boundary conditions, property contrasts, and geometries using computer modelling, including the well-studied whole-mantle and double-layer convection. Dynamo modelling for geomagnetic field production models both short- and long-term fluctuations in regional anomalies and secular variation, including polarity reversals, that are seen at the surface. The dynamo behavior is significantly influenced by thermal boundary conditions. Higher resolution simulation of tiny mesh geometries is possible with increased computer capacity. The area of geodynamic modelling has grown significantly in recent years, with significant potential for additional advancements when paired with deep interior models for layered convection, mantle viscosity, and physical property contrast regional anomalies.The sites of plate borders are where active exchange interactions that express as seismicity, heat transport, and magmatic activity from the deep mantle to the surface take place. Regional instrumentation networks, geophysical surveys, and modelling on regions including the Honshu subduction zone in Japan, the Dead Sea and Anatolian faults in the Middle East, and the San Andreas transform fault in western United States are supplying new high-resolution data. Studies also include the economic repercussions, the concentration of important mineral and energy resources along plate borders, and associated earthquake and volcanic eruption threats. Research on earthquakes, slow slip events, and volcanic eruptions helps create new monitoring technologies and improves our knowledge of the underlying mechanics. Megathrust earthquakes, such as the 9.0 Tokai-Oki earthquake, and plate subduction are the subject of studies. A variety of remote sensing techniques, including GPS, tiltmeters, broadband seismic networks, and integrated potential field and electromagnetic surveys, have been developed as a result of the unique challenges that active volcanoes present, particularly when modelling the magma inside conduits and deep connections in the mantle. Muons tomography, which uses secondary cosmic rays generated in the upper atmosphere and has improved imaging capabilities for deep volcanic structures, is one of the new technologies being introduced. The fossil record,

which gives data on previous living animals preserved throughout Earth's history, has mostly been used to study the evolution of life. Paleontological research has developed a comprehensive picture of the history of life from the Precambrian's single-celled creatures to the Phanerozoic's multicellular species, offering a spatial-temporal reference system included into the geological time scale. The focus of the discipline shifted from stratigraphic, fossilization, and taxonomic research to ecosystems, physiology, reproductive characteristics, organism illnesses, connections between climate and environment, and feedbacks. The study of molecular biology and isotope geochemistry have broadened the area of paleobiology and made it more multi- and multidisciplinary[7], [8].

Due to human activity and the consequences of climate and environmental change, extinction rates have been rising. Ecosystems are being impacted by pollution, deforestation, ocean acidification, global warming, and other factors, leading to the extinction of species both on land and in the sea. Numerous species have vanished over a longer period of time since the last deglaciation during the Late Pleistocene and Holocene transition, including numerous terrestrial and marine animals. Studying historical extinction events, especially those connected to the five major extinctions in the Phanerozoic, has gained attention due to the extinction rates and size. Mass extinctions are distinguished by happening over a brief period of time and occurring at rates exceeding baseline extinction levels. In a geological perspective, Barnosky et al.'s analysis of the most recent extinctions and comparison with the previous five catastrophes. Studies of extinction rates and mechanisms are crucial for comprehending the evolution processes since the majority of species that have ever existed are extinct

Number of families shown against geologic time, highlighting the five main extinction events that were accompanied by a severe decline in biodiversity. The end-Cretaceous mass extinction, the most recent and second-worst in the Phanerozoic, is the subject of much research. With the extinction of the dinosaurs, pterosaurs, ammonites, and various marine microbes, it had a substantial impact on a number of species and genera, resulting in the demise of nearly 75% of the species. The Mesozoic Era comes to an end with the catastrophic extinction. An internationally dispersed thin clay layer, which represents the fine-grain-sized portion of the ejecta from the Chicxulub impact, marks the Cretaceous/Paleogene boundary. A worldwide stratigraphic marker known as the K/Pg boundary layer allows for exceptional temporal resolution and lateral correlation of events.

sections for the distant, moderate, proximal, and extremely proximal locations of the Cretaceous/Paleogene boundary. K/Pg border sections in a schematic. Schelte et al.'s description of the locations of K/Pg border sites.A base spherulitic layer, which represents parabolic-emplaced melting droplets or condensates from a high temperature ejecta cloud, and clay, which represents fine-grained ejecta emplaced in the upper stratosphere, together constitute the K/Pg layer, which is a few millimeters to centimeters thick. It has a more complicated structure in the Gulf of Mexico-Caribbean Sea area, where a high-energy tsunami deposit and a high temperature layer are present. Reconstructing the dynamics of the impact event is possible via examinations of the layer distribution, composition, and physical characteristics. Data on climatic and environmental changes and their impacts on the biota are obtained through studies of K/Pg border sections. Extinct species, ecosystem disturbance, surviving species, short- and long-term postimpact impacts, recovery patterns, and diversification are among the topics that have been examined in studies. The accuracy required in chronology and correlation has proven difficult when evaluating the causes of extinction and their impact on the biota. It is difficult to distinguish between the seconds-to-months-long episodes that make up the impact event in the geologic record, which has led to efforts to improve dating techniques and stratigraphy. The most recent investigation by

Renne et al. has sharply improved dating capabilities by bringing the uncertainties in dating the K/Pg border to within 30 ka.Studies on the K/Pg border, the impact event, and the mass extinction are developing and now include both short- and long-term life evolution. The development of the maximum body size for terrestrial mammalswhich coexisted for the majority of the Mesozoic alongside dinosaursis one of the mechanisms examined. Mammals coexisted alongside dinosaurs for roughly 140 Ma, although they were constrained to modest body sizes and environments. After the dinosaurs were extinct, initially the birds became bigger, including some gigantic predators. Later, throughout the Paleocene and early Eocene, mammals began to diversify and their maximum body size increased. Regardless of the landmass, Smith et al.'s analysis of the development of the maximum body size for terrestrial mammals demonstrates that the groups all increased their body mass by the late Eocene.

The fossil record offers a fragmented perspective of the development of life that is skewed towards certain geological regions, habitats, and more readily preserved living forms. As we move farther back in time, there are more challenges with dating and lateral correlation of rock layers. Statistical, spectral, and numerical simulation studies are integrated into multiproxy approaches used in high resolution stratigraphic methodologies now under development. High resolution chronologies are produced by combining radiometric dating, which has improved, with cyclostratigraphy, magnetic polarity, and astronomy. The innovations are used to more precisely calibrate the geological time scale.Studies of the fossil record and evolution are closely related to climatic and environmental factors, which have been connected since the Precambrian Period with the oxidation of the atmosphere and oceans, the emergence of eukaryotes and the evolution of life, and climate and environment during the Phanerozoic. Early life forms, the production of the iron banded formations, global glaciations, and the creation of the life tree are the main topics of research. A broad variety of biological, chemical, isotopic, and physical proxies are being used to provide new tools for high-resolution climate reconstruction. Studies evaluate the impacts, causes, and linkages of the latitudinal movement of the Inter-tropical Convergence Zone, the North American monsoon, El Nio-Southern Oscillation, the Pacific Decadal Oscillation, solar irradiance, and teleconnections in Mexico and North and Central America. The research, which combine theoretical models and computer simulations with millennial, centenary, and decadal resolution, examine climate development at various regional and temporal scales. Recent research investigates how climatic and environmental variables affect evolutionary patterns and how the biosphere is connected to the climate.The molecular clocks have considerably altered techniques for calibrating evolutionary time, which is a significant breakthrough. Molecular tree analysis modelling techniques have developed quickly, and they now provide estimates for branching events that are calibrated against the lowest ages from the fossil record. The use of molecular clocks to produce exact dates has continued to face significant challenges, including a better knowledge of the various genomes and rates of change. The molecular clock will provide more clarity when analyzing evolutionary time due to advancements in equipment and methodologies that are capable of producing enormous volumes of data and processing capacity. Phylogenetic reconstructions, the fossil record, and limitations on genome evolutionary rates are all being integrated by multigene clocks applied to multidata, which is already providing previously unheard-of branching point data.

Molecular analysis is particularly adapted for researching macroevolutionary development, such as the emergence of eukaryotes, which first appear in the fossil record about 800 Ma, at a time when the world's seas and climate were undergoing major changes. Around 1866 to 1679 Ma are the molecular estimates for the early eukaryotic diversity. This earlier date is in keeping with studies of eukaryotic microfossils, which point to a lengthy period of time

during which the main eukaryotic lineages underwent diversification. Studies are looking at eukaryotic evolution spanning million-year timescales across species, addressing evolutionary features at the genomic level. Organism complexity is connected to genomic characteristics that are being measured, such as the number of cell types, gene contents, protein length, proteome disorder, and protein interactivity. Alternative splicing has consistently risen with organism complexity during the 1.4 Ga development of eukaryotes.New study horizons have been opened by the exploration of the solar system utilizing multispectral remote sensing from Earth and space spacecraft. Planetary missions have collected information on the structure, surface morphology, magmatic activity, tectonic modes, and deep interiors of the terrestrial planets and moons of the gas giant planets.

The surfaces of the inner planets and moons have been seen to have craters, which vary in size and morphology. Over time, asteroid and cometary debris have collided to produce them, starting with tiny impacts and progressing to huge peak ring and multiring basin impacts. significant impacts result in deep temporary excavation holes in the crust, which cause the material of the crust to be redistributed and significant amounts of rock to be broken up and removed. On Earth, the dynamic tectonic environment and erosion have mostly obliterated the record of impacts, with just a few minor craters and three significant multiring basins having been identified. The youngest of the multiring basins and the only one with the ejecta retained is the Chicxulub crater, which has a rim diameter of around 200 km and was produced near the K/Pg boundary. The other two structures, Sudbury and Treefort, were created during the Precambrian period between 1.8 and 2 Ga ago. The Yucatan platform is where the Chicxulub crater is situated in the southern Gulf of Mexico. Geophysical techniques and deep drilling are being used to explore the structure, which is coated in carbonate deposits.

Impact crater of Chicxulub. The Gulf of Mexico and the Yucatan platform's Chicxulub crater. A satellite interferometric radar picture of the Yucatan peninsula, displaying surface characteristics connected to the buried crater structure. The Chicxulub crater's Bouguer gravity anomaly. Plotted as a function of relative distance to the crater center are schematic lithological columns and lateral correlation for deep boreholes in the Chicxulub crater region.At different depths, impacts cause deformation that results in thermal anomalies and the creation of long-lasting hydrothermal systems. As part of the exobiology programmed, the craters with hydrothermal alteration are being looked at for signs of life. Studies of impact craters in the fossil record and elsewhere are improving knowledge of the role played by these very intense processes in forming planetary surfaces, particularly those in the asteroid belt.The age of the planetary surfaces may be determined by analyzing the frequency, density, and size distribution of craters, with older surfaces being characterized by a high density of craters, often comprising huge multiringbasins. The geodynamics and deep structure are also connected to the size-frequency crater connections. It seems that plate tectonics only occurs on Earth. There is evidence of magmatic activity on other planets, such as Venus, Mars, and Io. Mars' lithosphere does not seem to be broken up and is moving relative to other rocks. Intense deformation may be seen on Venus, which also had a disastrous resurfacing event approximately 500 Ma ago.

Studies of meteorites, magnetic fields, and core dynamos provide evidence for the deep structure, temperature state, and convection. For a very long time, meteorites have been utilised to examine the formation and early history of the planetary system. Analysis of chondrites and other early meteorites has revealed information on the genesis of planetesimals, the chemical makeup of the solar nebula, and the age of the earliest solids

indicated by chondrules and refractory inclusions. The evolutionary phases are being studied in more detail. Studies on iron and stony-iron meteorites and chondrites provide evidence that these planetesimals had differentiated iron cores capable of supporting dynamo activity for around 10 Ma periods. The main group pallasites' paleo magnetic record provides evidence that they originated from differentiated planetesimals with intrinsic magnetic fields close to the core-mantle barrier. It's possible that there were several partially differentiated planetesimals in the early solar system. A portion of them are still present in the asteroid belt despite the fact that most were destroyed by intense impacts. Recent studies indicate that the early Vesta had a convecting iron core.Calcium-aluminum inclusions and chondrules are shown in a schematic model. Protoplanetary disc is. Chondrule kinds with various interior structures and morphologies. Images taken using scanning electron microscopy of several chondrules from the Allende meteorite, displaying its various interior structures, morphologies, and Fe, Ni, and S compositions. The numbers represent identifications of laboratory sample data.

With fresh information from solar system missions and brand-new, exciting discoveries of exoplanets and planetary systems, planetary exploration is one of the geophysical areas that is growing the fastest. The ideas for planetary system formation and early development based on observations of our solar system are under scrutiny due to the recent findings of exoplanets and multiple systems. The abundance of found exoplanets has rekindled interest in planetary models that include large-scale planet migration and discrete formation zones for gas-icy giants and rocky planets within certain parts of the accretion disc.

Smaller planets the size of Earth is being found with increasing resolution and detecting capability. Numerous tiny mass planets are among the hundreds of possibilities being examined by the Kepler space-based telescope experiment. Quintana et al. recently announced the discovery of Kepler-Earth-radius exoplanet orbiting an M1-type dwarf star on the main sequence in the habitable zone. The outermost planet in a system of five planets called Kepler-186f has coplanar orbits. The multiplane system is consistent with planets forming in a protoplanetary disc from the accretion of nearby material and/or planetesimal collisional development. Quintana and coauthors' numerical simulations of the Kepler-186 system demonstrate that excessively steep density configurations with a dense accretion disc nearby are necessary. These findings imply either a late-stage disturbance or an inward migration of planets during their formation.

Kepler-186 multiple systems are shown schematically and artistically in comparison to the inner solar system. According to Quintana et al., Kepler-186 is a five-planet system that is 500 light-years from Earth and orbits a M star with a mass half that of the Sun.The majority of discovered planets are huge gas planets in orbits near to their stars since detection techniques primarily target massive planets close to the star. Finding tiny Earth-like planets is still difficult. The system around the M dwarf Gliese 581 star was studied by Robertson. who demonstrated that stellar activity may produce interference that leads to erroneous planetary identification. Their findings demonstrate that the signal for GJ 581 g, one of the system's four exoplanets, is dependent on the eccentricity anticipated for GJ 581 d.

Constraining the mass, density, composition, and orbital characteristics of exoplanets is a difficult task. Recent advancements are beginning to provide fresh resources and information. It is anticipated that rocky planets would be smaller than gas and ice planets, however further observations are needed, which may be investigated from the star metallicity. The abundance of elements heavier than hydrogen and helium for 405 exoplanet host stars was examined by

Buchhave et al., who discovered that the sizes of the exoplanets divide into three metallicity areas. The three populations are explained by the exoplanet types rocky, gas dwarf, and gas-icy giant. The finding of atmospheres for super-Earths, gas dwarfs, and icy-gas giants is another area under close examination. Clouds on a super-Earth are confirmed by absorption characteristics reported in recent research utilizing transmission spectroscopy data . These features provide information on the atmosphere's attributes. The new discoveries offer an intriguing area of study since a sizable portion of exoplanets discovered to far are between Earth and Neptune in size.Important limitations on the planet's ambient properties may be derived from knowledge of the orbital parameters and spin. Many of the discovered exoplanets have close-in orbits, making them simpler to find with the technology at hand. Data on the spin velocity, which has just been published for the gas giant planet Pictorisb, may be obtained via spectroscopy studies. The exoplanet is very bright and far away from the star—about twice as far away as Jupiter in our solar system. A spin estimate of 25 km/s is obtained from carbon monoxide spectral data from the planet that have been shifted. With the exception of Mercury and Venus, spin exhibits a general tendency throughout the solar system where it corresponds with mass. The rapid rotational speed, which is between 2 and 50 times that of Jupiter and Earth, is consistent with the mass of the planet. The paper develops a useful method for characterizing multiplane systems that may restrict planetary formation theories.

Studies of organisms in harsh conditions have resulted from alien life interest, which for a very long time was just speculative. Understanding of food webs, energy sources, reproductive techniques, and metabolic states has increased as a result of studies of extremophile groups from the deep crust, ocean thermal vents, hyperacid deserts, or polar caps. Extraterrestrial life searches are being prioritized for planetary missions. Since the Viking missions' studies evaluated the soils' and atmosphere's characteristics in search of signs of liquid water and organic molecules, a number of missions have been sent towards Mars. The characterization of surface liquid water, hydrothermal activity, organic chemicals, and fossil hints is being expanded by recent missions. Remote sensing indicators of life activity in the planetary atmospheres are used in new missions and spectroscopic investigations.The only known planetary system up until the middle of the 1990s was our own. The creation of planets from planetary discs was anticipated by models for the development of planetary nebula, but there was no observable proof. Theories and models for the creation of planets and planetary systems are radically altering and growing in response to the recent discoveries of hundreds of exoplanets and multiple planet systems, as well as measurements of their sizes, orbits, and star properties[9], [10].

CONCLUSION

The global positioning system, planetary missions, high pressure/temperature tests, high resolution tomography, and high-performance computation are only a few of the new instruments that have significantly pushed the boundaries of geophysics study. Population growth and demographic shifts, which raise global demand for minerals, water, and energy resources and cause pollution, land use changes, deforestation, environmental degradation, organism extinction, changes in the composition of the atmosphere's gases, and global warming, are other factors contributing to an increase in interest in understanding Earth processes and new developments in instrumentation, modelling, and observational capabilities. Understanding Earth's subsystems, including its atmosphere, seas, continents, ionosphere, magnetosphere, biosphere, and deep interior, as well as its interactions, cycles, spatiotemporal scales, and feedback processes, has taken on significant importance in this context. The similarities between human and geological changes on the globe emphasize the value of interdisciplinary study. This has led to the establishment of interdisciplinary study

areas including bio geosciences, environmental geophysics, exobiology, and planetary sciences as well as global methods in Earth system science.

REFERENCES:

[1] J. Urrutia-Fucugauchi and L. Pérez-Cruz, "Planetary sciences, geodynamics, impacts, mass extinctions, and evolution: Developments and interconnections," *International Journal of Geophysics*. 2016. doi: 10.1155/2016/4703168.

[2] Á. T. Kocsis, C. J. Reddin, and W. Kiessling, "The biogeographical imprint of mass extinctions," *Proc. R. Soc. B Biol. Sci.*, 2018, doi: 10.1098/rspb.2018.0232.

[3] A. D. Muscente *et al.*, "Quantifying ecological impacts of mass extinctions with network analysis of fossil communities," *Proc. Natl. Acad. Sci. U. S. A.*, 2018, doi: 10.1073/pnas.1719976115.

[4] P. R. Renne *et al.*, "Time scales of critical events around the cretaceous-paleogene boundary," *Science (80-.).*, 2013, doi: 10.1126/science.1230492.

[5] T. J. D. Halliday, P. Upchurch, and A. Goswami, "Eutherians experienced elevated evolutionary rates in the immediate aftermath of the cretaceous-palaeogene mass extinction," *Proc. R. Soc. B Biol. Sci.*, 2016, doi: 10.1098/rspb.2015.3026.

[6] F. M. Smithwick and T. L. Stubbs, "Phanerozoic survivors: Actinopterygian evolution through the Permo-Triassic and Triassic-Jurassic mass extinction events," *Evolution (N. Y).*, 2018, doi: 10.1111/evo.13421.

[7] P. R. Grant, B. Rosemary Grant, R. B. Huey, M. T. J. Johnson, A. H. Knoll, and J. Schmitt, "Evolution caused by extreme events," *Philos. Trans. R. Soc. B Biol. Sci.*, 2017, doi: 10.1098/rstb.2016.0146.

[8] J. B. C. Jackson, "Ecological extinction and evolution in the brave new ocean," *Proc. Natl. Acad. Sci. U. S. A.*, 2008, doi: 10.1073/pnas.0802812105.

[9] L. C. Sallan and M. I. Coates, "End-Devonian extinction and a bottleneck in the early evolution of modern jawed vertebrates," *Proc. Natl. Acad. Sci. U. S. A.*, 2010, doi: 10.1073/pnas.0914000107.

[10] J. A. Fawcett, S. Maere, and Y. Van De Peer, "Plants with double genomes might have had a better chance to survive the Cretaceous-Tertiary extinction event," *Proc. Natl. Acad. Sci. U. S. A.*, 2009, doi: 10.1073/pnas.0900906106.

CHAPTER 11
THE HARD PALATE'S MORPHOMETRIC STUDY AND ITS RELEVANCE TO DENTAL AND FORENSIC SCIENCES

Dr.Ramakant, Assistant Professor

Department of Science, Maharishi University of Information Technology, Uttar Pradesh, India

Email Id- ramakant@muit.in

ABSTRACT:
The goals of this research were to describe the morphometric characteristics of the hard palate and to assess the validity of palatal morphology as a sex indicator. Dental offices in north Jordan were contacted for 300 maxillary castings. The patient's age, gender, and each cast's serial number were noted. The range of ages was 6 to 50. The hard palate's dimensionslength, breadth, and depthwere determined using a caliper. Additionally, the incisive papilla's size, shape, and location were established. A skilled examiner who was able to perform the measures in a repeatable way conducted all of the measurements. According to statistical analysis, men in both groups had the largest mean palatal length, breadth, and depth as well as dental papilla size. The length, breadth, and depth were all substantially linked with gender in the adult group, according to the complete logistic regression model that took into account all three variables.

KEYWORDS:

Morphometric,Morphology, Regression, substantially.

INTRODUCTION

The bony portion of the palate that makes up the front section of the palate is known as the hard palate. It is a crucial component of the human skull that helps to separate the nasal and mouth cavities. The horizontal plates of the palatine bones posteriorly and the palatine processes of the maxilla anteriorly make up the hard palate. A cruciform system of sutures, which includes the median and transverse palatine sutures, connects all of these bones. It runs parallel to the intermaxillary suture that separates the upper central incisors.The tissues of the face typically grow from either side and converge in the middle. This is accurate for the upper lip and palate development, which occurs during the first 30 to 60 days of pregnancy. The literature has explored qualitative sex differentiation utilizing several bones. The human skeleton consists of almost entirely sexually dimorphic parts. One of the 14 markers that Krogman and Isan reported with a 90% accuracy rate to aid in sex determination is the shape of the palate. Other subsequent findings persisted in suggesting that palate morphology may be utilised to determine sex since it has many distinctive anatomical sites that make measurements simple and repeatable. Researchers have suggested that metric measures of the palate may be accurate indicators of sex as a result of further study in this field.It goes without saying that forensic dentistry is useful for determining a person's sex and identifying them. This is connected to the dental and palatal structures, especially the palatal rugae, which have been considered to be stable and unique. The fact that palatal structures withstand postmortem decomposition for many days, and more so for the dental tissues, supports the importance of forensic dentistry in human identification.

Additionally, the palatal and dental structures are shielded by the mouth cavity, making them resistant to heat and major stress injuries. As a result, when there is significant tissue damage,

sex estimate and individual identification utilizing palate morphometric traits are practical methods of identification[1], [2].

In the field of clinical dental sciences, the morphometric characteristics of the palate are also quite significant. The planning of orthodontic treatments and the early identification of dental diseases both heavily depend on the length, depth, and breadth of the palate. For conventional complete dentures or implant-supported prostheses to be made that effectively restore natural speech, appearance, and normal function, the proper central incisor tooth location must be determined.In order to restore the labial contour in edentulous patients, the central incisor teeth should be positioned as closely to their original position as feasible, according to the horizontal connection between the maxillary central incisors and the incisive papilla in dentate persons.

After tooth and bone loss, the incisive papilla maintains its place. The incisive papilla is a valid reference point for evaluating the position of anterior teeth in edentulous individuals during the setting of their teeth for dentures, according to a number of further findings.This research sought to establish normative criteria for palatal length, depth, and breadth by examining the anatomy of the hard palate in Jordanians. It also sought to create standards for Jordanians' incisive papilla size, form, and distance from the labial surface of the central incisors, as well as to further investigate the accuracy of the aforementioned characteristics in determining sex.Jordanian men and women were chosen at random for this cross-sectional survey. 300 dental casts from the study's sample were split into two groups: adults and children. 150 participants made up the adult group, with 66 men and 84 women ranging in age from 18 to 50. The kid group, however, included 150 cast members, 75 of whom were boys and 75 of whom were girls and ranged in age from 6 to 12. A sample size of at least 300 casts is required to adequately reflect the Jordanian population, according to a statistical power study[3], [4].

With the exception of a few participants who had one or two missing teeth that had little impact on the measures, all subjects were totally dentate with the exception of the third molars. None of the individuals had any serious medical conditions or injuries in the past, no history of orthognathic surgery, no prior orthodontic therapy, and no substantial restorative operation. The research eliminated participants who had significant malocclusions, such as open bites and crossbite. Additionally, each individual had the ability to provide their permission before any treatments were done. A single professional examiner collected the data. To reduce dimensional changes, upper jaw impressions were created using silicon material, and castings were then immediately formed in type II dental stone. A unique serial number was assigned to every manufactured cast. Each cast's serial number, together with the patient's age and gender, was noted and kept in the project files.The palatal dimensions, the distances between the labial surfaces of the central incisors and the anterior and posterior borders of the incisive papillae, and the size of the incisive papillae for each cast were all measured using a digital caliper. The measurements that follow were taken down to the closest millimeter.The linear distance between the oracle, which is the point at the anterior end of the incisive suture located between the sockets of the two central maxillary incisors, anteriorly, and the midpoint of the linear distance between the distal surfaces of the upper second molars in adult casts, posteriorly, was used to measure length.In adult castings, the width was measured between the inner margins of the sockets of the upper second molars.The depth measured the distance between the greatest point of the palatal arch and the inner border of the socket of the upper second molar.

Each cast had incisive papilla boundaries that were delineated, and the incisive papilla's form was determined. On each cast, the anterior and posterior margins of the incisive papilla as well as the labial surface of the central incisor were also indicated. Following that, the distances between the labial surface of the maxillary central incisor and the anterior and posterior borders of the incisive papilla were measured. The Jordan University of Science and Technology's institutional review board gave its approval to this work[5], [6].

DISCUSSION

All data were manually entered into a computer, numerically coded, and exported to the statistical package for the social sciences programmed. To compare genders, descriptive statistics, an independent-samples t-test, and binary logistic regression were computed using SPSS. The significance threshold was set at.The examiner who carried out the measures received training for doing so. The same examiner remeasured 60 randomly chosen casts to check the trained examiner's accuracy. A second trained examiner who was blind to the study's design and the location of the castsremeasured 60 randomly chosen casts in order to analyses the evaluation's variability and bias. The significance of differences, the coefficient of reliability, and the variance of original and repeated sets of measurements were examined.The breadth, length, and depth of the palatal arch were measured, and the mean and standard deviation of these measurements are shown. Using Student's t-test, the aforementioned variables were compared between adult males and females. In comparison to adult females, adult men had considerably larger palatal breadth, length, and depth. Furthermore, logistic regression was used to examine each of these factors' capacity to predict gender. According to the results of binary logistic regression in the adult group, each of the three independent variables in the full logistic regression model was statistically significant. This means that the independent variables significantly predicted the outcome variable, gender. The strongest association between length and gender was seen in length. The odds ratio of 2.816 for length made this clear.

displays the average values of incisive papilla size, CAIP, and CPIP for both sexes. The student’s t-test was used to compare these measures between adult males and females. In the adult sample, the only significant difference between the two genders was the size of the incisive papillae.The incisive papilla was seen in five different shapes: pear, cylindrical, flame, round, and double. For Jordanian adult men and females, the pear form and the flame shape, respectively, were the most prevalent. Dimensions of the Child Group's Palatal ArchThe breadth, length, and depth of the palatal cavity's mean and standard deviation were determined and are shown in Table 3. Using the Student's t-test, the aforementioned variables were compared between males and girls. Males had considerably larger palatal breadth and length than females. Furthermore, logistic regression was used to examine each of these factors' capacity to predict gender. In the kid group, the results of binary logistic regression revealed that palatal width and length were statistically significant in the entire logistic regression model, with and, suggesting that they strongly predicted the outcome variable, gender. The most significant association between gender and width was seen. This was shown by the odds ratio, which was 1.708.SIP, CAIP, and CPIP mean dimensions in Jordanian children.displays the average values of incisive papilla size, CAIP, and CPIP for both genders among the child population. The Student's t-test was used to compare these measures between males and girls. In the kid group, only the size of the incisive papillae differed substantially between the sexes.The incisive papilla was found to have the following five shapes: pear, cylindrical, flame, round, and double. Table 4 shows that among them, the cylinder form was most prevalent in Jordanian males while the flame shape was most prevalent in Jordanian girls.The hard palate in the Jordanian population is being investigated for the first time using morphometric analysis. The objective of this research was to establish

normative values for palatal length, depth, and breadth in the Jordanian population. The size of the incisive papilla and the distance between the labial surface of the central incisors and the incisive papilla were also measured for the first time in this research. The information supplied by this research may be very useful for Jordan's dental clinics. The prosthodontists who create dentures for edentulous Jordanian patients may take the findings from this research into consideration while doing so. In addition, information on the typical palate size and the dimensions and shape of the incisive papilla may be useful in the practise of oral medicine. Our results, for instance, might serve as a starting point for research on irregularities in oral development in the Jordanian population. Additionally, by offering putative sex characteristics that may be used in human identification, this data may advance forensic research[7], [8].

The palatine bones themselves have received little attention, despite the fact that geometric morphometric methods for examining the human skeleton and the sexual dimorphism of its bones have been extensively documented. However, several academics were attracted by the palatine bones and looked into their relevance in a variety of fields, including dentistry and the biology of the development of the nasal and mouth cavities. This theoretical underpinning of the palate's potential values inspired our study team to look at the morphometric characteristics of the palate in Jordanians.In our research, we found that males had considerably greater palatal dimensions—a measure of palate size—than females. This hints strongly at the sexual dimorphism of both the palate dimensions and size. Our results seem to be consistent with studies that have already been published in other groups using other research methodologies. For instance, research on dried skulls from south India found that males had considerably larger palate measurements, indicating that they were sexually dimorphic. Similar findings were reported by Bygone et al., who found substantial sex differences in the palatal dimensions in a European population. In addition, Sumati and Phatak discovered that the greatest predictor of sex in a sample of the north Indian population was the size of the palate out of five hard palate characteristics. Additionally, a Brazilian study team looked at the widths of dental arches. Males have a wider maxillary arch than females, according to their research. Additionally, a thorough examination was done to look into how gender affected palatal dimensions. That review's conclusion was consistent with our findings. This agreement between our results and those of earlier studies reported in the literature lends credibility to our experimental strategy. It demonstrates that taking direct measurements on dry skulls is just as precise as using dental casts of the upper jaw to represent the anatomy of the palate.

Our results were in line with earlier research in terms of the palatal dimensions' sexual dimorphism in the kid group. For instance, prior research that measured the palate dimensions of 150 kids found that males had greater palatal measures than girls. This suggests that whether or not puberty has been attained has no impact on the sexual dimorphism of palate size.The horizontal connection between the maxillary central incisors and incisive papilla has been studied by a number of writers. For instance, Grave and Becker recommended that the maxillary central incisors' labial surfaces should be 12–13 mm apart from the papilla's posterior border in the horizontal direction. Regarding the distance between the incisive papilla and the anterior teeth in both dentate and denture-wearing patients, other researches obtained various but equivalent values. Additionally, several studies measured the distance between the papilla's center and the labial surface of the central incisors to study the anatomical placement of the incisive papilla . Due to their importance to the clinical practise of prosthodontics, these incisive papilla-related factors have attracted a great deal of interest from several research groups.Restoring the normal dentilabial interactions with the overall face look is crucial during total denture manufacture. This will ensure that edentulous individuals get effective treatment in terms of both function and aesthetics. However, it could

be challenging to repair lost dental and oral tissues in the same roughly proportionate numbers and places from which they were lost owing to the ongoing alveolar bone resorption. By giving standards in the Jordanian population about the placement of artificial upper anterior teeth during full denture manufacturing, the data we gave in this research on the SIP, CAIP, and CPIP may assist solve this issue[9], [10].

CONCLUSION

Certain palate characteristics exhibit sexual dimorphism and may be used to determine sex. Not only do adults exhibit the sexual dimorphism of palate dimensions, but so do children. In addition to the palatal dimensions, there is some sexual dimorphism in the incisive papilla size and shape. The size of the incisive papilla, the distance between the labial surface of the central incisors and the anterior border of the incisive papilla, and the distance between the labial surface of the central incisors and the posterior border of the incisive papilla were some of the studied parameters that may help improve the stability and aesthetics of maxillary dentures for edentulous Jordanians. Having said that, it is important to emphasize that our study's primary weakness was its restriction to patients seeking dental care in the northern part of Jordan. If we could do a sizable research with the goal of creating a nationwide registry of the factors we assessed in our study, it would enhance the value and validity of our findings.

REFERENCES

[1] B. A. B. de Andrade, N. A. Padron-Alvarado, E. M. Muñoz-Campos, T. M. de L. Morais, and R. Martinez-Pedraza, “Hyperpigmentation of hard palate induced by chloroquine therapy,” *J. Clin. Exp. Dent.*, 2017, doi: 10.4317/jced.54387.

[2] C. M. Oranges *et al.*, “Hard palate melanoma: A population-based analysis of epidemiology and survival outcomes,” *Anticancer Res.*, 2018, doi: 10.21873/anticanres.12921.

[3] A. Eskander *et al.*, “Outcome predictors in squamous cell carcinoma of the maxillary alveolus and hard palate,” *Laryngoscope*, 2013, doi: 10.1002/lary.24079.

[4] M. Abdel-Aziz, A. Kamel, M. Fawaz, I. Rezk, and M. Kamel, “Closure of fistula of the hard palate with two layers of mucoperiosteum,” *Int. J. Pediatr. Otorhinolaryngol.*, 2018, doi: 10.1016/j.ijporl.2017.10.037.

[5] M. Chaturvedi, A. Jaidev, R. Thaddanee, and A. K. Khilnani, “Large pleomorphic adenoma of hard palate,” *Ann. Maxillofac. Surg.*, 2018, doi: 10.4103/ams.ams_47_14.

[6] S. A. Patigaroo *et al.*, “Pleomorphic Adenoma of Hard Palate: An Experience,” *J. Maxillofac. Oral Surg.*, 2014, doi: 10.1007/s12663-012-0448-5.

[7] J. D. Martin-Smith, L. Fitzgerald, and D. J. A. Orr, “How reliable is the vomer flap in early hard palate repair?,” *J. Plast. Reconstr. Aesthetic Surg.*, 2017, doi: 10.1016/j.bjps.2017.02.026.

[8] T. Ono, K. Hori, and T. Nokubi, “Pattern of tongue pressure on hard palate during swallowing,” *Dysphagia*, 2004, doi: 10.1007/s00455-004-0010-9.

[9] Ö. E. Gür, N. Ensari, and N. D. S. Yılmaz, "The Effects of Platelet-Rich Fibrin Membrane on Secondary Healing After Pleomorphic Adenoma Excision in the Hard Palate: A Preliminary Study.," *Ann. Maxillofac. Surg.*, 2017.

[10] G. W. Mallory *et al.*, "The rise and fall of the craniocervical junction relative to the hard palate: A lifetime story," *J. Neurosurg. Spine*, 2016, doi: 10.3171/2015.6.SPINE141250.

CHAPTER 12

SOUTH ETHIOPIA'S ARBA MINCH COLLEGE OF HEALTH SCIENCES WAS THE SUBJECT OF AN ASSESSMENT OF EDUCATIONAL QUALITY

Dr. Nisha, Assistant Professor
Department of Science, Maharishi University of Information Technology, Uttar Pradesh, India
Email Id- nisha.kumari@muit.in

ABSTRACT:

Numerous studies throughout the years have noted the need of raising educational standards. It became into a political debate in many media outlets throughout the world and the subject of etiquette among scientists. Because there is a worry about education that cannot be disregarded or put off, there are more initiatives to make improvements as time goes on. As a result, the main goal of this work was to evaluate the level of education and the elements that go along with it in order to enhance the study site in the future. Methods. Students and employees from all departments at Arba Minch College of Health Sciences participated in institution-based cross-sectional research. Beforehand, verbal agreement was obtained and ethical approval was obtained. Data was processed, transmitted, and then examined in SPSS 25.0 after being input into Epi Info. Discussion and Findings. The college's total education quality was 2.87 1.12. Resources, reading areas, and administrative services made up a higher portion of the subpar services. Accessibility, staff friendliness towards one another and students, the presence of clear conduct guidelines, the provision of efficient, accurate, and promotional services, the presence of high-standard administrative facilities, the availability of standard catering services, the presence of standard laboratories, communication and exchanges with colleges of a similar level in the area, the weekly timetable, the weekly load, distance, etc., and some sociodemographic factors were linked to poor quality. In order to address the aforementioned issues and propose adequate answers, the institution asked.

KEYWORDS:

Accessibility, Aforementioned, Administrative, Timetable.

INTRODUCTION

Improvements in educational quality have been seen repeatedly throughout time in various research. As the need for higher educational standards develops, the debate becomes political in nature. While the number of students and educational institutions is rapidly growing, every higher education institution has begun to worry about the quality of instruction. The level of higher education quality has been managed in varied ways throughout nations. One method through which national quality assurance organizations regulate how higher education institutions function and perform is via Berit's peer review model. However, even if the primary goal of higher education is to create a generation of productive workers, the level of education itself and other external stakeholders find it difficult to understand. Some research focused on measuring student accomplishment with the idea that it should match the curricular goals and learning circumstances, particularly while gathering data. Overall, all higher education institutions have struggled with quality, which calls for rigorous evaluations[1], [2]. There were several curricula to help medical students succeed with the requirement to assist patients, but not all of them resulted in widespread recognition in the knowledge acquisition and modification of essential behaviors. We may raise the standard of

education via outcome-based learning, with the primary components being continual quality improvement, constructive alignment, presentation of results and assessment, and evaluation tools . Teaching medical students and residents the knowledge and abilities of practice-based learning and development is essential and lays a crucial basis for better patient care, according to a framework derived from the literature and developed by Ogrinc and colleagues in 2003. Additionally, they discovered that online instruction and resources were very beneficial in enhancing students' familiarity with other literary works. Although many NGOs and stakeholders were implementing various mechanisms in search of quality education that would provide the much-needed good child and maternal care recently, health teaching colleges in Ethiopia and probably in most of the sub-Saharan African countries were not the focus of educational quality assessments. From this, we deduced that there were several opportunities to raise educational standards, particularly in Ethiopian health colleges where such knowledge was woefully inadequate. Therefore, evaluating the education provided by Arba Minch College of Health Sciences is crucial for enhancing the quality of care that is provided by its alumni. identifying related aspects that stakeholders would want to better by putting the suggested solutions into practise.

Governments began using standardized exams as measures of education and teaching quality throughout time, despite the fact that these tests were insufficient in other ways. A variety of variables exist; therefore, test results alone cannot be used to evaluate the quality of education. According to certain research, it is presumable that the quality of education is influenced by student attendance and socioeconomic diversity. Other research indicated that the quality of instruction is influenced by the variations in implementation styles among teachers. The quality of education was said to be affected by 32% by factors including language ability, resistance to active learning, absenteeism, lack of enthusiasm in learning, bad communication, etc. Negative conduct and low-level qualifications, resource availability, widespread use of part-time teaching, devotion, skill, pedagogy, collaboration, moonlighting, etc. were seen to have a significant impact on educational quality. Students often voiced their dissatisfaction with university facilities such the cafeteria, dorms, student clinic, guidance, and counselling, necessitating the office's training of counsellors, nurses, laboratory technicians, pharmacists, and cafeteria staff. However, other research concluded that in order to attain excellent education, we need a model that goes along with the majority of high-quality higher education institutions. Curriculum-related, staff-related, e-service-related, career perspective-related, infrastructure-related, library-related, administrative service-related, and those related to the location of institutions providing the service were summarized as the majority of the influencing factors from different types of literature[3], [4].

There has been a considerable shift in curriculum and academic organization as a result of the present impact of globalization and the accelerating information creation. The modern world's dynamism calls for a more adaptable curriculum and other elements for the appropriate problem. For greater quality accomplishments in higher education, almost every fact and idea in an education-based curriculum has to be transformed altogether. Positive expectations improve motivation and engagement, but they also have an undeniable impact on the quality of education, as shown by the frequent occurrence of students who feel threatened by their future employment prospects. The importance of staff and student safety in the classroom is crucial to maintaining the standard of instruction. The quality of education is significantly impacted when security and safety must compete for attention with instruction. It was vital to monitor the learning environment constantly. The shift in curriculum has not been impacted by globalization alone, but it has brought with it issues with school bullying, violence, and secrecy. We anticipate an educational setting where these incidents are avoided, and we anticipate those who implemented conflict resolution

curriculum to have a favorable impact on high-quality education. Education quality increased in institutions with complete facilities for studying libraries in literature. They discovered that the library service, which is not provided by qualified personnel, is a problem that unquestionably lowers the level of instruction provided. Harvey discovered in 1995 that resources like competent personnel, well stocked libraries, well-equipped labs, and students with sufficient credentials at the time of enrollment to the school all contribute to the quality of the service offered in schools. We derive a lot that may assist in raising individual educational quality today from these aspects that Harvey overlooked. But research by TesfayeChala at Nekoite Teachers College that revealed infrastructure did not change called for a different explanation. Of course, there might be an alternative explanation for why the quality of schooling has no impact. In fact, due experts participating in the field and contributing to learning and teaching might have a greater impact on education quality than raw materials. The engagement of administrative employees in instruction that would spur progress was a further surprise from the same research. This notion was inspired by academic administrators and faculty members who assumed responsibility for establishing objectives for the teaching-learning process; creating and providing academic courses and programmed would be prompting. In order to increase the quality of education, it was thought that we would need to make significant changes to the way academic administrators and faculty members engage with students. The influence of educational and procedural quality improvement on knowledge, behavioral change, and patient care is used to warn about the quality of medical education. Improved school quality, student-teacher ratio, average teacher income, and duration of the school year all had a favorable impact on later life, according to critical research by David Frisvold and Ezra Oberstein[5], [6].

DISCUSSION

Despite the fact that over 70% of Ethiopia's health services depend on graduates from these midlevel health colleges, there are only a few studies in the literature that have expressed concern about the quality of education, particularly in midlevel higher education health colleges like Arba Minch College of Health Sciences. The assessment system, materials, and other teacher or student-focused areas were the subject of relatively few studies that were already conducted in the nation. As a result, the present research evaluated the Arba Minch College of Health Sciences using several variable categories from various higher education quality evaluation models. In reality, the study's primary goals were to evaluate the educational standards at Arba Minch College of Health Sciences and pinpoint the elements that influence them in order to improve care delivery as a consequence of the great educational standards.From November 2017 to August 2017, a sample of all students and staff was selected for a cross-sectional research at Arba Minch College of Health Sciences in the Ethiopian state of South Nation Nationalities and Peoples Regional. One of the four health science universities in southern Ethiopia is AMCHS. The study included all eligible students who were no repeated, not in a disciplinary position, and had been enrolled in the institution for at least two years, as well as employees who had been employed for at least two years and were eligible to participate. Clinical nursing, midwives, health extension, health IT, pharmacy, laboratory technicians, and anesthesia divisions are all part of AMCHS. Since its founding, the institution has actively participated in research projects. To evaluate the quality of schooling, we gathered data using the technique from another research.

Here, we define educational quality as being appropriate for the goal. Curriculum, personnel, electronic services, libraries, administrative services, setting, field of study, and resources were the eight factors used to evaluate the quality of education. They were modified based on

research on higher education quality evaluation. Five-point Likert scale questions were utilised as the evaluation criterion, and we determined that the best score was eight, while the poorest was zero. We divided the score into two categories: and everything else. We anticipated that year two, year three, and employees from various units were sampled using a stratified sampling approach. The tool comprising general educational quality-related questions included staffs engagement in research activity, good professional experience to teach and share knowledgethe college is cooperativeavailability of appropriate academic advising, “availability of transportation services accessibility of college for the community, availability of safety and security department,Sufficient working for enough hours,friendliness of staff to each other and students,clear exam guideline and advice to follow,effective, accurate and prompt service,” “the college is cooperative in all aspects,” “modern and higher quality laboratories/demonstration,good perspectives for professional career or development,” “availability of e-service through social networks,” “availability of textbooks and journals for students and instructorseasy borrowing process in the library,” “sufficient place of sitting and reading in the libraryavailability of sports facilities,” “availability of medical facilities,” “high-quality good administration buildings,” availability of service to host social and cultural events,” “the college website provides academic and administrative services,” “standard catering service and “availability of communication skill throughout the college”. Sociodemographic variables were assessed using various related standard measures. We measured these using "yes/no." The following sociodemographic factors were examined using a categorical scale: age, monthly income, the distance from home to college, the academic year , and the weekly load. The research then included 10% of each class year's pupils, excluding first-year students, teachers, and other administrative employees, after taking each department or unit into account as a stratum. Sociodemographic factors were evaluated independently for staff and students before being integrated, and both groups used the same basic quality-related questionnaires. It was done using the proportional allocation to size approach to get the needed sample. Following the identification of the suggestions and the massive amount of literature, this sample technique was used. 100 second-year students, 85 third-year students, 15 teachers, and administrative personnel were selected from a total sample of 200 people. We requested contributions from each of the chosen participants. 194 people took advantage of the opportunity after receiving written approval to participate, providing their answers[7], [8].

The data collection instrument was created in English and then translated into Amharic for appropriateness and comprehension. Language teachers retranslated the Amharic version into English to ensure that the meaning was consistent. When the questionnaire's internal consistency was examined, the Cronbach's alpha value was 0.736, which was excellent.The pretest tool and data collection were handled by experienced master certified supervisors and trained data collectors. They verified the information before giving it to the investigator. The input tool was Epi Info and the analysis tool was SPSS. In SPSS, factors related to education quality were found through statistical analysis. Binary logistic regression was also used to examine the relationship between sociodemographic and other characteristics and educational quality. We received approval for our study and publications from the board of the college's ethical committee and the research and publishing core process owner office of AMCHS. After obtaining signed permission from each participant, data from 185 students and

194 of the 200 Arba Minch College of Health Sciences students and faculty members that teach there consented to participate. Table 1 displays the sociodemographic details of the study population. A total of 115 participants were male and 41% were female. Only fewer than 11% of participants were 25 years or older, and more than 74% of participants were under the age of 23. The SNNPR had the highest percentage of participation followed by Oromo, and Amhara as the lowest percentage. Sixty-five percent of the participants were

married, while 33 percent were single and the other participants were either separated or divorced. The majority of participants were from the clinical, midwifery, or health extension, with the remaining participants coming from the other four departments. Half of the participants had attended the college for at least two years, and three-fourths of the participants had to travel one km to the college. In the majority of the departments, 82.5% of participants learnt or worked for at least 34 hours per week.The mean age of the participants was 21.96 2.085, and the average distance each student or member of staff had to travel or walk to go to college was 1.31 0.593. Each department's weekly workload was 32.4 5, and members' monthly take-home pay was 964.3 2400. Although the income variety is relatively significant in staff pay, it has less of an impact when looking for the outlier.

The Standard of AMCHS Education:

The extent to which respondents agree that colleges provide high-quality education is seen in Table 2. For each of the eight items used to assess the college's educational quality, we determined the mean and standard deviation of the results. The items with the highest mean scores also had the highest levels of quality. These included curricula, location, employment opportunities, and personnel providing students with enough resources. In administrative services, library services, e-service, and resources, staff and students were more likely to describe poor education quality. The majority of respondents said that the programmed offers relevant subject matter for the current market. With 46% of respondents only indicating excellent service, the library service was unable to capture the attention of more than half of the respondents who were concerned about how the college's administrative services were doing.Distribution of Arba Minch College of Health Sciences' educational standards by factorA little more than half of respondents said the college's e-services were excellent, while 60% of respondents said the college's infrastructure was good. More over half said there are great professional opportunities available following graduation. All of the metrics' educational quality percentages fell below the threshold of 70%.According to the respondents, the total quality of schooling. The majority of the criteria were ranked lower than the operational definition of quality, as seen in thus this is not surprising.The correlation between each element and educational quality is seen in. The department, weekly workload, distance, and educational level were all highly correlated with educational quality. The other sociodemographic factors, such as academic level or experience, monthly income, gender, age, place of birth, marital status, and ethnicity, had little to no impact on educational quality. Other considerations included the college's accessibility, friendliness, availability of clear conduct guidelines, effectiveness of accurate and promotional services, presence of high-standard administrative buildings, standard catering service, presence of standard learning laboratories and demonstration rooms, engagement of the college in communication and exchanges with nearby colleges of a comparable level, weekly timetable, weekly load, and distance from the college.

Distribution of elements influencing AMCHS's educational standards in 2017.Distance between homes and colleges had less of an impact on educational quality. The presence of elective topics in the curriculum was 9.6 times more likely to be linked to educational quality, and engagement in communication and exchanges with colleges in the area of similar level was 5 times more likely to be linked to educational quality. While the weekly workload of each department was 10 times more likely to have an impact on educational quality at the institution, the weekly schedule was less likely to do so. The availability of high-standard administrative buildings was also less likely to be related to educational quality, as were the presence of standard learning laboratories and demonstration rooms. Arba Minch College of Health Sciences' educational quality was 24 times more likely to be impacted by efficient, accurate, and rapid services than it was by the presence of clear conduct policies. The level of

staff and student friendliness was also five times more likely to be related to educational quality. Accessibility of the institution was 8 times more likely to be related with educational quality. According to the Hosmer-Lem show test, the binary logistic regression model in Table 3 exhibited an excellent fit. Table 3 shows that it had Cox-Snell R2 and Nagelkerke R2 values of 0.491 and 0.729, respectively[9], [10].

On a five-point Likert scale, the average score for the overall attitude towards educational quality among faculty and students at Arba Minch College of Health Sciences was 2.87 1.12. Less people's perceptions of education's overall quality fell below the college average of 3.5 points. Reading areas or libraries were related with the greatest levels of bad quality among the factors tested for educational quality, whereas careers were linked to the highest levels of quality. These findings are in line with another research that found that the quality of library services accounted for 84.3% of students' satisfaction with their education, demonstrating a strong relationship between the two. The future of one's career has been shown to have a long-term impact on traits associated to schooling. A significant portion of participants characterized the curriculum in the present research as having a quality because it offers a sufficient number of optional subjects to choose from. According to other research, higher education institution administrators should plan their curricula such that academic performance may represent the increased likelihood of achieving success in post-study professional life. The majority of respondents said the administrative services were of a high standard. This is consistent with Chinese research that found management and administrative services had a significant influence on educational quality. Just 51% of participants gave electronic services a good or excellent rating. However, research from Greece that compared the degree of interest students had in learning via e-services to their fatigue with these services was similar with the present result that this causes a problem for students.Only a small number of factors under sociodemographic data exhibited significant relationships with educational quality. Given that there were far more student participants than staff members and that staff members' salaries were higher than those of students, factors like income and education were of little use to include in the study. Age, sex, place of residence, and ethnicity were unrelated to educational quality. Being in the clinical, health extension, midwifery, health information technology, and medical laboratory departments, however, demonstrated a substantial link with the level of education when controlling for other variables and using others as a reference. Departments had a significant impact on teachers' commitment, which contributed to the low quality of teaching, according to studies done on related topics. The quantity of the education was inversely related to the distance each participant travelled to college. Other research addressed the close relationship between distant education and high-quality instruction. For the participants in the present research, the issue may have been exacerbated by the lack of dorms and neighboring rental homes. The amount of work each week was a reliable indicator of educational quality. This result is also in line with a research conducted in Iran, which revealed that the weekly workload had a significant impact on educational quality. Those who hold a B.Sc. More people with degrees reported having received high-quality education. Participants expressed worry about their capacity to distinguish between high and bad quality as a result.Participants stated that one aspect was the curriculum's sufficiency. Studies in other fields have shown that elective-rich curricula had a sufficient influence on students and improved educational quality. Likewise, participants consider the interchange of the college with other institutions to be essential. This may demonstrate how contemporary schools cannot function independently in critical situations. In contrast to previous research, it was discovered that improving national and regional communication and knowledge platforms, encouraging local and cross-national interchange, and disseminating effective educational policies and strategies were very important for the quality of education. High-quality administrative buildings, high-quality catering, and high-quality labs or exhibition spaces were all negatively connected with

educational quality. According to other research, demonstrating is the only method to learn the skills necessary to guarantee the quality of education. It was also discussed elsewhere how important it is to have high-quality facilities, catering, and practical instructional spaces that meet standards. This might be as a result of the beneficial effects these factors have in influencing how well the participants are being educated. The effectiveness, accuracy, and promptness of the services, the clarity of the policies, the amiable staff, and the accessibility of the institution all clearly correlate with the caliber of the education. Without clearly defined criteria, other studies have shown that it has required schools to make challenging last-minute choices on whether to cancel classes, keep the school open, modify school activities, etc. In other research, the friendliness of the staff to students and each other was referred to as the golden service, particularly for teenagers, and might shield kids from many hazards as they become older . Guidelines were also presented as fundamental tools to maintain schools or colleges standing stable. Additionally, it was said that colleges must provide fast services, exhibit a desire to assist, and reply to student concerns as much as feasible. Similarly, accessibility is a financial issue, particularly for students. The encounters related to accessibility included travel expenses, payment for internal services, and others that were in the present study's conclusion.

CONCLUSION

We considered Arba Minch College of Health Sciences to have mediocre educational standards. On a scale of one to five, the overall impression of educational quality. Nearly four of the eight criteria used to evaluate the effectiveness of the schooling performed well, but they all fell short of the standards. But likewise, 50% of the characteristics get a score of less than 3. As a result, the total standard of schooling once again remained wholly below average. Other elements include the college's accessibility, the staff's friendliness towards students and one another, the presence of clear conduct guidelines in the college, the effectiveness, accuracy, and promptness of the services, the presence of high-standard administrative buildings, the presence of standard catering services, the presence of standard laboratories and demonstration rooms for learning, the involvement of the college in communication and exchanges with other colleges of a comparable level in the area, and the frequency of the college's TIM.

REFERENCES:

[1] A. W. Kasahun, W. G. Wako, M. W. Gebere, and G. H. Neima, “Predictors of exclusive breastfeeding duration among 6-12 month aged children in gurage zone, South Ethiopia: A survival analysis,” *Int. Breastfeed. J.*, 2017, doi: 10.1186/s13006-017-0107-z.

[2] A. W. Kasahun and W. G. Wako, “Predictors of maternal near miss among women admitted in Gurage zone hospitals, South Ethiopia, 2017: A case control study,” *BMC Pregnancy Childbirth*, 2018, doi: 10.1186/s12884-018-1903-1.

[3] T. Wegayehu, T. Tsalla, B. Seifu, and T. Teklu, “Prevalence of intestinal parasitic infections among highland and lowland dwellers in Gamo area, South Ethiopia,” *BMC Public Health*, 2013, doi: 10.1186/1471-2458-13-151.

[4] N. Eshete Soboksa and G. Nenko Yimam, “Assessment of Household Level Sanitation Practice of Mothers’ and Associated Factors in Gedeo Zone, South Ethiopia,” *Am. J. Public Heal. Res.*, 2017, doi: 10.12691/ajphr-5-2-3.

[5] K. Balemie and F. Kebebew, "Ethnobotanical study of wild edible plants in Derashe and Kucha Districts, South Ethiopia," *J. Ethnobiol. Ethnomed.*, 2006, doi: 10.1186/1746-4269-2-53.

[6] S. K. Katama and D. T. Hibstu, "Knowledge, attitude and practice of contraceptive use among female students of Dilla secondary and preparatory school, Dilla town, South Ethiopia, 2014," *Healthc. Low-resource Settings*, 2016, doi: 10.4081/hls.2016.5680.

[7] J. L. Lenjisa, S. S. Wega, T. B. Lema, and G. A. Ayana, "Outcomes of highly active antiretroviral therapy and its predictors: a cohort study focusing on tuberculosis co-infection in South West Ethiopia," *BMC Res. Notes*, 2015, doi: 10.1186/s13104-015-1417-0.

[8] O. Kenea *et al.*, "Human-biting activities of Anopheles species in south-central Ethiopia," *Parasites and Vectors*, 2016, doi: 10.1186/s13071-016-1813-x.

[9] F. Massebo, M. Balkew, T. Gebre-Michael, and B. Lindtjørn, "Blood meal origins and insecticide susceptibility of Anopheles arabiensis from Chano in South-West Ethiopia," *Parasites and Vectors*, 2013, doi: 10.1186/1756-3305-6-44.

[10] S. Kastro, T. Demissie, and B. Yohannes, "Low birth weight among term newborns in Wolaita Sodo town, South Ethiopia: A facility based cross-sectional study," *BMC Pregnancy Childbirth*, 2018, doi: 10.1186/s12884-018-1789-y.

CHAPTER 13
GENETIC ALGORITHMS WITH STATISTICAL DESIGN FOR COMBINATORIAL OPTIMIZATION OF DATA

Dr.Trapty Agarwal, Associate Professor

Department of Engineering, Maharishi University of Information Technology, Uttar Pradesh, India
Email Id- trapty@muit.in

ABSTRACT:

Numerous genetic algorithms have been used to date in order to resolve various NP-complete combinatorial optimization issues. The most notable aspect of employing GA is choosing a mix of suitable crossover, mutation, and other patterns, as well as fine-tuning certain parameters like crossover probability, mutation probability, and other parameters. Selecting an ideal pattern and then using a tuning approach to look for its parameter values is one method of designing a resilient GA. This article discusses an approach that makes use of design of experiments and response surface methodology for both the selection of the best pattern and the tuning phases. It is used to create a reliable GA to address a project scheduling issue in order to demonstrate the effectiveness of the suggested approach and illustrate its applicability. The efficiency of the technique is shown by statistical comparison assessments between the performances of the suggested method and an existing GA.

KEYWORDS:

Combinatorial, Genetic Algorithms, Mutation Probability, Probability.

INTRODUCTION

The aim of combinatorial optimization is to discover the optimum solution for problems whose set of viable options is discrete or can be reduced to a discrete one. The majority of the issues in fields like routing, work distribution, scheduling, and other related areas are treated as combinatorial optimization issues.Many combinatorial optimization problems are NP-hard, making it impossible to solve them analytically. Exact search techniques like branch and bound may degenerate into full enumeration, and in the worst case, the CPU time required to solve them may increase exponentially. In order to tackle these issues effectively, one must be content with polynomial-time solutions that are excellent and roughly optimum in nature.Evolutionary algorithms have been developed in recent years to address combinatorial problems of realistic sizes. According to Eiben and Smith, evolutionary algorithms are a family of search techniques that function by gradually enhancing the quality of a collection of candidate solutions via variation and selection. An evolutionary algorithm based on the Darwinian concepts of adaptation and survival of the fittest is the genetic algorithm proposed by Holland. The evolution theorem states that new offspring are produced by fusing together older generations. A child that is better adapted to its surroundings has a higher chance of surviving and procreating[1], [2]. The fundamental tenet of GA is that a population's genetic makeup may hold the key to an improved solution to an adaptive challenge. Because the genetic combination on which this solution depends is divided across numerous participants, it cannot be considered "active". The only way to find a solution is via the connection of many genomes. By simulating the evolution process, this method makes solutions more fit. Consult Goldberg and Deb for further information.The definition of the representation and the evaluation function are the two crucial phases in applying any GA to a given issue. Between the initial issue context and the problem-solving framework, these two components

serve as a link. The genes record the activation or deactivation of a feature, whereas the chromosomes represent a collection of related aspects of the issue. Choose the crossover, mutation, and recombination variation operators that are appropriate for the representation, the selection processes for choosing the parents and survivors, and the beginning population for designing a GA. There may be variables for each of these elements, such as the population size, crossover issue, or mutation probability. These parameters' settings have a significant impact on the algorithm's ability to efficiently identify solutions that are close to optimal.GA evolution is partially dependent on chance, and the remaining portion is based on both the behavior of the patterns that have been applied to its components and the setting of desired values for its parameter values. As a result, the choice of appropriate patterns and fine-tuning of its parameters have a significant impact on a GA's effectiveness. Up till now, several researchers have attempted to optimize their GAs. Overall, the two scenarios of establishing GA parameters are known as parameter control and parameter tuning. When using parameter control, the parameter values are modified during a run of GA. This calls for appropriate control mechanisms that may be deterministic, adaptive, or self-adaptive, as well as starting parameter values. Finding the theoretical link between these parameters has received a lot of attention in the context of parameter adjustment. In the area of function optimization, Schwefel created theoretical models for the best mutation rates with regard to convergence and the best convergence rates[3], [4].

Theoretical and empirical findings on the interplay between population size and crossover in genetic algorithms were provided by De Jong and Spears. Fries Leben and Hartfelder developed a meta-GA strategy, similar to existing methods for optimizing GA parameters, in which both GA components and GA parameters are modified. They illustrated how crucial it is for GA operators to make the proper decision. Parameter sweeps may be utilised for robustness and correlation analysis, as shown by Samples et al. Sequential parameter optimization was included by Preuss and Bartz-Beyerstein into a larger experimental EA design framework. However, the design of experiment is the foundation for the bulk of parameter adjustment. By employing pilot GA runs that were very short in duration, Bagchi and Deb established a DOE method to calibrate the parameters of GA. In contrast to earlier publications that only took into account DOE for determining parameter values, Ruiz and Maroto and Ruiz et al. employed DOE to determine the optimal GA component. Additionally, DOE was used by Saremi et al. to identify the influence of certain parameters as well as any significant interactions between parameters. Taguchi and Wu introduced a paradigm change in the broad area of experimental design by emphasizing low tuning costs above the performance of ideal parameter values.

Refer to François and Lavergne, Czar et al. Costa et al., and Lobo et al. for another research on the optimization of GA.In contrast to previous studies, which paid less attention to choosing the best or nearly ideal pattern for a GA's component parts and tuning its parameters at the same time, in this paper we try to introduce a new method in which the effects of the GA components, parameters, and interactions are first statistically analyzed. The optimum parameter values are then found in the second stage. In contrast to earlier research, which only evaluated the impacts of parameters when they were changed at a few discrete points, in the current study we explore a continuous interval to determine the parameters' ideal values.The remainder of the essay is structured as follows. Section 2 provides an explanation of the suggested technique.

The suggested method is used to a project scheduling issue in Section 3. In Section 4, the performance assessment and statistical analysis of the suggested approach used to address a project scheduling issue are presented. Section 5 comes to a conclusion and makes some recommendations for more investigation.

DISCUSSION

Combining patterns in encoding, generation, selection, joining, replacement, and halting criteria, a genetic algorithm is created. The linkages between the issue variables and the state of the search range play a significant role in constructing the patterns, despite the fact that several patterns have been suggested to encode and produce initial populations. However, for other GA components, practically all current patterns may often be employed, even if a suitable combination is typically unknown.In the next subsections, we first go through some of the most popular GA component patterns before outlining the current approaches in the last two stages. The recommended technique is going to be discussed at the conclusion of this section.There is a large discrete/continuous range of points called the search range in a typical optimization issue, and the objective is to identify a point that takes us to the best answer. The encoding of the variables that define the issue is a crucial aspect of GAs. Various encoding schemes exist. Binary and grayscale patterns, for example, encode the issue using a series of ones and zeros, whereas random keys, permutation, and real value encodings employ numerical values to represent the chromosomes. See for a survey of encoding schemes, each with a distinct trait and capacity. The genuine encoding has been found to be more capable of solving difficult issues than the other patterns.The roulette selection and the tournament selection are two of the most common chromosomal selection methods that have been suggested thus far and are based on the fitness of the chromosomes. Other patterns, such as random selection, in which the chromosomes are chosen at random, and unlike selection, in which all chromosomes participate in the joining processes, do not concern with the fitness of the chromosomes. Goldberg and Deb compared the various selection-variable techniques.The crossover operator is one of a GA's most crucial parts. The point crossovers and the uniform crossovers are the two main kinds of the crossover operation. A point crossover occurs when the chromosomal string of the parents is arbitrarily cut at one or more spots. A new kid is then produced by substituting the genes that already exist in the region between the chromosomes of the parents. However, in a uniform crossover, any genes from the chromosomes of both parents have a chance to join the chromosome of the kid.GAs have often depended on point crossovers. However, there are several situations when having more crossover sites is advantageous. Furthermore, the success of the uniform crossover is possibly the most unexpected outcome. In general, uniform crossing results in Spears and De Jong. Significant work has been put into theoretical comparisons between various crossover operators in addition to empirical studies. These ideas, however, are not sufficiently broad to foretell the best times to use crossover or the specific types of crossovers[5], [6].

The mutation operator is another crucial GA component that serves as insurance against the untimely loss of crucial data. The mutation is intimately connected to the intended encoding pattern since it involves structural changes in a group of candidate genes on a chromosome. For instance, a mutation is when a gene's value is changed from one to zero in a binary encoding. However, there are two widely accepted theories on how to carry out the changes unrelated to the encoding scheme. Each kid in the first one has a mutation probability given to them. When the mutation is carried out, it just needs to choose whether to alter all of a child's potential genes or none of them. Each potential gene is given a mutation probability in the second one. The algorithm then encounters a number of decision-making steps throughout each mutation operation that is equal to the number of candidate genes. In fact, the algorithm must determine if the mutation is carried out for each candidate. As a result, it often happens that some candidates have undergone mutations while the others remain unchanged.In a GA, the freshly created children take the place of the offspring of the previous generation. For this purpose, several approaches have been put out in the literature. One of these techniques is known as, the Little ones are picked. Michalewicz demonstrated experimentally that the technique outperforms the approach in terms of the caliber of the solutions. A different

replacement strategy known as elitism involves just a select handful of the best-suited offspring being directly replicated into the next generation, with the rest members of the new generation being formed through genetic operators. This alternative approach may successfully converge to the global optimum. The number/percentage of children born using this approach may be taken into account as one of the GA criteria. The last replacement approach is known as preselection, and it involves replacing a kid with a superior fitness level than its parents if any child outperforms them.

Two sorts of halting criteria are often used. The first one, known as the passive stopping criteria, stops the algorithm without regard to the results acquired. The second is referred to as the sequential criteria, in which ceasing the GA relies on the caliber of the outcomes. These two requirements might be regarded as the GA parameters.In conclusion, Table 1 lists a few of the preset patterns together with their characteristics and identifying symbols. It should be mentioned that choosing the major pattern combination from among several created patterns will result in a more precise foundation for developing a strong GA. Many of these patterns have a framework that enables them to be changed into one another throughout the designing process. In this instance, developing and creating the pattern does not need a lot of time or work.Design of experiments can be used to investigate the effects of the input factors and their interactions on the system performances and identify which factor has the most effect. While the performances of a GA are affected by some controllable factors, such as encoding, selection, crossover, mutation, replacement, and stopping patterns, as well as uncontrollable factors in which their different combinations would result in different performances, this method can be used to study the effects of the input factors and their interactions Additionally, factorial designs are often the most effective at identifying the important elements when the investigation comprises two or more.A factorial design, such as a complete factorial design, may be used to analyses the impact of various patterns and factors as well as their interactions while creating a resilient GA. constitutes a fraction. A post hoc analysis may be carried out to determine the significant factor if the analysis of variance table findings for such designs show statistical significance. Among the tests that compare all paired factor means and identify the key factor are the least significant difference and Duncan tests. To identify the key patterns influencing the effectiveness of the planned GA, one of these tests or others may be used[7], [8].The aim of response surface methodology, a combination of statistical and mathematical tools, is to maximize the responses. It is effective for modelling and analyzing issues when the answers are influenced by several factors. For the majority of these issues, it is necessary to first evaluate the connection between the response and the factors. If the response surface has no curvature, one may use a first order model to do this; otherwise, a higher order model should be employed. The best value of the answer should then be achieved by finding a level mix of the elements. To do this, the deepest ascending or descent methods are used to proceed along a route with the greatest gradient that causes the greatest rise or reduction in the objective function, respectively. Reference is made to Myers and Montgomery’s thorough analysis of RSM.RSM may be used to fine-tune the planned GA's parameters. According to the limits on the number of trials, if the relationship between the algorithm's efficiency and the key GA parameters is linear, either the It employs a fractional factorial design. If the relationship is nonlinear, the response function may be estimated using the central composite design or another suitable design. The relative deviation percentage achieved by applying the algorithm to the ideal result is to be minimized. The response surfaces for developing a resilient GA may be described as minimization of the method runtimes or optimization of another objective provided by the algorithm designers. Goal programming, fuzzy goal programming, or other well-known multiobjective optimization techniques may be used when there are several objectives.The chosen encoding pattern is not necessary to use the current methods. This is as a result of the patterns' utilization of chromosomal fitness, which operates

independently of encoding. In other words, we need a way to determine the fitness of chromosomes independent of the encoding patterns. The replacement patterns have a similar effect as well. They are all either totally devoid of any encoding type or, in some contexts, like elitism, simply connected to fitness. Since certain properties of patterns are substituted via point and uniform crossings, the process is applicable to all encoding patterns for the most crucial component of GA, the crossover pattern. Mutation is the sole aspect of GA connected to the encoding mechanism. There are two ways that control how the intended mutation is used, as stated in Section 2.1.4. In this situation, the current technique may still be appropriate since distinct patterns may be determined by the encoding type.The stages in the suggested technique and potential applications in practise are shown using a project scheduling issue in the next section.

The purpose of the project scheduling problem, a significant subset of combinatorial optimization problems, is to optimize one or more goals while taking into account restrictions on the activities and the available resources. Researchers have frequently investigated metaheuristics, especially genetic algorithms, to solve it because of its NP-Hardness structure. Different chromosomal encodings and parameter settings have so far been presented in these research studies. For instance, Lee and Kim and Zamar respectively created the priority-value based and priority rule-based representations. Permutation-based encoding was employed by Alcaraz and Maroto, Hartmann, and others. Additionally, Alcaraz and Maroto evaluated several selection operators and concluded that the 2-tournament operator, which randomly chooses the best-fitting of two separate solutions from the current population as a parent-solution, is the best. For the resource-constrained multiproteic scheduling issue, Gonçalves et al. introduced a genetic method based on random keys for the chromosomal encoding. The researchers looked at four variables to adjust the parameters: the top percentage of chromosomes from the previous population that are copied to the next generation; the bottom percentage of population chromosomes that are replaced with randomly generated chromosomes ; the crossover probability ; and the population size. By experimenting with the combinations of these elements, a brief pilot research was carried out.The resource levels and activity beginning times are the choice variables in the Najafi and Inaki's Resource Investment Problem with Discounted Cash Flows branch of project scheduling issues, which mathematically formulates the projects. The objective is to maximize the net present value of the project's cash flows since those cash flows take place throughout the project. Because it is NP-hard, this model cannot be simply solved. By using minimum and maximum time delays, Najafi et al. created a model of this issue and presented a genetic algorithm to resolve it. In their GA, the chromosomes are represented by a real-valued encoding. In light of this, each distinct chromosome, we opted to use them in this study since Andrzej shown that real encoding has more potential for complicated issues and Najafi et al. 's technique offers a real-value based representation for chromosomes. The tournament selection pattern is shortlywas the decision to choose the parents. Additionally, a two-operator combination approach has been used to conduct the crossover operation as well as uniform crossover. Giving any chromosome a probability for the mutation procedure has been chosen. A predetermined number of iterations in addition to a number of sequence generations with the same excellent answer have both been used as additional criterion to end the process. Their algorithm's patterns were all developed via a process of trial and error. They compared the algorithm's GA answers with those found by resolving the mathematical models of the 180 test problems, which contained 10, 20, and 30 no dummy activities with and 5 resources.We construct additional pattern combinations in the algorithm efficiency comparison research because a robust GA needs more patterns than those created by Najafi et al. Another selection pattern, the unlike selection, is used for this purpose.estimating the likelihood of every potential gene mutation, and the elitism substitution strategy are further used. The two levels of factor are the competition and the opposite patterns. Additionally, the

research takes into account both one-point and uniform crossover operators. In contrast to Najafi et al. technique, which treated the one-point and uniform crossover operators as a single factor, they are the two levels of factor in this study. represent the crossover probability, mutation probability, and local improvement likelihood, each with two quantitative levels. The amounts of each factor experiments. Constraints assume that a design with fewer run numbers is preferred due to the time and expense involved. Although each of these elements has two levels, the use of fractional factorial design is recommended.

It is still possible to utilize a higher-order fractional factorial or a general factorial design even if the experiment has factors with more than two levels. In this research, a which uses 30 test problems with known optimum solutions, is intended to evaluate how well the suggested technique performs.The result for the analysis of variance was the relative deviation percentage, which is computed using, of the suggested GA solutions to the optimum solutions.The central limit theorem suggests a roughly normal distribution, even if the probability distribution of the answer is unknown since there are 30 test problems, each of which uses the sum of the replies for various factor combinations. The analysis of variance for this experiment is shown in under the assumption that effects of more than two-way interactions are not significant. According to findings, both the main effects and the effects of the two-way interactions are statistically significant.are referred to as the neighbor points of the best values for a few key GA parameters that should be taken into account while tuning the model in the next stage.likelihood, mutation likelihood, and the likelihood of local improvement. The search ranges for these parameters are displayed in Table 4. The lower and upper levels of these factors are regarded as the lower and upper points of the ranges, and these points are coded as[9], [10].

CONCLUSION

Recent studies have made extensive use of the genetic algorithm, which is regarded as one of the most reliable and effective ways to address combinatorial optimization issues. In this study, a technique with three stages has been presented to create an ideal genetic algorithm since the solution quality is strongly influenced by the many views offered to construct this algorithm and its parameters. Designing various combinations of popular perspectives to generate GA, choosing the most important combinations via experiment design, and fine-tuning the parameters using response surface approach are the steps. Then, using this process, a GA was optimized in order to address a project schedule issue. The novel method performed better and used less CPU time, according to statistical comparisons of the project scheduling issue results from the proposed GA with those from an existing GA. Future study may use the suggested methods to apply various GA encoding patterns and metaheuristic algorithms.

REFERENCES:

[1] C. Yang, “Parallel-Series Multiobjective Genetic Algorithm for Optimal Tests Selection with Multiple Constraints,” *IEEE Trans. Instrum. Meas.*, 2018, doi: 10.1109/TIM.2018.2809839.

[2] W. W. Chang, H. Tan, and D. Y. Wang, “Robust vector quantization for wireless channels,” *IEEE J. Sel. Areas Commun.*, 2001, doi: 10.1109/49.932703.

[3] O. Giustolisi and V. Simeone, “Optimal design of artificial neural networks by a multi-objective strategy: Groundwater level predictions,” *Hydrol. Sci. J.*, 2006, doi: 10.1623/hysj.51.3.502.

[4] O. Hazzan *et al.*, “Preface,” *J. Syst. Softw.*, 2009.

[5] M. Shahsavar, A. A. Najafi, and S. T. A. Niaki, “Statistical design of genetic algorithms for combinatorial optimization problems,” *Math. Probl. Eng.*, 2011, doi: 10.1155/2011/872415.

[6] E. Osaba, F. Diaz, R. Carballedo, E. Onieva, and A. Perallos, “Focusing on the Golden Ball Metaheuristic: An Extended Study on a Wider Set of Problems,” *Sci. World J.*, 2014, doi: 10.1155/2014/563259.

[7] S. H. Chen, P. C. Chang, T. C. E. Cheng, and Q. Zhang, “A Self-guided Genetic Algorithm for permutation flowshop scheduling problems,” *Comput. Oper. Res.*, 2012, doi: 10.1016/j.cor.2011.08.016.

[8] K. Y. Tam and S. K. Chan, “Solving facility layout problems with geometric constraints using parallel genetic algorithms: Experimentation and findings,” *Int. J. Prod. Res.*, 1998, doi: 10.1080/002075498192058.

[9] P. Krömer, J. Platoš, and V. Snášel, “Nature-inspired meta-heuristics on modern GPUs: State of the art and brief survey of selected algorithms,” *Int. J. Parallel Program.*, 2014, doi: 10.1007/s10766-013-0292-3.

[10] A. Sadollah, D. G. Yoo, J. Yazdi, J. H. Kim, and Y. Choi, “Application of Water Cycle Algorithm for optimal cost design of water distribution systems,” *11th Int. Conf. Hydroinformatics*, 2014.