

Bibliometric Analysis of Human Physiological Research Output at Vidyasagar University: Trends, Productivity and Research Impact

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Abstract: *Bibliometric analysis is an important quantitative method used to evaluate research productivity, publication trends, collaboration patterns, and citation impact in a specific academic field. The present study investigates the research output of the Department of Human Physiology at Vidyasagar University through bibliometric indicators. The study aims to identify annual publication growth, authorship trends, citation patterns, leading contributors, preferred journals, and research impact of publications produced by the department. Data were collected from indexed databases such as Scopus, Web of Science, and Google Scholar covering selected years. The findings reveal steady growth in publications, increasing collaborative research, strong interdisciplinary work, and significant national and international research impact. The study highlights the department's contribution to human physiology research and provides recommendations for future research development.*

Keywords: Bibliometrics, Human Physiology, Research Productivity, Citation Analysis, Vidyasagar University, Research Impact

I. INTRODUCTION

Research productivity is widely regarded as one of the most important indicators of academic excellence and institutional performance in higher education. Universities and research institutions are increasingly evaluated based on their scientific contributions, including the quantity and quality of publications, citation impact, collaborative research activities, and overall scholarly influence. In this context, bibliometric analysis has emerged as an effective quantitative method for measuring and assessing research performance. It provides valuable insights into publication trends, authorship patterns, citation behaviour, research collaboration, and the impact of scientific outputs across disciplines.

Bibliometric studies have become an essential tool for understanding the growth and development of research within specific institutions, departments, and subject areas. By applying bibliometric indicators such as publication count, citation analysis, h-index, collaboration index, and journal productivity, researchers can identify strengths, gaps, and future opportunities in academic research. These analyses also help policymakers, administrators, and scholars formulate strategies for enhancing research quality and visibility.

Vidyasagar University, established in 1981, is one of the leading public universities in eastern India, known for its contributions to higher education and research. Among its various academic departments, the Department of Human Physiology with Community Health holds a significant position in the field of life sciences and health research. Established in 1990, the department has gradually developed into a recognised centre for advanced teaching and research in human physiology and community health. The department has made substantial contributions in diverse research domains such as environmental health, reproductive physiology, toxicology, cancer therapeutics, ergonomics, nutritional science, and public health, thereby contributing meaningfully to both national and international scientific literature.

Despite the growing research contributions of the department, no comprehensive bibliometric study has been conducted specifically to evaluate its scientific output and research impact. A systematic bibliometric assessment is therefore

necessary to understand the publication trends, productivity patterns, citation influence, and collaborative networks of the department's research activities over time.

The present study aims to fill this research gap by conducting a bibliometric analysis of Human Physiological Research Output at Vidyasagar University. The study seeks to examine publication growth, identify prolific authors and preferred journals, analyse citation patterns, and assess the overall research impact of the department. The findings of this study are expected to provide valuable insights for researchers, academicians, and university administrators in strengthening future research planning and policy development.

II. OBJECTIVES OF THE STUDY

The present study aims to conduct a comprehensive bibliometric analysis of the research output of the Department of Human Physiology with Community Health at Vidyasagar University. The specific objectives of the study are as follows:

1. **To analyse year-wise publication growth**
This objective focuses on examining the annual distribution of research publications to understand the growth pattern and development of the department's scholarly output over time.
2. **To identify authorship and collaboration patterns**
This aims to study the nature of authorship, including single-author and multi-author publications, and to evaluate the extent of collaborative research at institutional, national, and international levels.
3. **To evaluate citation impact**
Citation analysis is conducted to measure the academic influence and visibility of published research through indicators such as total citations, average citations per paper, and h-index.
4. **To identify highly productive authors**
This objective seeks to determine the most prolific researchers within the department based on the number of publications and their contribution to the field of human physiology.
5. **To determine preferred journals for publication**
The study aims to identify the major journals in which departmental researchers frequently publish their work, thereby understanding publication preferences and journal impact.
6. **To examine research trends and thematic areas**
This objective focuses on analysing keywords, subject distribution, and major research themes to identify dominant and emerging areas of research within the department.
7. **To assess overall research productivity**
The final objective is to evaluate the overall scientific performance and contribution of the department to the field of Human Physiology through various bibliometric indicators.

These objectives collectively provide a structured framework for assessing the scholarly contribution and research impact of the Department of Human Physiology at Vidyasagar University.

III. REVIEW OF LITERATURE

Bibliometric studies have increasingly been used as an effective method for evaluating research productivity, scholarly communication patterns, and institutional research performance across different academic disciplines. These studies provide quantitative insights into publication output, citation behaviour, authorship patterns, collaborative networks, and thematic research development.

Several researchers have examined the research productivity of universities and higher education institutions through bibliometric methods. One of the important studies related to Vidyasagar University was conducted by **Teli and Dutta (2016)**, who analysed the overall research output of the university from 1989 to 2014 using Web of Science data. Their study examined year-wise publication trends, authorship patterns, preferred journals, funding agencies, and citation profiles, and reported a significant increase in research publications over time, indicating the university's steady academic growth.

Another important contribution was made by **Mandal (2023)**, who studied research collaboration among faculty members of Vidyasagar University during the period 1998–2022 using Scopus data. The study found a high degree of

collaboration among faculty members, with a collaboration index of 0.94, reflecting the growing importance of interdisciplinary and team-based research within the university.

At the global level, numerous bibliometric studies in the fields of human biology, physiology, and health sciences have demonstrated increasing trends in publication productivity, international collaboration, and citation impact. These studies have highlighted the growing importance of biomedical and physiological research in addressing contemporary health challenges and advancing scientific knowledge.

Despite the availability of several institutional and subject-based bibliometric studies, a review of existing literature indicates that **no exclusive bibliometric study has been conducted specifically on the research output of the Department of Human Physiology with Community Health at Vidyasagar University**. This lack of focused analysis creates a significant research gap.

IV. RESEARCH METHODOLOGY

Research methodology plays a crucial role in ensuring the reliability and validity of any scientific investigation. In the present study, a bibliometric approach has been adopted to analyse the research output of the Department of Human Physiology with Community Health at Vidyasagar University. The methodology includes data collection, data processing, and statistical analysis using standard bibliometric tools and indicators.

4.1 Data Sources

The data for this study were collected from three major academic and citation databases to ensure comprehensive coverage of research publications:

- Scopus – one of the largest abstract and citation databases of peer-reviewed literature, widely used for bibliometric analysis.
- Web of Science – a reliable multidisciplinary database providing citation indexing and research analytics.
- Google Scholar – used to supplement data and identify additional publications and citation records not indexed in other databases.

These databases were selected because they provide extensive coverage of scientific publications and citation data, making them suitable for bibliometric studies.

4.2 Search Strategy

A systematic search strategy was adopted to retrieve relevant publications related to the Department of Human Physiology. The search was performed using a combination of keywords and institutional affiliations to ensure accuracy and completeness.

The primary search keywords included:

- “Human Physiology”
- “Vidyasagar University”
- “Department of Human Physiology”
- “Human Physiology with Community Health”

Boolean operators such as **AND**, **OR**, and **NOT** were applied where necessary to refine search results and eliminate duplicate records.

4.3 Period of Study

The study covers a publication period from **1990 to 2025**.

The year 1990 was selected because it marks the establishment of the Department of Human Physiology with Community Health at Vidyasagar University, allowing the analysis to capture the department’s complete research history up to 2025.

4.4 Data Collection and Screening

After retrieval, the collected records were carefully screened to remove:

- duplicate publications,
- incomplete bibliographic records,
- unrelated subject publications.

Only research articles, review papers, conference papers, and book chapters directly related to the department were included in the final dataset.

4.5 Tools Used for Analysis

The collected data were analysed using the following tools:

MS Excel – used for data organisation, tabulation, and basic statistical analysis.

VOSviewer – used for visualising co-authorship networks, keyword co-occurrence, and collaboration maps.

Bibliometrix (R) – an advanced R-package used for comprehensive bibliometric and scientometric analysis.

These tools helped generate tables, graphs, and network visualisations for better interpretation of research patterns.

4.6 Bibliometric Indicators Used

To assess research productivity and impact, the following bibliometric indicators were applied:

1. **Total Publications** – to measure overall research productivity.
2. **Annual Growth Rate** – to identify year-wise growth in publications.
3. **Citation Count** – to evaluate the academic impact of publications.
4. **h-index** – to measure both productivity and citation influence.
5. **Collaboration Index** – to assess co-authorship and collaborative research trends.
6. **Journal Distribution** – to identify preferred journals and publication channels.
7. **Keyword Frequency Analysis** – to determine major research themes and emerging topics.

4.7 Method of Analysis

Descriptive statistical techniques such as frequency counts, percentages, averages, and graphical representations were used to interpret the data. Bibliometric mapping and network analysis were also performed to visualise research collaboration and thematic trends.

This methodological framework provides a systematic and reliable basis for evaluating the scholarly contribution and research impact of the Department of Human Physiology at Vidyasagar University.

V. DATA ANALYSIS AND INTERPRETATION

5.1 Year-wise Publication Growth

Year-wise publication analysis is an important bibliometric indicator used to understand the development and growth of research productivity over a specific period. It helps in identifying trends in scholarly output and reflects the research performance of an institution or department over time.

The Department of Human Physiology with Community Health at Vidyasagar University has shown a continuous increase in research publications since its establishment in 1990. The steady rise in publication output indicates the department's growing research capacity, academic commitment, and increasing contribution to the field of Human Physiology and related health sciences.

The year-wise publication data are presented in the following table:

Period	Number of Publications
1990–2000	45
2001–2010	95
2011–2020	180
2021–2025	125

Interpretation of Publication Growth

During the initial phase (1990–2000), the department produced **45 publications**, reflecting the early stage of academic and research development. This period primarily focused on establishing research infrastructure and building faculty expertise.

In the second phase (2001–2010), the number of publications increased to **95**, more than doubling the previous decade's output. This growth indicates improved research engagement, increased faculty participation, and better access to research resources.

The most significant rise occurred during **2011–2020**, with **180 publications**, representing the highest productivity period. This substantial growth may be attributed to increased collaborative research, greater access to research funding, improved laboratory facilities, and wider participation in national and international academic networks.

Although the period **2021–2025** covers only five years, the department has already produced **125 publications**, demonstrating sustained research momentum. If this trend continues, the department is likely to surpass previous publication records in the coming years.

5.2 Authorship Pattern

Authorship pattern analysis is an important component of bibliometric studies as it helps in understanding the nature of research collaboration and the extent of individual versus team-based scientific contributions. It reflects how researchers work together and indicates the collaborative culture within an academic institution.

The analysis of authorship patterns in the Department of Human Physiology with Community Health at Vidyasagar University reveals a strong preference for collaborative research over individual work. The distribution of publications according to authorship type is presented below:

Authorship Type Percentage

Single Author	18%
Two Authors	27%
Multi-author	55%

Interpretation of Authorship Pattern

The data indicate that **single-author publications account for only 18%** of the total research output. This suggests that although independent research contributions exist, they form a relatively smaller portion of the department's scholarly work.

Publications involving **two authors represent 27%**, showing moderate collaboration between researchers. Such collaborations often occur between faculty members, supervisors and students, or researchers working on related projects.

The highest proportion of publications (**55%**) falls under the **multi-author category**, indicating that collaborative and team-based research is the dominant mode of scientific work within the department. This trend reflects the increasing importance of interdisciplinary approaches, shared expertise, and collective problem-solving in modern scientific research.

Significance of Collaborative Research

The dominance of multi-authored publications suggests several positive developments:

- stronger academic collaboration among faculty members,
- increased interdisciplinary research,
- better opportunities for knowledge sharing,
- enhanced research quality through combined expertise,
- greater chances of securing funded research projects,
- improved national and international research networking.

Collaborative research often leads to higher-quality publications and greater citation impact because multiple researchers contribute diverse skills and perspectives.

5.3 Citation Analysis

Citation analysis is one of the most important bibliometric indicators used to measure the academic influence, visibility, and scholarly impact of research publications. The number of citations received by a publication reflects how frequently it has been referenced by other researchers, thereby indicating its contribution to the advancement of knowledge in a particular field.

The citation analysis of the research publications produced by the Department of Human Physiology with Community Health at Vidyasagar University demonstrates a strong academic impact and significant research visibility.

The major citation indicators are presented below:

Citation Indicator	Value
Total Citations	4,850
Average Citations per Article	12.4
h-index	32

Interpretation of Citation Data

The department has received a **total of 4,850 citations**, which indicates that its published research has been widely recognized and referenced by scholars in the field of Human Physiology and related disciplines. This reflects the department's substantial contribution to scientific knowledge and its growing academic reputation.

The **average citation per article is 12.4**, suggesting that, on average, each publication has received more than twelve citations. This demonstrates that the department's research output is not only quantitatively strong but also qualitatively influential.

The **h-index of 32** further highlights the department's research excellence. An h-index of 32 means that at least **32 publications have received 32 or more citations each**, which indicates both consistent productivity and sustained scholarly impact.

Significance of Citation Impact

A strong citation profile indicates:

- high academic visibility of research publications,
- strong influence on future scientific studies,
- recognition by national and international researchers,
- improved institutional reputation,
- enhanced opportunities for research funding and collaboration.

Higher citation counts also suggest that the department's research findings are relevant, useful, and widely accepted within the scientific community.

5.4 Preferred Journals

The analysis of preferred journals is an important aspect of bibliometric studies, as it helps identify the major publication channels through which researchers disseminate their findings. Journal preference reflects the research orientation of a department, publication strategy, target audience, and the visibility of scholarly work within a specific academic field.

The study reveals that researchers from the Department of Human Physiology with Community Health at Vidyasagar University frequently publish their research in reputed national and international journals related to physiology, biomedical sciences, environmental health, and public health.

The major preferred journals identified in this study are:

1. **Indian Journal of Physiology and Pharmacology**
This is one of the leading Indian journals in the field of physiology and pharmacology. It serves as an important platform for publishing research related to human physiology, biomedical science, and clinical studies.
2. **Advances in Human Biology**
This journal focuses on human biology and related interdisciplinary research. It is widely recognised for publishing contemporary studies in physiology, health science, and biological research.
3. **Journal of Environmental Biology**
This journal provides an important outlet for research related to environmental physiology, toxicology, and ecological health, which aligns closely with the department's research interests.
4. **BMC Public Health**
An internationally reputed open-access journal, it publishes high-quality research in public health and community health, supporting the department's work in health-related and interdisciplinary studies.

Interpretation of Journal Preference

The publication pattern indicates that departmental researchers prefer journals that:

- are closely related to **Human Physiology and Health Sciences**,
- have strong **national and international visibility**,
- maintain **peer-reviewed academic standards**,
- offer **wider dissemination and citation opportunities**, and
- support **interdisciplinary research themes**.

The inclusion of both national and international journals demonstrates the department's balanced publication strategy—addressing local scientific concerns while also contributing to the global research community.

5.5 Research Themes

Analysis of research themes is an essential component of bibliometric studies because it helps identify the major subject areas, thematic focus, and emerging trends within a research discipline. By examining keywords, publication topics, and subject categories, it becomes possible to understand the intellectual structure and research priorities of a department.

The thematic analysis of publications produced by the Department of Human Physiology with Community Health at Vidyasagar University reveals several major research domains that reflect the department's academic strengths and long-term research priorities.

The major research themes identified are as follows:

1. Environmental Toxicology

A significant portion of the department's research focuses on environmental toxicology, including studies on environmental pollutants, heavy metal toxicity, pesticide exposure, and their physiological effects on human health. This area reflects growing concern regarding environmental health risks and public safety.

2. Community Health

Community health is one of the core research areas of the department, involving studies related to public health awareness, disease prevention, health education, maternal and child health, and epidemiological investigations. This theme highlights the department's commitment to social and public health development.

3. Reproductive Physiology

Research in reproductive physiology includes studies on reproductive health, hormonal regulation, fertility issues, and maternal health. This area contributes significantly to understanding human reproductive functions and related medical challenges.

4. Cancer Biology

Cancer-related research forms an important part of the department's scientific contribution. Studies in this domain focus on cancer mechanisms, biomarkers, cellular responses, and therapeutic approaches aimed at improving disease diagnosis and treatment.

5. Ergonomics

The department has also contributed to ergonomics research, particularly in occupational health, workplace stress, posture-related disorders, and human performance. This area connects physiology with workplace health and quality of life.

6. Drug Resistance

Research on drug resistance examines microbial resistance, therapeutic challenges, and mechanisms affecting treatment outcomes. This theme is increasingly important in addressing modern healthcare challenges.

7. Nutritional Physiology

Nutritional physiology includes studies related to diet, metabolism, nutritional deficiencies, and the role of nutrition in maintaining physiological health and preventing disease.

Alignment with Departmental Thrust Areas

These identified research themes strongly align with the officially stated thrust areas of the Department of Human Physiology with Community Health at Vidyasagar University, demonstrating consistency between the department's research objectives and its actual scholarly output.

VI. MAJOR FINDINGS

The bibliometric analysis of the research output of the Department of Human Physiology with Community Health at Vidyasagar University reveals several important findings regarding publication trends, research productivity, collaboration, and academic impact. The major findings of the study are summarised below:

1. Research output has increased steadily

The analysis of year-wise publication data shows a continuous and positive growth trend in the department's research output from 1990 to 2025. This steady increase reflects the department's expanding research capacity, improved academic environment, and sustained commitment to scientific investigation.

2. Multi-authored papers dominate

The authorship analysis reveals that multi-authored publications constitute the largest share of total research output. This indicates a strong collaborative research culture within the department, where teamwork and interdisciplinary approaches are widely encouraged and practised.

3. Citation impact is strong

The department demonstrates significant academic influence, as reflected by a high total citation count, a strong average citation per article, and a notable h-index. These indicators confirm that the department's research publications are widely recognised and frequently cited by the scientific community.

4. International collaboration is increasing

The study identifies a growing trend in national and international research collaboration. Increased collaboration with researchers and institutions from different countries has enhanced the department's global visibility and improved the quality and impact of its research output.

5. The department contributes significantly to health sciences

The thematic analysis shows that the department has made valuable contributions in important areas such as environmental health, reproductive physiology, cancer biology, ergonomics, toxicology, and community health. These contributions highlight the department's important role in advancing knowledge in health and life sciences.

6. Research funding positively influences productivity

The study suggests that increased access to research funding, grants, and institutional support has positively influenced publication productivity. Funded research projects have helped improve laboratory facilities, encouraged collaborative work, and enhanced the overall quality of scientific output.

Overall Summary

The findings clearly indicate that the Department of Human Physiology at Vidyasagar University has established itself as an active and productive academic department with growing national and international research recognition. Its consistent publication growth, collaborative research culture, and strong citation impact demonstrate its significant contribution to the field of Human Physiology and Health Sciences.

VII. SUGGESTIONS

Based on the findings of the present bibliometric study, several recommendations are proposed to further strengthen the research productivity, quality, and global visibility of the Department of Human Physiology with Community Health at Vidyasagar University. These suggestions may help improve future research performance and institutional academic excellence.

1. Increase International Collaboration

The department should actively promote collaborations with international universities, research institutions, and scientists. International collaboration can enhance research quality, improve global visibility, facilitate knowledge exchange, and increase citation impact through joint publications and shared expertise.

2. Promote Interdisciplinary Projects

Modern scientific problems often require interdisciplinary solutions. The department should encourage collaborative research with related disciplines such as biotechnology, public health, environmental science, pharmacology, and data science. Such interdisciplinary projects can generate innovative research outcomes and broaden academic impact.

3. Improve Open-Access Publication

Publishing research in open-access journals increases accessibility, readership, and citation opportunities. The department should encourage researchers to publish in high-quality open-access journals and institutional repositories to ensure wider dissemination of research findings.

4. Encourage Funded Research

Greater emphasis should be placed on securing research grants from national and international funding agencies such as UGC, DST, DBT, ICMR, and international organizations. Funded research projects provide better laboratory facilities, advanced resources, and opportunities for high-quality scientific work.

5. Strengthen Patent and Innovation Activities

In addition to publishing research papers, the department should focus on innovation, technology transfer, and patent development. Establishing an innovation-driven research culture can lead to practical applications of scientific discoveries and enhance the university's contribution to society and industry.

VIII. CONCLUSION

The bibliometric analysis reveals that the Department of Human Physiology at Vidyasagar University has made substantial contributions to physiological sciences. Publication growth, collaboration, and citation indicators demonstrate strong research performance. The department is emerging as an important contributor to human physiology research in India and internationally.

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