Health research in the state of Odisha, India: A decadal bibliometric analysis (2011-2020)

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ABSTRACT

Background: Bibliometric analyses are an important tool for evaluating health research outputs in terms of their distribution, trends, contributors, focus, and funding sources. The transition from millennium to sustainable development goals has led to a gradual shift in the health policy, and possibly, research priorities of low-income settings in the Empowered Action Group (EAG) states lagging in socioeconomic and health parameters, and also ranking low on innovations and research. In this study, we depict the recent trends, quantity, type, focus, and sources of health-related research in the EAG state of Odisha, India. Methods: Peer-reviewed published original research articles related to human health published between 1 January, 2011 and 31 December, 2020 and where the study population was the residents of Odisha, or the study site was in Odisha, exclusively or partially, were analyzed. The publication characteristics were tabulated, including the title, journal name, open access, date of publication, number of authors, designation of the authors, number of institutes involved, and name of the institute of the first author. The details of the study setting, study site, ethical clearance, and funding source were also analyzed. Results: The study identified 2,285 articles from database searches and included 666 articles after screening for bibliometric analysis. Most of the manuscripts had between three and six authors (43.5%). Two institutes from the state, the Regional Medical Research Center (ICMR-RMRC) and Kalinga Institute of Industrial Technology (KIIT), together contributed to 22.4% of the published manuscripts. Nearly 45.9% of the studies were community-based while 45.3% were hospital-based. While most of the published work was on infectious diseases, the proportion came down with time. An overwhelming majority of the studies were observational and less than 10% were experimental in design. Conclusions: The analysis shows a substantial increase in the number of publications in this decade. Priority setting of healthcare problems, increased funding, and capacity-building can give a much-necessitated impetus to more quality- and evidence-based research for aiding policy implementation and improvement of the overall health.

Keywords: Bibliometric analysis, health research, Odisha, publication trends

Introduction

The definition of health research is broad and not only includes biomedical research, epidemiological studies, and health services research, but also studies on behavioral, social, and economic factors affecting health. The value of research toward advancing innovations and improving patient care, healthcare services, systems, policies, and the overall well-being of the communities is well-recognized.¹

The quality, quantity, and impact of health research is an indirect measure of the maturity of the healthcare systems and reflects the national policy priorities of a country. There are wide variations in the quality and quantity of research in different regions and countries. Bibliometric analysis can be an important tool for evaluating health research outputs in terms of their distribution, trends, contributors, focus, and funding sources.²

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in the health research outputs between and even within countries. In a large and diverse country such as India, with one-sixth of the population and a large proportion of global disease burden, the health research support systems, and consequently, the research output, have generally been inadequate.[2] Historically, the meager resources allocated to health research concentrated on the control of communicable diseases, reduction in fertility, maternal and child health, nutritional disorders, and other health challenges of the twentieth century.[5] The health research output is not equitably distributed across the country and has been concentrated in a few institutions with only 4% of the top-ranked institutions contributing to over 40% of the research output from the country.[3,4] Additionally, regional disparities across the country persist with eight socioeconomically backward states of Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha, Rajasthan, Uttarakhand, and Uttar Pradesh, referred to as the Empowered Action Group (EAG) states, lagging in socioeconomic and health parameters and ranking low on innovations and research.[2,3]

A part of this group, the state of Odisha on the eastern coast of India with a significant population of indigenous tribes, has been ranked in the bottom three in the country using a composite health index comprising of health outcomes, governance, information, key inputs, and processes.[5] However, sustained efforts to address these challenges and ensure equity in healthcare have been undertaken in the state during the past decade.[6] This period has also seen an increased focus on public health with the establishment of a dedicated cadre of health professionals in the public health system and an increase in the public health training and research institutions in the state. The transition from millennium to sustainable development goals (SDGs) has led to a gradual shift in the health policy and possibly the research priorities of low-income settings such as Odisha.

Bibliometric analyses are an important tool for evaluating the health research outputs in terms of their distribution, trends, actors, focus, and funding sources. This would also be useful in identifying the gaps in the research ecosystems and addressing them. The results of this study will also help the primary care physicians in evaluating the gaps and focusing on new dimensions of research particularly in the rural and inaccessible regions of the country. To the best of our knowledge, there are no data on the quantification of the health research outputs or changing trends of the health research priorities among the EAG states such as Odisha, India. In this study, we aim to describe the recent trends, quantity, type, focus, and sources of health-related research in the state of Odisha, India, between 2011 and 2020.[6-10]

Material and Methods

This is a prospectively registered bibliometric analysis of published literature from the state of Odisha. A comprehensive systematic search was performed on January 1, 2021, in the following electronic databases: Medline (via PubMed), Embase (via Ovid), PsycINFO (via Ovid), and CINAHL (via EBSCOHost). The databases were searched for those studies that had a mention of the name of the state and its variations as well as the name of all the districts and major cities in the state within their abstracts and titles. The detailed search strategy is provided in Appendix 1.

Following de-duplication, the articles were screened using the Rayyan software by two independent review authors based on their titles/abstracts.[11] We included peer-reviewed published original research articles which were related to human health published between January 1, 2011 and December 31, 2020, and where the study population was the residents of Odisha, or the study site was in Odisha, exclusively or partially. We excluded studies from the field of environmental science, physical science, botany or veterinary science, laboratory, biological or chemical research not related to human health directly. We also excluded conference abstracts or presentations, protocols, books/book chapters, preprints, reviews—narrative or systematic, letters/news articles/opinions/commentaries, and studies carried out at the national level with none of the objectives involving the state or population of Odisha in full or in part.

The discrepancies were discussed and resolved by consensus. In case of a disagreement, a third author made the decision. Full texts were retrieved and reviewed for eligibility subsequently. The full-text review followed the same method as the title/abstract screening in case of disagreement.

Through an iterative process, a predefined data extraction sheet was developed to capture all relevant aspects of the included studies. The publication characteristics were tabulated, including the title, journal name, open access, date of publication, number of authors, designation of the authors—classified as junior faculty (assistant professor)/senior faculty (associate professor and above) resident/scientist/others, number of institutes involved, and name of the institute of the first author. The details of the study setting, study site, ethical clearance, and funding source were collected.

The studies were further classified as per their study domains using the International Classification of Diseases and Related Health Problems (ICD-11) framework.[12] Similarly, a study design was classified as per the SAGE Research methods framework.[13] The descriptive statistics and cross-tabulations were performed using the R software ver. 4.0.3.[14] The frequencies were used to describe the outputs over time, institutes, authors, study types/setting/funding, and examine outputs in different disease domains over time, the geographical distribution of studies/institutions, and collaborations. The retrieved literature was exported to the VOS viewer program to create network visualization maps.[15] As this was a secondary data analysis from the resource material available in the public domain, an ethical clearance was not deemed necessary.

Results

The study identified 2,285 articles in total from database searches and finally included 666 articles after screening for the bibliometric analysis as shown in Figure 1.
Most of the manuscripts had between three and six authors (43.5%) while 28.0% of the manuscripts had either two or three authors and 22.6% of the articles had between 6 and 15 authors. Only 3.3% of the manuscripts had a single author and 2.4% had more than 15 authors. Two institutes from the state, ICMR-RMRC and KIIT, together contributed to over 22.4% of the published manuscripts as lead authors. The contribution of the other institutes was lesser as shown in Figure 2.

While 45.9% of the studies were community-based, 45.3% were in hospitals, and 2.1% were in both these settings. The rest were primarily laboratory-based studies. The overall quantity of research publications per year increased steadily from 22 in 2011 to 99 in 2020. While most of the published work was on infectious diseases, the proportion came down with time between 2011 and 2020. The domain-specific trends with time are provided in Figure 3. An overwhelming majority of the studies were observational and less than 10% were experimental in design. Table 1 shows the distribution of the study designs.

Most of the studies were carried out in the central districts (43.2%), followed by the southern districts (10.3%) and northern districts (9.5%). While 24.5% of the studies were across the regions of the state, 12.5% were between multiple states.

Among the 213 articles, which had declared their sources of funding, most were funded by foreign entities (42.2%). The Indian Council of Medical Research (ICMR)-funded research was 22.1% and the Department of Biotechnology (DBT)/Department of Science and Technology (DST)-funded 7.0% of the studies. The declarations on ethical clearance and funding details are provided in Table 2.

There was a significant clustering of the major groups of authors with little collaborations between the groups as shown in Figure 4. The changing trend of the author–groups collaborations is shown in Figure 5.

**Discussion**

This comprehensive bibliometric analysis was carried out to describe the state of health research in the state of Odisha between 2011 and 2020. To the best of our knowledge, this study is the first such study that evaluates the trend of published health research from the region.

The quantity of published health literature from the state of Odisha has witnessed a significant and steady increase from 2011 to 2020 with the maximum number of articles published in 2019. The annual publications were relatively stagnant at less than 50
per year in the decade preceding the study period, however, this has more than doubled over the past decade.\textsuperscript{[2]} But, the overall output in terms of quantity is still very low when compared to the rest of the country and is comparable to other EAG states such as Bihar.\textsuperscript{[2,16]} This increase in the research output may be attributed to multiple factors. For example, this rise in the number of publications can be attributed mostly to the increased number of public health academic institutions, increased funding sources, and newer regulatory guidelines reinforcing academic research as a stringent criterion for faculty promotions.

This increase in the number of publications is associated with a change in the focus areas of health research in the state. Over time, research into social, environmental, and other determinants of health has increased in proportion. While most of the articles between 2011 and 2020 were related to the infectious disease domain, there is a gradual increase in research into diseases of the blood or blood-forming organs, endocrine system, nutritional or metabolic diseases, mental health, behavioral or neurodevelopmental disorders, etc. Similar diversification is a feature of the changing trends of focus areas for health research across India over the past decade.\textsuperscript{[3]} With an increase in the burden of non-communicable diseases commensurate with a decrease in the burden of infectious and maternal/child health issues, the priorities of both the health systems and health research in India seem to be changing in the twenty-first century.

Nearly two-thirds of the studies were cross-sectional by design. Case-control studies, cohort studies, and experimental studies were a few and far between in number. The proportion of clinical trials in health research in India remains very low.\textsuperscript{[3]} This is possibly due to the high resources necessary for carrying out longitudinal and experimental studies. This also highlights a major gap in the methodological diversity of health research in the state and needs further evaluation of the causes, the necessary capacity-building, and support systems available for the experimental and longitudinal studies.\textsuperscript{[17-19]}

We observed an almost equal number of community-based studies and hospital-based studies during the decade. While more than two-thirds of the publications comprised of more than three authors, the collaboration between the authors was limited to a few groups from specific institutions and the collaboration between these groups was scarce. This possibly implies the lack of interdisciplinary collaborations and multicentric studies. Strong professional networking and working groups on specific topics of common interest would be useful in improving the collaborative research and increase the chances of funding.

More than two-fifths of the publications were based on funding from outside India. This is significant from two viewpoints: the quality of proposals and research questions seem to be good enough to get funding from organizations outside India, and on the other hand, this also shows a possible lack of access to domestic funding, and therefore, an over-dependence on foreign

| Study design          | Study population | Total |
|-----------------------|------------------|-------|
|                       | Urban            | Rural | Both  | Others |       |
| Case study            | 10 (4.9%)        | 9 (4.4%) | 5 (2.5%) | 5 (8.9%) | 29 (4.4%) |
| Case series           | 7 (3.4%)         | 0 (0.0%) | 6 (3.0%) | 0 (0.0%) | 13 (2.0%) |
| Ecological study      | 0 (0.0%)         | 0 (0.0%) | 1 (0.5%) | 2 (3.6%) | 3 (0.5%) |
| Qualitative study     | 4 (2.0%)         | 28 (13.7%) | 10 (5.0%) | 4 (7.1%) | 46 (6.9%) |
| Cross-sectional       | 145 (71.1%)      | 115 (56.4%) | 149 (73.8%) | 38 (67.9%) | 447 (67.1%) |
| Case-control          | 12 (5.9%)        | 3 (1.5%) | 11 (5.4%) | 1 (1.8%) | 27 (4.1%) |
| Cohort                | 10 (4.9%)        | 16 (7.8%) | 15 (7.4%) | 1 (1.8%) | 42 (6.3%) |
| Quasi experimental    | 4 (2.0%)         | 4 (2.0%) | 0 (0.0%) | 3 (5.4%) | 11 (1.7%) |
| Cluster/Community trials | 2 (1.0%)    | 16 (7.8%) | 3 (1.5%) | 0 (0.0%) | 21 (3.2%) |
| RCT                   | 10 (4.9%)        | 13 (6.4%) | 2 (1.0%) | 2 (3.6%) | 27 (4.1%) |
| Total                 | 204 (100.0%)     | 204 (100.0%) | 202 (100.0%) | 56 (100.0%) | 666 (100.0%) |
funds for research. This counters the need of setting research priorities from within and calls for an increase in local investments in health research. The quality of research in India needs to be included in health policy decisions and capacity-strengthening by building research institutions of international standards, especially in resource-poor states such as Odisha, and would be a step in the right direction.\[20\]

Evidence from the published body of literature from the state of Odisha helps to understand the trends and priorities of the researchers and is necessary for calibrating the health research needs of the region. This likewise furnishes us with the knowledge on how the trend of exploration has moved its focus from one research domain to another. This information eventually serves as a foundation for generating better evidence, focusing resources, and overall improved evidence-based policy and practice.\[21\] Lastly, it also helps us to identify the gaps in the disease and health system knowledge which can shape the future research agenda in the region. The bibliometric analysis provides a panoramic view for communicating the essential findings to the researchers and policymakers, particularly those involved in decision-making in public health. This study also helps in identifying the subfields of health research which will foster transdisciplinary collaborations for a better contribution to the overall healthcare sector.

The strengths of the study include an exhaustive search in multiple databases with a detailed, explicit, and replicable methodology. A major limitation of our study, as with most bibliometric analyses, is that the quality of publications could not be ascertained. The study included only journal articles in English, which is the major language for scientific communication in India and is used almost exclusively in the health literature. Health research is a broad and multifaceted topic and although

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### Table 2: Declarations made in the manuscripts in Odisha between 2011 and 2020

| Declaration                  | Declared (%) | Not Declared (%) |
|------------------------------|--------------|------------------|
| Ethical clearance            | 424 (63.7%)  | 242 (36.3%)      |
| Funding status               | 331 (49.7%)  | 335 (50.3%)      |
| Sources of funding           | 213 (64.3%)  | 118 (35.7%)      |

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**Figure 4:** Major contributors to published papers (diameter of the circles) groups of authors (colors) and the networks for collaborations (lines)

**Figure 5:** Changing trends of author collaborations between 2011-2020
our search strategy was broad, we possibly could have missed the tangential topics of interest and acknowledge this limitation. Similarly, a significant proportion of literature from non-indexed journals and gray literature have not been analyzed.

**Conclusions**

This bibliometric analysis analyses publications from 2011 to 2020 showing a substantial increase in the number of publications in this decade. This detailed analysis identifies the research gaps and helps in generating evidence for future policy implications. Further in-depth analysis within individual domains will help in identifying the critical areas for improvement and strengthening the health system in Odisha. Priority setting of healthcare problems, increased funding, and capacity-building can give a much-necessitated impetus to more quality- and evidence-based research for aiding policy implementation and improvement of the overall health of Odisha.

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**Conflicts of interest**

There are no conflicts of interest.

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