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Review Article

Public Health Section

Analysis of Quantity and Quality of Medical Research in India: A Narrative Review

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ABSTRACT

The research output and quality from Low and Middle-Income Countries (LMICs) such as India grades lower than high-income countries. 12th five-year, planning document, also cited that "health research in India has yet to make a major impact" on public health. The recent report of the Parliamentary Standing Committee on Health, has described the state of medical colleges as "rotten". This review presents an overview of quantity and quality of medical research in India; identifies poor performance of medical research in overall rankings, international collaborations, indexation and impact factor. Good quality research is imperative to produce indigenous and original data to address public health problems within the country.

Keywords: Predatory journals, Public health research, Quality data, Research output

INTRODUCTION

Research (FRENCH recherché) means to search closely. Medical research in country has evolved over the years to improve health care. In India, life expectancy has doubled since independence due to significant research in health [1]. Public health research has gained increasing importance in India's national health policy for universalizing health care [2,3]. But unfortunately, the research output and quality from LMICs such as India grades lower than high-income countries [3,4]. The national health policy underlines the need for strengthening of research in country [5,6]. With escalating burden of non-communicable diseases in country, indigenous data is essential for policy and planning of health programs. A 12th five-year, plan document, also cited that "health research in India has yet to make a major impact" on public health. The recent report of the Parliamentary Standing Committee on Health, has described the state of medical colleges as "rotten" [7]. In the words of Soumya Swaminathan, former director of the Indian Council for Medical Research (ICMR), 'only a few medical colleges in the country encourage and promote the culture of research and we need to ensure that in the coming years, many more medical colleges and faculty get involved in research'.

Factors for this state include, poor research environment, poor infrastructure, lack of education and training, poor functioning of ethical committees, array of illegal trials occurring in country, limited resources and role models. Poor expenditure plays an important role, according to a study on Asian countries; there is a positive correlation between the country's expenditure on research and of scientific indexed journals [8]. With this backdrop, present paper will review current status of medical research in India. A comprehensive search of literature was undertaken using keywords "medical research" or "health research" and "Quantity" or/and "Quality" and "India" through search engines like PubMed and Google scholar. All types of papers were reviewed like original research studies, review articles, Editorials, Commentaries from 1990 to 2019. Both full texted and abstracts were included. Relevant publications from references of all articles were further searched. All the listed articles and abstracts were downloaded and reviewed in detail. From the articles, various domains were selected and presented as quantity and quality parameter.

Research Output, Global Ranking, Researchers Ratio

A bibliometric analysis by an Elsevier publications found that India's major contribution to the scientific world has been in the field of chemistry (38 per cent) while input from health sciences (3.5 per cent) and medical specialties (4.3 per cent) was relatively low [9]. In context of quantity and quality of research, India ranked fifth in global research output whereas countries from North America, Europe and Pacific were leading, as stated in a joint study by Council of Scientific and Industrial Research-National Institute of Science Technology and Development Studies (CSIR-NISTADS) and Indian Institute of Science Education and Research (IISER) [10]. Another study on output of scientific papers, published in 2016 found that India ranked 10th in the world [11]. Among the productive countries, India scored 12th position with meager 1.6% share in the world research output [12]. An analysis of index medicus database (1998) showed that out of 41656 articles published, only 2974 (0.714%) was from India [13]. The global average for researchers per million populations in 2010 was 1023, while for India this number was 157 [14]. A recent national survey on the status of research and development in the country reported that the number of researchers per million population in India has more than doubled from 110 in 2000 to 218 in 2015 [15].

Many studies have confirmed that medical research is skewed in context that it is limited to some institutes and hospitals. A report (2002) by ICMR found that out of 156 medical colleges, 27 of them published no paper while 29 medical colleges published only one paper. Furthermore, only top eight institutes were contributing most in research placing country much behind China, Thailand and Philippines [16,17]. A study in 2007 showed that 96% of the research publications in India were from only nine medical colleges [18]. Ray S et al., appraised the research output from 579 medical colleges and hospitals in India. Their study revealed that only 25 (4.3%) of the institutions produced more than 100 papers a year with AIIMS in New Delhi at the top (11,377 publications) followed by the PGIMER in Chandigarh (8145 publications). Around 40% of total publications were from the top ten institutes. An analysis found that 57.3% of medical colleges did not publish a single paper in the period between 2005 and 2014. States with the most private medical colleges performed the worst. These findings concluded that medical research output from institutes in India is dismal [18-20].

Likewise, a research on 6000 publications found that maximum number of research publications were from AIIMS (New Delhi), PGIMER (Chandigarh), CMC (Vellore), SGPGI (Lucknow), Banaras University and Tata Memorial Cancer Centre (Mumbai) [13]. Similarly, a study showed that only 10% of Indian medical colleges contributed to research regularly [21]. The ICMR provide grants for research projects in medical colleges; analysis of publications from these funded projects showed that most projects did not resulted in any publications and only 10% of publications were in indexed journals [22].

Public Health Research Output

An analysis of PubMed database (1988-2008) showed that the proportion of published papers from India increased from 0·4% to 1.8 percent of the total global output. However, the proportion of public health research output was just 5 percent of the total health research published and only one in four public health research reports were of adequate quality [23]. A study of 4876 health papers from India (2002) showed that 95.5% of papers were from basic and clinical fields; contribution from public health sciences was only 4.5%. Exploration of 4495 original papers revealed that only 3.3% were from public health domain. Studies on non-communicable diseases (62% of total) accounted for most quality-adjusted original research output followed by cardiovascular diseases (3.6%) and injuries (0.7%). 75.6% of the quality-adjusted output was from cities with 6% of the population of country [24]. An analysis of studies from 2014 to 2016 for quality assurance of data in public health research, it was found that only 5.5% of publications have mentioned about data quality assurance [25].

Many reports have highlighted the need for more public health research both in India as well as in other developing countries [26-28]. With 18% of the global population and disproportionate amount of the global burden of disease in India, it was favourable that public health research has increased over the period of time. But this increase is far below the other middle-income countries such as South Africa, Mexico and Brazil [29-31].

Public health research in India has not yet recognised much with striking inequities and requires strategic planning, investment, and resource support to universalise health care [28,32,33]. The ICMR has faced criticism that the medical research it supports does not adequately address public health problems (nature medicine 2013) [34]. It is matter of great concern that one report of the Parliamentary Standing Committee found no actual application of any medical research done under ICMR.

Clinical Trials

With booming Indian pharmaceutical industry and diverse population, India is a fertile bed for clinical research. Nevertheless, with 16 percent of the world's population and 20% of the global disease burden, it has less than 2 percent of Clinical Trials registered worldwide [35]. A Study published in 2015 observed a substantial drop in number of clinical trials since 2009-2010. This has been associated with reports of ethical misconducts, activist protests, and departure of international collaborators. Influencing and funding by pharmaceutical industry lobby in research for the market benefits is another important concern in clinical trials [36]. Then, clinical research is not a well-recognised career option in Indian health care sector and there are deficiency of government-accredited clinical-research training institutions, biostatisticians, and epidemiologists. For introduction of new and relevant therapeutics, there is requisite for clinical research centers to set standards of excellence for education and training [35,37,38]. In background of declining clinical trials and ethical misconducts in India, the Ministry of Health and Family Welfare (MoHFW), Government of India presented the New Drugs and Clinical Trials Rules on March 2019. These are set to increase trials and approval of new drugs and include reviewing, approval and monitoring by ethical committees registered with the CDSCO. The revised rules have some flaws like; no clear guidelines for waivers and consideration of ethnic factors, lack in transparency and rights of participants [39].

IEC Guidelines, Research Designs and Statistical Methods

A recent survey by ICMR showed that only 40 of 179 Institutional Ethical Committees (IEC) follow prescribed guidelines in research [40]. A bibliometric analysis of studies done by medical students (MBBS) showed that 87 percent of articles were cross-sectional descriptive based while 13 percent were interventional. Moreover, majority of these articles were published in local journal with very low impact factor [41]. Randomised clinical trials are done infrequently; those published have lot of methodological errors [42]. A systematic review found that studies, which have positive or statistically significant findings of their data, are more favoured for publications and reporting bias for significant results is present is such studies. Registration of randomised trials and their results has somewhat addressed this issue [43].

A study on research designs and statistical methods in Indian medical journals found that in period between 2003 and 2013, the reduction in errors in statistical analyses was not considerable (25% in 2003 compared to 22.6% in 2013) but errors in the study designs have decreased significantly. Another analysis of 46 clinical trials observed that majority of papers had errors in the interpretation of results, with over dependency on p-value <0.05 [44]. Few other studies on similar issue also highlighted errors in use statistical parameters and interpretations [45-47]. One issue while writing results in thesis and research papers is obsession with p-value. Researchers and readers must realise its importance and interpretation. An article in 'The New England Journal of Medicine' (July 2019) mentions that p-values are used overtly in medical research and misinterpreted. The American Statistical Association (ASA), published recently that p-values have strengths and inherent weaknesses [48]. With reference to good research question, biological plausibility, sound study design and conduct, effect sizes and confidence intervals should be preferred in analysis of data [49].

Impact Factor of Indian Journals

Eugene Garfield and Irving H. Sher developed a parameter called the impact factor for selection of journals according to Science Citation Index (SCI). In terms of impact factors and Citations Per Article (CPA), studies provide poor picture. In 1999, a study on Indian journals found that only 47 journals were included in International Scientific Indexing (ISI's) list and impact factors of all these selected journals was less than 0.6 [50]. PubMed database (2002) analysis of 5000 health papers found that due to very low impact factors, Indian journals contributed for only 1.5% of the total impact factor of all health papers [24]. An analysis (2006-2010) by Elsevier research group found that India's average CPA was 2.71, which has improved from 2.0 to 2.71 in the five years. In the same study, average CPA of China and United States' was 2.21 and 6.45 respectively [9]. Another study showed that >90% of the publications in the leading medical institutes of country, have less than 25 citations and <0.5% have more than 100 citations [51].

A committee on evaluation (2014) of publications of the ICMR reported that impact factor of 2.86 for 2800 research papers and 3.38 for more than 1100 publications from extramural research [52]. A comparative analysis of some countries found that, the average Impact Factor of articles from India (2.97) was higher than that of articles from china (2.82), Taiwan (2.77) and Japan (2.71) and this finding was significant. Then the average number of citations of each article from China, Taiwan, Japan and India was 4.4, 3.9, 3.7, and 3.0, respectively. Researchers from China, Taiwan, Japan published 153 (26.9%), 111 (19.5%), 216 (38.0%) articles respectively in 10 high-impact health care sciences and services journals, while Indian researchers published 89 articles (15.6%) [53].

Indexing and Predatory Journals

For evaluation of quality of published papers, global Indexing and abstracting is an accepted parameter internationally. A study found that share of Indian journals in Pubmed database covering around 5500 journals and Embase database of Elsevier was 0.71% (39 journals) and 1.71% (128 journals) respectively [54]. Another database called 'Nature Index' developed by Nature Publishing Group in 2014 underlined that research output from India have shown steady growth since 2012 and that the country ranks 13th for its high-quality scientific publications [55].

In recent times, phenomenon called 'publish or perish' thrived after the obligatory requirement of publication of papers by MCI for promotion of higher posts in 2015 [56]. Publications guidelines including Index Copernicus as a standard indexing service have paved way to many predatory journals [57,58]. Publishers of predatory journals publish research of academicians without following any publishing guidelines and seek financial profits through Article Processing Charges (APC). In last few years, myriad of papers have been published in predatory journals and most of them are Indian journals [57,59]. An article in Indian Journal of Medical Ethics (2018) revealed that there are so many "referred" and "reputed" journals in India that are sub-standard and predatory, so much so that India is considered to be the world's capital for predatory journals [60]. Several other studies have also exposed that most articles published in poor-quality predatory open access journals were from India [61-64]. Moher D et al., (Nature, 2017) study on predatory journals showed similar findings from India regarding research in biomedicine and contributed to 27 per cent of the scientific studies in bogus publications [65]. A study by Demir S (2018) found that 62% of fake journals are published in India while for US contributed just less than 1 percent in fake journals [66].

International Collaborations

Quality of research was superior for the projects with collaborations between Indian and international organisations [23]. A report by Elsevier group revealed that worldwide publications with international co-authors are rising; it is declining for India, suggesting lack of collaboration [9]. A study of published research from PGIMER, Chandigarh also showed that collaboration is important for quality research. For all the published papers in PubMed database in the year 2011, only about 2.55% had the first author affiliation from India [67].

CONCLUSION(S)

This narrative review gives insight into quantity and quality of medial research in the country and it is summarised that the performance of medical research in India is not satisfactory with poor recognition on international forum. The MCI guidelines for academic promotions are unfavourable for quality research in medical institutions. Good quality research is imperative to produce indigenous and original data to address public health problems within country.

There is a need to strengthen research capacity in developing countries to equalise the "10/90" gap- that only 10% of all global health research funding is being allocated to 90% of the world's burden of preventable mortality. Developing a research culture scientific temperament, scholarship for research, extra incentives, art of medical writing, increasing capacity building of young health students/professionals in medical research for quality research is requisite for quality research.

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