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A DECADE'S WORTH OF INDIAN JOURNAL OF PHARMACOLOGY PUBLICATION TRENDS

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ABSTRACT

Scientific journals are a means for disseminating research to a large community of researchers. The proportion of peer-reviewed articles published in a certain area of research can provide interesting insights on research trends in that subject. We reviewed trends and publications in the Indian Journal of pharmacology (IJP) from 2010 to 2019. We examined the articles published in IJP. Descriptive statistical analysis was conducted as per requirement. Total number of articles published in IJP in the last decade was 1378. This study showed that most publications are done in the central nervous system, followed by the cardiovascular system. There has been a growing interest in prominent nervous system research in the last decade.

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1. INTRODUCTION

Over the last seven decades, there have been remarkable developments in pharmacology [1]. The evolution of modern pharmacology commenced from the extraction of pure molecules and preclinical and clinical development to the present era of biotechnological products. It has led to the division of pharmacology into different sub-specialities. The critical trends in the publication patterns during this evolutionary process in pharmacology research need to be evaluated. The evidence-based medicine (EBM) is based on recent preeminent evidence from the scientific publications and experience of health care providers. The evidence from randomized controlled trials, systematic reviews, and meta-analysis studies is at the highest in the evidence pyramid [2].

Publications in the Indian Journal of Pharmacology (IJP) reflect modern pharmacology practices. IJP publications depict the trends in quantity (proportions), quality, type (preclinical/clinical), thrust areas, etc., of pharmacology followed by healthcare professionals nationally and internationally. The teaching and research institutes from medical and pharmacy streams have followed identical pharmacology research principles in their contribution to IJP [3]. Evaluating publishing trends in scientific journals is one means of comprehending the progress of a subject and identifying potential gaps in particular research areas. Therefore, this study evaluated the publication trends on various sub-speciality topics in the IJP.

Scientific publications are a platform to disseminate scientific discovery and newer knowledge. They are the reflection of the research and education on the subject. They can be considered as a scale of achievement and assured academic standard. In a broader sense, these publications serve as a critical indicator that provides information on individual skills, the orientation of the involved research team, organizational resources and their contributing factors, focus areas of interest and scope of development [4].

New advancements and computer-assisted learning need to be incorporated into our subject/field [3]. Different countries are progressing at different paces in the healthcare field, as reflected in the publication trends. A publication trend study indicates a significant increase in the annual number and percentage of scientific publications in orthopaedics journals in China. Still, a huge gap exists between the USA and Japan regarding quantity and quality [5]. Several researchers have studied the trends of publications in different fields [6]. However, similar data on publication trends in Pharmacology is inadequate. Indian Journal of Pharmacology has a wide readership base with no particular inclination towards any one speciality of pharmacology. As expected, the highest readers are from India, followed by the USA, Egypt, the United Kingdom and China [7]. We postulated that all subspecialties of pharmacology should have a comparable share in the publication in the IJP during the last decade. This paper attempts to review recent trends in publication types in IJP. It is not an assessment of journal articles' quality but a quantitative look at recent publication trends in IJP. The insights derived from this study would provide an idea regarding the distribution of studies published across various sub-specialities.

2. METHOD

This was a cross-sectional study to evaluate the publication trends in the IJP over the last decade. The IJP website was accessed between October 2019 and March 2020. All issues online over the previous ten years (2010 to 2019) were included. Both authors independently reviewed the contents of each issue and classified the articles under different categories. They were classified as Original article, Review article, Letter to the editor, Book review, Case study, and Short communication. The original articles were further sub-classified as Experimental Pharmacology, Molecular Pharmacology, Clinical pharmacology, Pharmacoeconomics and Pharmacogenetics. The Clinical pharmacology papers were further divided into interventional and observational studies. Editorials were excluded from this study.

The number/frequency of publications by different pharmacy institutes was counted issue-wise, and its percentage of total publications issue-wise and year-wise was calculated. Articles were categorized as editorial, educational forum, research article and review article, letter to the editor, drug watch, short communication, and book review. Research articles were further classified as preclinical (animal studies) or clinical (human). Preclinical research was further categorized based on the investigational product, whether a plant product/extract or chemical/synthetic product. The articles were also categorized based on the therapy area involved in the research: Gastrointestinal, Endocrine, Excretory system, Skin, Musculoskeletal (including analgesics), Reproductive system, Anti-cancer, Respiratory system, Antimicrobial and vaccine.

Further, the articles were categorized based on Teaching methodology, Drug interaction, ADR, Pharmacy related topics. The articles were also categorized depending on whether a plant product/extract or chemical/synthetic product was studied. To avoid discrepancies, the authors simultaneously evaluated the documents and recorded the publication category by consensus. If there was a difference of opinion between the two authors, the article was classified after consulting senior faculty. The number/frequency of publications by afore-mentioned subspecialties was counted in each issue. Their percentage of total publications regarding the issue and year was calculated. Descriptive statistical analysis was carried out on the collected data of different parameters. The results focus mostly on a graphical representation of the data rather than statistical calculations. Microsoft Excel 2007 was used to draw graphics and to analyze yearly quantitative distributions of different articles.

3. RESULTS

The total number of articles published in the Indian Journal of pharmacology in the last ten years was 1378. The types of articles were: original research articles 675 (48.98%), Letter to editor (173 (12.55%), Short Communication (133(9.65%), Adverse drug reactions 1319.65%), (Review articles 122(8.85%), and book reviews 21 (1.52%). The maximum and minimum articles were published in 2011 and 2018, respectively. The change in publication trend from 2010 to 2019 is depicted in figure 1. The average number of original research articles published per year was 56. The maximum and the minimum number of original research articles were published in 2012 (100 articles) and 2019 (29 articles), respectively. The maximum and the minimum number of review articles were published in 2015 (28 articles) and 2010 (2), respectively.

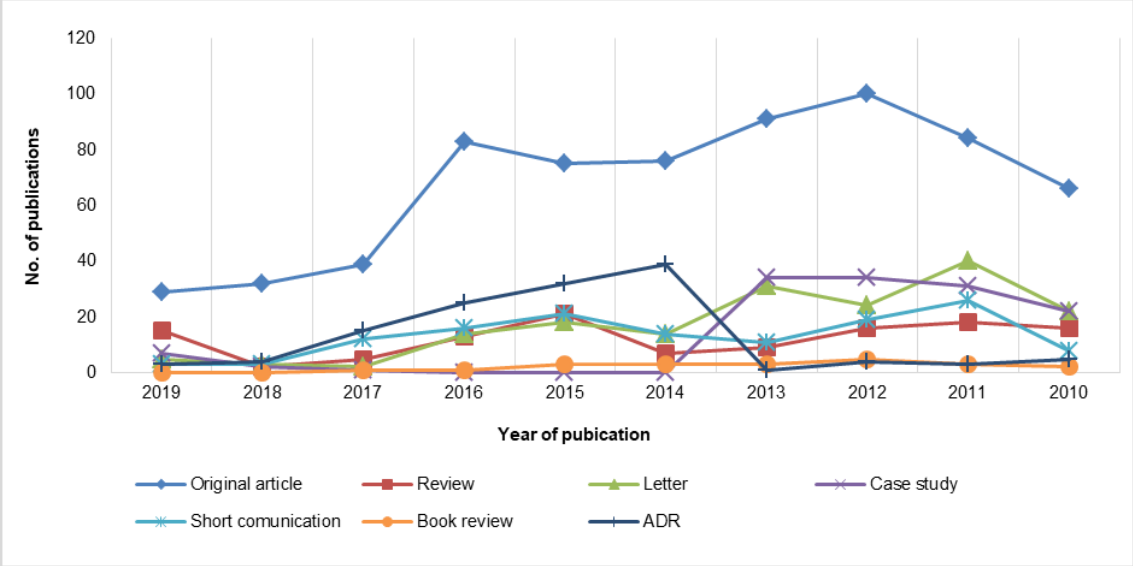

Figure 1: The change in publication trend based on type of article from 2010 to 21019

When the original articles were sub-categorized based on the type of study, it was revealed that there was the highest number of articles on experimental pharmacology 406 (60.14%), followed by Clinical pharmacology 148 (21.92%), molecular pharmacology 73 (10.81%), teaching methodology 20 (2.96%), pharmacoeconomics 15 (2.22%) and pharmacogenetics 13 (1.92%). The articles when categorized based on the systemic therapy: Central nervous system (CNS) 150 (22.22%), cardiovascular system (CVS) 112 (16.59%)Gastrointestinal 68 (9.94%), Endocrine 64 (9.36%), Excretory system 46 (6.73%), Skin 45 (6.58%), Musculoskeletal 41 (5.99%), Reproductive system 28 (4.09%), Anti-cancer 27 (3.95%), Respiratory system 20(2.95) Antimicrobial 15 (2.19%) and vaccine 5 (0.73%). The change in publication trends in different systems from 2010 to 2019 has been illustrated in Figure 2. Among original research articles, 218 (32.29%) research manuscripts studied in vitro, in vivo screening of phytochemical constituents of indigenous plant extracts or formulations for their pharmacological activity and 70 (10.37%) evaluated synthetic or small molecules for their clinical efficacy and safety or pharmacological activity in experimental studies.

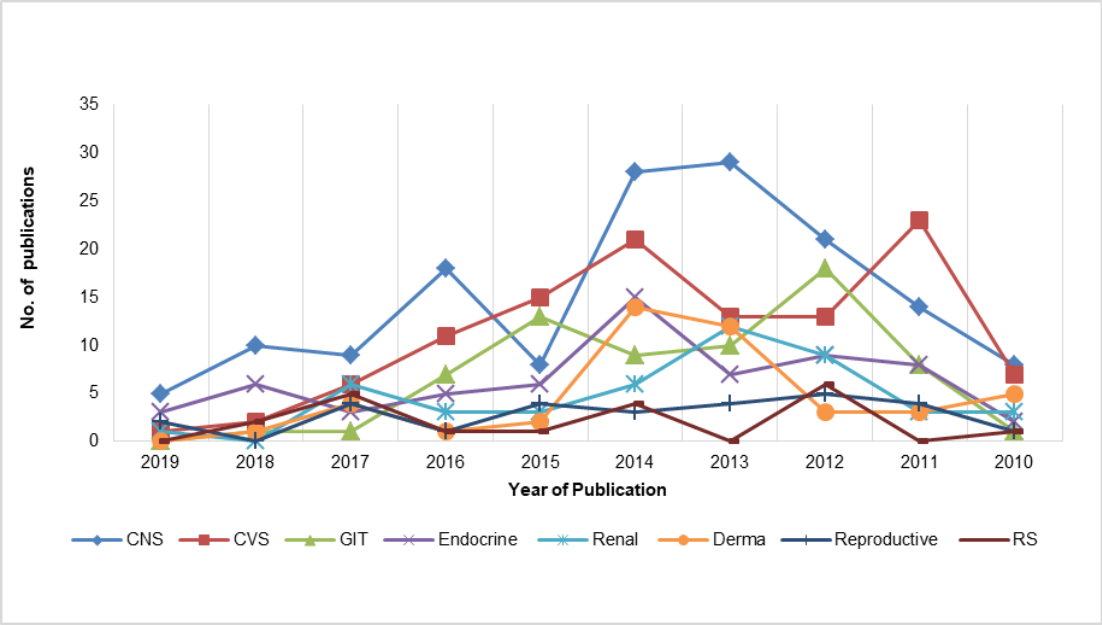

Figure 2: The change in publication trend based on different system wise from 2010 to 2019

A higher trend in the case study was seen between 2013 and 2010 in the range of 22 to 34 publications, which was reduced to zero between 2014 and 2016. Though it resumed in 2017, by 2019, its number remained at a slower pace in the range of 1 to 7 articles per year. The maximum number of short communication was published in 2011 (26 articles). In the last two years, the short communication publication have been significantly reduced to just three articles per year. The maximum number of book reviews was published in 2011 (5 articles). On average, about three book reviews were published from 2011 to 2017. However, the last two years' issues do not have any book reviews. A maximum number of articles, 39 on adverse drug reactions, were published in 2015. Between 2010 to 2014, about 1 to 5 articles and between 2015 to 2018, around 15 to 39 articles were published. There was a dip in 2019, wherein only five articles were published. The articles published on drug-drug interaction, teaching methodology, pharmacy-related, and miscellaneous topics were 1.3%, 1.67%, 0.67% and 1.0%, respectively.

4. DISCUSSION

Scientific writing and publication results from research indicate the comprehensiveness of the research carried out. It is peer-reviewed and accepted by the scientific body [8]. Publication is a critical channel for disseminating scientific research work as it helps communicate novel insights and knowledge. It also is a pathway of fulfilling specific job necessities by employers, professional accreditation in the form of continuing medical education, promotion to an academic position, and enhancing the prospect of success in the research grant application [8]. The trends in the publication have some relation to the criteria decided by the regulatory body, but its various features depict the pure academic interests of the authors. Pharmacology has beheld implausible advancement over the last seven decades. Its scope has evolved to such an extent that it has led to the subdivision of the subject into various sub-specialities. Similarly, the research and publication trends have evolved to a large extent. We can comprehend the varying interest in the research. The development and growth of speciality can be assessed by the publication trends in a particular subject. Investigating publishing trends in reputed journals is an essential tool for understanding the progress path of a speciality [6].

In the past, Chetna Desai and B. Dinesh Kumar have evaluated the temporal trends of pharmacology publications in IJP by pharmacy institutes. However, there was a lack of knowledge on the overall trends [1]. Hence, we conducted a descriptive analysis to understand the evolution of research and publications in pharmacology by evaluating the publication trends in the Indian Journal of Pharmacology (IJP) over the last decade. Over five decades Indian Pharmacological Society has published IJP (ISSN 0253–7613) as an official peer-reviewed publication with open access in the biomedical speciality periodical [9]. The first issue of the journal came out in 1969, and it has continued its publication. IJP publishes original research articles, reviews, research letters and correspondences. Publications in IJP are from the biomedical fraternity involving pharmacological aspects. Researchers from the medical and pharmacy healthcare profession contribute their scientific manuscripts to IJP.

This study revealed 1378 articles published in IJP over the last ten years. As expected, the most common type of papers (48.98%) were original research articles. An original research paper is based on original research that produces newer insights, which can be obtained from observations and experiments [10]. There are several limitations to having a good quality original research article, such as inadequate expertise, minimal funds to conduct medical research, and shortage of time. In recent years, most researchers have performed small studies, such as questionnaire-based surveys in one institution or retrospective clinical data analyses of one or more departments or institutes. At times, clinicians try to get an audit of a technology or Knowledge, Attitude and Practice Surveys published as an original article. In the absence of clearly defined criteria for the categories of research, authors demand that their research be treated as original because it is the requirement for faculty promotion [10].

In this study, there were 12.55% of letters to the editor. The letter to the editor plays a dual role in the literature. It serves a critical corrective function but also can spread and share knowledge [11]. The percentage of short communication in this study was 9.65%. A short communication article involves a novel and original scientific study without discussion and, consequently, a conclusion. It is generally something novel and of scientific relevance addressing some knowledge gap or unmet need but with many uncertainties (unknown pharmacological mechanism of action). The maximum number of short communication was published in 2011 (26 articles). In the last two-year, the short communication publication have been significantly reduced to just three articles per year. A book review is a form of genuine critical description of a book analyzed based on content, style, and merit. It may serve as an opinion, summary or scholarly insight regarding the book and can potentially be an influential literary form [12]. We found that 1.52% of articles published in IJP were book reviews. The maximum number of book reviews was published in 2011 (5 articles). On average, about three book reviews were published from 2011 to 2017. However, in the last two years, no book reviews have been published. The process of publishing a successful scholarly book review requires the reviewer to appreciate the

book review publication process and to be aware of the skills and strategies involved in writing a successful review [13].

There are substantial differences between countries in drug prescribing. Many published research papers on therapeutic agents deal with adverse drug reactions. In our study, 9.65% of articles were published on adverse drug reactions, including pharmacovigilance. Ferner and Aronson reported that their study included 10.8% of ADR articles in the adverse effects subcategory [14]. The substantial differences between countries are not explained by population- the economic variation, overall publication rate on therapeutic agents, or the presence of large indigenous pharmaceutical companies. Many local cultural factors influence the ratio of papers on adverse reactions to all drug effects. Improving their recognition and reporting through international efforts may be difficult.

The maximum and the minimum number of original research articles were published in 2012 (100 articles) and 2019 (29 articles). This could be because of increasingly stringent criteria applied during peer review and a high rejection rate. Peer review is the most critical step in the selection processes of any scientific work for publication in medical and all other science journals. It helps to grant allocations, academic promotion and prize distribution [15]. Every article submitted for publication in a particular journal must undergo a peer-review process per the ethical and established criteria [16].

Generally, a review article is a form of publication that analyze or discuss research previously published by others instead of reporting original new experimental results. An expert's opinion is valuable, but an expert's literature assessment can be more valuable. As readers may miss features that are apparent to an expert clinician-researcher, the review article provides the expert's explanation and assessment of the validity and applicability of individual studies. Our study revealed the publication of 8.85% of review articles in IJP. There was a surge in the published review articles in 2015 (28 articles), but again, it showed a decreasing trend by 2010.

The original articles were sub-categorized based on the type of study. The highest number of articles dealt with experimental pharmacology, 60.14%. Most pharmacology departments have well-established animal house facilities supporting experimental pharmacology work. Moreover, experimental pharmacology is an integral part of the drug development process. An increasing trend with 21.92% of clinical pharmacology articles was observed. Clinical pharmacology includes drug efficacy and safety studies, rational prescribing, clinical trials of drugs, ADR monitoring, pharmacokinetics, pharmacodynamics, toxicity, drug interactions, prescribing, and pharmacotherapeutics [17]. However, the number of publications is relatively low compared to the experimental studies. Clinical pharmacology research could be enhanced by collaborative studies with clinical subjects, public health or the pharma industry by the pharmacology department. Maximum number of articles (n= 39) on adverse drug reactions were published in 2015. Between 2010 to 2014, about 1 to 5 articles and between 2015 to 2018, around 15 to 39 articles were published. There was a dip in 2019, wherein only five articles were published.

Pharmacology deals with an interplay between organisms and molecular mechanisms of drugs. It plays a translational role in modern medicine, bridging basic research and clinical application. Molecular research has led to discovering of many potential drug targets and biomarkers. These have made a significant contribution to the overall advancement of pharmacological sciences [18]. In this study, we found 10.81% of molecular pharmacology publications, which indicates a huge gap in this area of research in India.

The original articles were subcategorized based on the system studied. The frequency of organ systems studied in the descending order were central nervous system (CNS) > gastrointestinal system (GIT) > Endocrine > Excretory system > Skin > Musculoskeletal > Reproductive system > Cancer > Respiratory system > Antimicrobial > vaccine. The maximum percentage of articles were published on CNS (22.22%). The highest number of publications in CNS is supported by many established animal models for evaluating drug action in experimental studies. The traditional ways of teaching pharmacology can become monotonous and lose the active participation of the students. Pharmacology teaching needs modifications and experimentation to maintain the pace with advances in the subject and information overload [19]. Several research studies describe various teaching-learning techniques- evaluation and their impact. In IJP, 2.96% of articles were based on education methodologies.

Pharmacoeconomics is the scientific discipline that compares the cost-benefits of two different drug therapies [20]. The number of pharmacoeconomics publications is increasing rapidly worldwide. Several studies have examined trends in pharmacoeconomics publications regarding publication numbers, journal placement, and the authors and universities involved in the research [21, 22]. IJP had 2.22 % publications on pharmacoeconomics during our assessment. The number of pharmacogenomics publications was 1.92%. Pharmacogenomics refers to the scientific discipline that includes all disease areas of interest and spans from in vitro studies to clinical trials while focusing on the relationships between genes and drugs and the resulting phenotypes [23].

Among 32.29% of original research articles in IJP, research manuscripts studied in vitro, in vivo screening of phytochemical constituents of indigenous plant extracts or formulations for its pharmacological activity. Only 10.37% of these manuscripts evaluated synthetic or small molecules for their clinical efficacy and safety or pharmacological activity in experimental studies. Most synthetic or small molecule studies are carried out on the clinical subjects as sponsored clinical trials.

In medical sciences, case reports are common methods of disseminating events or efforts in managing individual patients with previously unreported characteristics. As a qualitative methodology, case study research includes more excessive complexity than a typical case report. Generally, it consists of multidisciplinary data combined in creative ways. The comprehensiveness of the case study description assists readers in comprehending the case and whether results might be applicable beyond that case scenario [24]. Higher trend of case study publication was seen between 2013 to 2010 in the range of 22 to 34 journals. With zero case study publication between 2014 and 2016, it has risen to 1 to 7 articles per year (2017 to 2019).

Our evaluation of IJP revealed a higher number (n=218, 32.29%) of original research articles based on in vitro, in vivo screening of phytochemical constituents of indigenous plant extracts or formulations for its pharmacological activity. Only 70 (10.37%) publications evaluated synthetic or small molecules' clinical efficacy and safety or pharmacological activity in experimental studies. The trend is related to the study budget and duration required for effective phytochemical research. The medicinal plants are potential resources for new drugs. Their pharmacological properties in a herbal formulation depend on phytochemical constituents. However, our data suggest that most phytochemical research is limited to screening activity in experimental studies and a very limited number of clinical studies.

The study findings reveal only 10.81% of IJP publications related to molecular and cellular pharmacology. There is huge potential for enhancing research in this area. As per present data, 92% of research by pharmacy institutes is preclinical, which is an integral part of the drug development process. Drug-drug and drug-dietary supplement interactions can cause adverse drug reactions (ADRs). It is estimated that 3 to 5% of ADRs requiring hospital admissions and emergency room visits are preventable [25]. The percentage of articles published on drug-drug interaction in IJP was relatively low (1.33%).

Interpreting the publication trends in this journal needs to be done with caution. The contributions to a particular journal may not reflect the global scenario in a particular field. Several factors determine the contribution of the researcher to a particular journal. These factors include the scope of research, marketing strategy of the publication house, citations, indexing, and impact factor of the journal. The publication fees and time lapse between submission to acceptance and actual publication also impact.

These study findings may not reflect the most comprehensive and accurate evaluation of trends in pharmacology research because of several limitations. Firstly, the operational definitions adopted by us were arbitrary. However, operational definitions that could be appropriate for literature searches are unavailable. Secondly, we collected articles from a single journal that may not reflect the overall trend in pharmacology research. In addition, the detailed content analysis of all the articles was beyond the scope of our study.

5. CONCLUSION

The transformation in publishing scientific research has been dramatic in the last decade. A rapid conceptual change is visible. The low trend of drug-drug interaction in publications needs to be improved. The area of research that has significant potential and needs a boost is the pharmacoeconomics and pharmacogenomics.

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ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee.

COMPETING INTEREST

The authors declare no conflict of interest.

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