Authorship Trends and Collaborative Research in Veterinary Sciences: A Bibliometric Study

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ABSTRACT: This study highlights the collaboration in research and authorship trend in the area of veterinary sciences all over the world with special reference to India. The study is based on the data collected from 'CABI abstracts" for the period of 2006-2010. The findings of the study revealed that collaborative research has been preferred by the scientists over that of solitary research. Average degree of collaboration was found 0.84, which also indicates dominance of collaborative research over solo research. Subject analysis showed a good research in the area of animal nutrition and veterinary physiology.

I. Introduction

In the present era of information explosion, research in science and technology is rapidly progressing not only in the area of pure sciences domain but also in applied sciences. Scientists are increasingly working in collaboration in order to gain their expertise in areas of their specialization. Today research has become interdisciplinary and scientists in one area have to collaborate with scientists in other areas in order to fulfill the goals of research as per objectives. They realize the necessity of collaboration in research to make it useful for human welfare.

The present study is a bibliometric analysis of authorship trends in the articles published in different journals and abstracted in CABI for the period of 2006-2010. Bibliometrics is the application of mathematics and statistics to documentation. According to the *ALA Glossary*, bibliometrics is the use of statistical methods in the analysis of a body of literature to reveal the historical development of subject fields and patterns of authorship, publication, and use. In other

words, it is a type of research method used in library and information science. It utilizes quantitative analysis and statistics to describe patterns of publication within a given field or body of literature. Researchers may use bibliometric methods of evaluation to determine the influence of a single writer or to describe the relationship between two or more writers or works.

Veterinary science helps human health through the monitoring and control of zoonotic disease **(**infectious disease**)** transmitted from animals to humans. It is a science pertaining to the art of healing or treating the disease of domestic animals.

II. Literature Review

The study of publication trends and authorship pattern is a relevant area of knowledge generation for library professionals. A large number of studies have been done in the past by the library professionals.

Falagas, Papastamataki, and Bliziotis (2006) studied the research productivity of different world regions in the field of parasitology. Using the PubMed database, they collected information for the period of 1995–2003. Research productivity was evaluated based on a methodology and used in other bibliometric studies by analysing the total number of publications, the mean impact factor of all papers, and the product of the above two parameters. The research productivity was also evaluated in relation to gross domestic product of each region and in relation to gross national income per capita and population of each region. They found that more help should be provided by the developed nations to the developing areas for the improvement of research infrastructure**.**

He, Luo and Lu (2009) in their study said that biological invasion is an important barrier for biodiversity conservation and sustainable development of global agriculture and forestry. They performed bibliometric study on biological invasion literature indexed by the Web of Science in the period of 1991-2006. They observed that, of all nations, the United States had the largest number of publications. They also analyzed the average impact factor of the top 10 journals, most important and popular journals related to this field, and institutions with a higher number of publications.

Codron, Bedu and Cibenel (1995) discussed about major countries publishing on fruit and vegetable economics. There were interested in research on how scientific concerns are connected with economic activities. Their paper aimed at answering these questions through an analysis of the references produced by the Commonwealth Agricultural Bureau International (CABI) data base from 1975 to 1989**.**

In a scientometric analysis, Surwase, Kademani and Vijaykumar (2008) attempted to highlight the neutron scattering research in India based on the number of publications included in the Scopus database.

Ramakrishnan and Ramesh Babu (2007) analyzed the literature output in the field of hepatitis from three bibliographic databases, namely MEDLINE, CINAHL and IPA, and found that collaboration in authorship pattern is prevalent, averaging 0.85**.**

Asha (2007) analyzed articles and citations in *Demography India* from 1972-2001 and identified core areas of demographic studies, including article contributions by country and geographic areas, authorship patterns and collaboration, most cited journals, bibliographic forms of cited documents, average age of citations, and rate of citations per article.

Ram (2011) analyzed data in the PubMed database for the period of 1996-2010 to study the growth of research on Artemisia, including research distribution by country, type of publications, journal authorship patterns, and Indian publication activity on Artemisia.

III. Objectives of the Study

The present study has been taken to identify the pattern of productivity in veterinary sciences. The objectives of the study are as follows:

- To examine and analyze the authorship pattern in veterinary science
- To study the proportion of single-authored papers against multi-authored ones
- To determine the degree of collaboration in veterinary science
- To study the growth of literature in different areas of veterinary science
- To compare the growth of research between India and the rest of the world

IV. Research Methodology

CAB Abstracts for the period of 2006-2010 were used as a source for data collection in the present study. *CAB Abstracts* is a product of CAB International (*Centre for Agriculture and Biosciences International*), a non-profit enterprise providing information and databases in the life sciences, distributed by SilverPlatter worldwide. The Veterinary Science Database, compiled by subject specialists at CABI Publishing, contains more than 650,000 abstracts and citations. With 15,000 records added annually and containing over 30 years of research from over 75 countries, it provides an ideal source of information in the fields of animal science, veterinary science, food and agriculture, and zoology.

V. Data Analysis and Discussion

A total of 98,713 papers published by veterinarians and included in *CAB Abstracts* during the period of 2006-2010 were selected for analysis as per the objectives of the study. The data collected was tabulated and analyzed. The results of the analysis are discussed.

Table 1: Year wise Distribution of Papers

Year	No. of papers	Non-displayable fields	Total
2006	18,692	89	18,781
2007	20,686	207	20,893
2008	20,442	182	20,624
2009	22,996	267	23,263

2010	14,924	228	15,152
Total	**97,740**	**973**	**98,713**

Table 1 shows the chronological distribution of papers during the period of 2006–2010. The highest number (23,263) of total papers was published in the year 2009 while the lowest number of papers (15,152) was published in the year 2010. One point to note is that 973 records were non-displayable.

Table 2: Productivity Pattern of Authors in Veterinary Sciences

Year	One author	Two authors	Three authors	Four authors	Five authors	Six or more authors	Total
2006	2,229	3,074	3,234	3,312	2,936	3,907	18,781
2007	3,984	2,875	3,258	3,330	2,641	4,598	20,893
2008	3,751	2,673	3,361	3,275	2,691	4,691	20,624
2009	3,705	2,905	3,349	3,610	3,261	6,166	23,263
2010	2,410	1,635	2,047	2,305	2,044	4,483	15,152
	16,079	13,162	15,249	15,832	13,573	23,845	98,713
Total	**16,079**	**81,661**					

Table 2 shows that 16,079 papers (16.45%) were contributed by single authors while 81,661 (83.55%) were contributed by multiple authors. See also Figure 1.

Figure 1

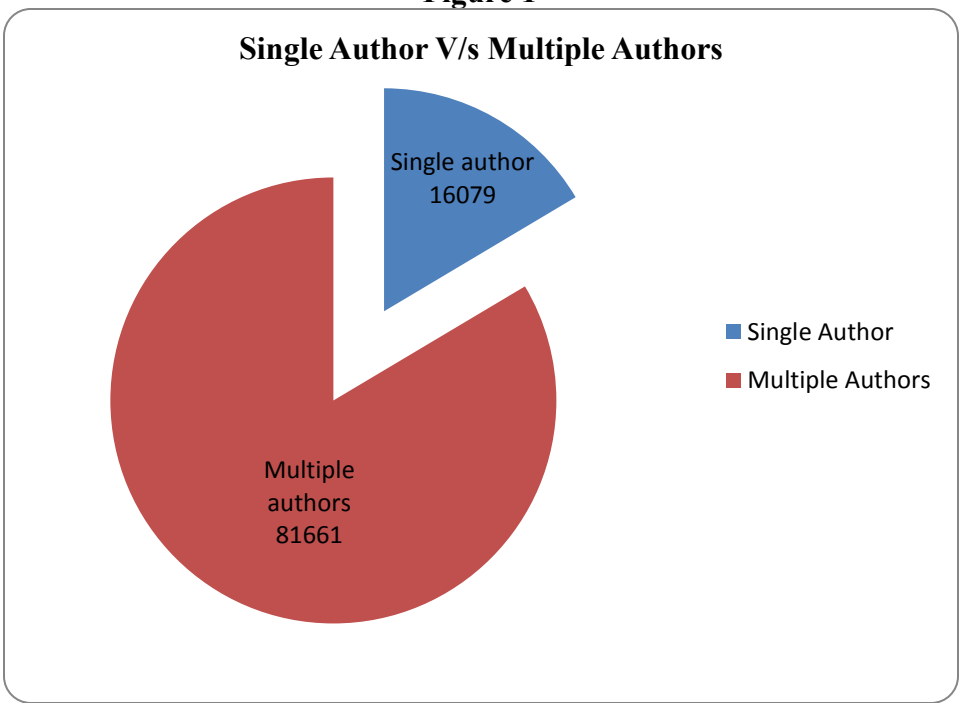


Table 2.1: Comparative Productivity of Authors

No. of Authors	No. of Papers	%
One	16,079	16.45
Two	13,162	13.47
Three	15,249	15.60
Four	15,832	16.20
Five	13,573	13.89
Six or more	23,845	24.40
	97,740	**100**

Table 2.1 shows the percentage of productivity of the authors. The majority of papers contributed by authors worked in collaboration. It indicates that veterinarians prefer to do research in collaboration. The single authorship only accounts for 16,079 papers (16.45%). Two authors accounts for 13,162 papers (13.47%), three authors 15,249 (15.60%), four authors 15,832 (16.20%), five authors 13,573 (13.89%), and six or more authors 23,845 (24.40%), which is the highest percentile of the total.

Table 3: Distribution of Papers by Year

Year	Single author paper	%NS	Multi author paper	% NM	Total No. of papers
2006	2,229	11.92	16,463	88.08	18,692
2007	3,984	19.26	16,702	80.74	20,686
2008	3,751	18.35	16,691	81.65	20,442
2009	3,705	16.11	19,291	83.89	22,996
2010	2,410	16.15	12,514	83.85	14,924
	16,079	**16.45**	**81,661**	**83.55**	**97,740**

Notes: %NS = percentage of single-authored papers; NM = percentage of multi-authored papers.

Table 3 shows that there were far more papers by multi-authors than that by singles in every year under study. The highest percentage of multi-authored papers is 88.08% in 2006. See also Figure 2.

Figure 2

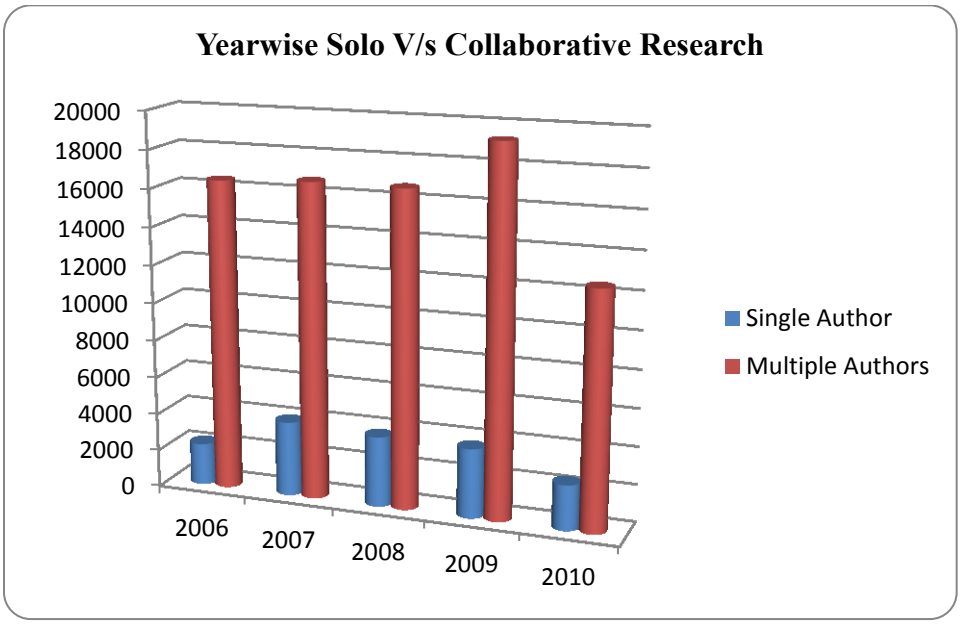


Table 4: Degree of Collaboration by Year

Year	Single author (NS)	Multiple author (NM)	Degree of collaboration C=NM/NM+NS
2006	2,229	16,463	0.88
2007	3,984	16,702	0.81
2008	3,751	16,691	0.82
2009	3,705	19,291	0.84
2010	2,410	12,614	0.84
Total	**16,079**	**81,661**	**Average degree of collaboration = 0.84**

Table 4 shows that veterinarians prefer to conduct research work in collaboration. The extent or degree of collaboration has been quantified by applying Subramanayam's formula, which states that the degree of collaboration is a ratio between the number of multi-authored papers (NM) to the number of multi authored papers (NM) plus the single authored (NS) ones.

$$C = \frac{NM}{NM+NS}$$ where,

NM = number of multi authored papers
NS = number of single authored papers

Hence, based on the above formula, the average degree of collaboration in veterinary is found to be 0.84, which again points towards the high degree of joint research in this discipline, The

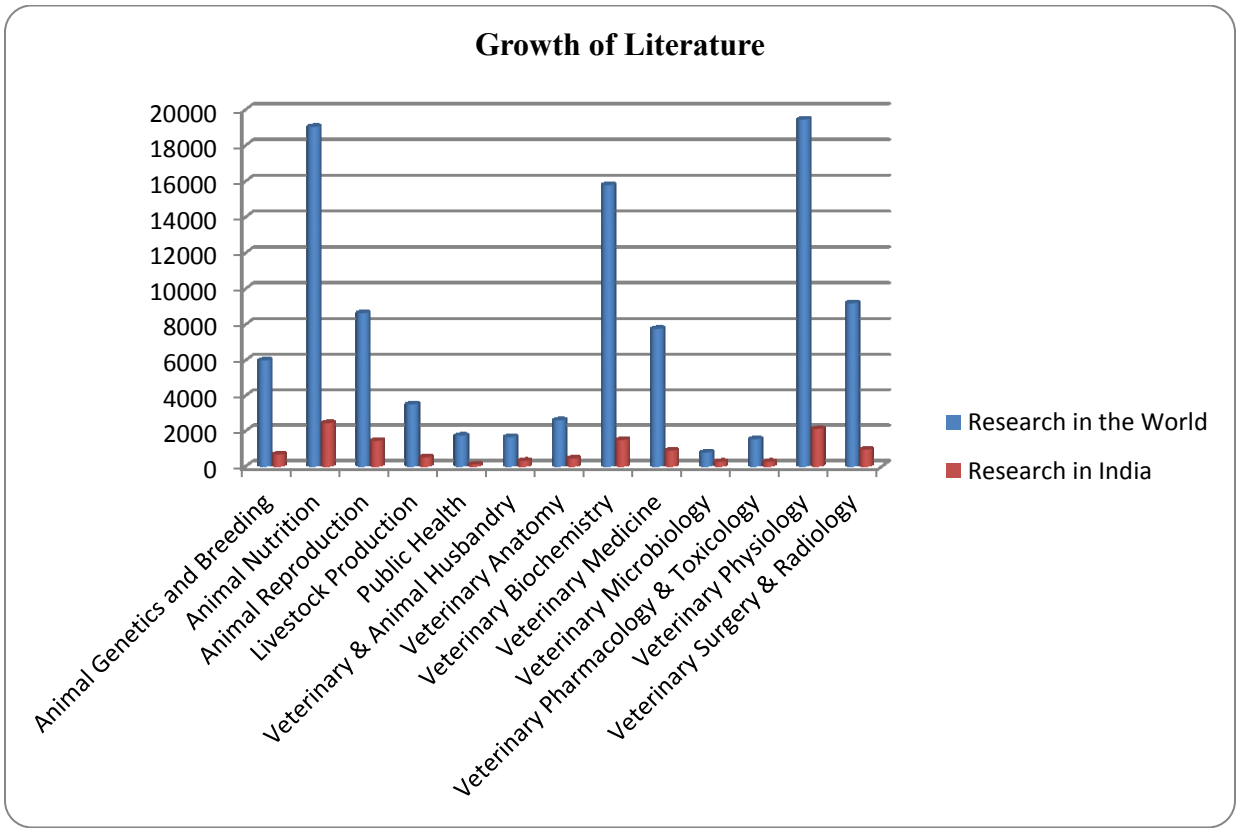
degree of collaboration worked out for all the years under study and found to vary between 0.81 to 0.88 as Table 4 shows. The degree of collaboration is 0.88 in 2006 and more or less this value is maintained throughout the period. In 2007, it decreased to 0.81 but in 2008, 2009 and 2010. It was again increased to 0.82, 0.84 and 0.84 respectively. It shows a trend of multi-authorship. The average degree of collaboration shows that veterinarians prefer to work as a team.

Table 5: Growth of Literature by Subject: India vs. Other Countries

Subjects	**World**	**India**	**%**	**Other Countries**	**%**
Animal Genetics and Breeding	5,998	681	11.35	5,317	88.65
Animal Nutrition	19,036	2,453	0.13	16,583	99.87
Animal Reproduction	8,643	1,451	16.79	7,192	83.21
Livestock Production	3,514	523	14.88	2,991	85.12
Public Health	1,741	123	7.06	1,618	92.94
Veterinary & Animal Husbandry	1,667	320	19.20	1,347	80.80
Veterinary Anatomy	2,612	453	17.34	2,159	82.66
Veterinary Biochemistry	15,793	1,499	9.49	14,294	90.51
Veterinary Medicine	7,763	897	11.55	6,866	88.45
Veterinary Microbiology	787	265	33.67	522	66.33
Veterinary Pharmacology & Toxicology	1,542	265	17.19	1,277	82.81
Veterinary Physiology	19,448	2,127	10.94	17,321	89.06
Veterinary Surgery & Radiology	9,196	955	10.38	8,241	89.62
Total	**97,740**	**12,012**	**12.29**	**80,411**	**87.71**

Categorization of subject areas was conducted according to the consultation of subject experts and arranged in Table 5. It shows the growth of literature by subject. It is observed that the literature on veterinary covers thirteen broad subject areas. Among the total 97,740 records in different subject areas, it can be clearly seen that the veterinarians have shown a greater interest in Veterinary Physiology, followed by Animal Nutrition. See also Figure 3.

Figure 3



VI. Conclusion

The study has identified a clear trend towards collaborative research in the area of veterinary. In other words, veterinarian scientists prefer to conduct research in collaboration. The degree of collaboration is high and multi authorship is prominent in the field of veterinary as well as some other disciplines of applied sciences. A comparative study of literature growth worldwide indicates that Indian has contributed a good portion to the veterinary sciences research.

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