BIBLIOMETRIC STUDIES ON AFRICAN TRYPANOSOMIASIS RESEARCH LITERATURE: A REVIEW OF AUTHORSHIP PATTERN

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Compares author collaboration in the periodical literature of African Trypanosomiasis. The study was based on the literature abstracted in the 1990-2000 articles of Tropical Diseases Bulletin and Tsetse and Trypanosomiasis Quarterly (TTQ) using the counting method. It is found that both the annual rates and the cumulation of author collaboration for the period for each of the ten years was high although the figures obtained for 1992-1995 and 1998-2000 were higher than those for 1990-1991 and 1996-1997. Concludes that though author collaboration exists in African Trypanosomiasis literature for the ten years studied, it is generally high but each year’s literature is dominated by multiple authorship, and in all, two and three authored papers were predominant. The extent of collaboration was up to 11 authors per article, and this calls for more collaboration to extend the authorship beyond 11 authors per paper, as it is noted in other scientific disciplines. The study has provided factual information in support of information services in the field of African Trypanosomiasis literature.

INTRODUCTION

The application of statistical techniques to the study of the subject literature has many dimensions. An example of these statistical techniques is the study of authorship patterns in a subject literature. This is of primary importance in understanding the structure of the subject field. In communication system, authors contributing to a subject field constitute a population. Within this population may emerge patterns such as single and multiple authorship. Studies in this area of statistical techniques (bibliometrics) have made useful discoveries which shed more light in our knowledge of structure of subject literatures [1]. When two or more authors jointly produce a publication, the act is operationally termed as collaboration. It is used synonymously in this work as co-authorship or multiple authorship.

The degree of collaboration varies from one discipline to another. It is generally high in the intensely collaborative scientific and technical fields, but low in humanities in which the lonely scholar, working without the trappings of “big science” still produces much of the scholarly literature [2]. Garfield has indicated that multi-authored papers accounted for only 17-25% of the samples of published papers in economics, social work, and sociology; but in gerontology, psychiatry, psychology and biochemistry multi-authored papers constituted 47-81% of the samples [3]. Author collaboration has been studied in some subject literatures in the humanities, social sciences and natural sciences but one subject where little is known about its author collaboration is African Trypanosomiasis. This study therefore seeks to determine the pattern of authorship as it relates to collaboration in the literature of African Trypanosomiasis. The study particularly seeks to answer the following questions: Does author collaboration exist in the literature of African Trypanosomiasis? If author collaboration exists, does it support Price’s idea [4] that collaboration accelerates steadily as the single authorship disappears completely? If author collaboration exists, what is the extent for each of the ten years studied? Does author collaboration vary from one year to another? What are the theoretical implications of author collaboration on the African Trypanosomiasis?
Among the previous significant studies of author collaboration were those of Price [4] who reported the incidence of collaboration work in science, and Clarke [5] who reported collaboration among biomedical writers. Price and Beaver found that the most productive member was by far the most collaborative in the literature of oxidative phosphorylation and terminal electron transport [6]. They suggested that part of the social function of collaboration is a method of squeezing papers out of the population of people who have less than a whole paper in them. Goffman also related authorship patterns to the Shannon entropy measure [7]. Hirsch and Singleton showed that the amount of multiple authorship in a subject field is closely related to the amount of financial support [8]. Mullins described groups of collaborators sociologically as "solidarity groups" in order to emphasize the role in the promoting and dedication to that area [9].

Pao has investigated the relationship between collaboration and productivity in musicology and concluded that even though a small number of authors had co-authors, the heavy collaborators were also the most prolific in the field [10, 11]. Shaw observed that co-authorship establishes a relation among authors which is a measure of the extent to which they communicate directly and that the strength of this relationship between any two authors may be computed by counting the number of papers they produce jointly [12]. Weintraub, provided a theoretical generalization that the scientist collaborates, while the humanist rarely collaborates [13]. Subramanyam introduced a method for measuring author collaboration and observed that the degree of collaboration varies from one discipline to another [14]. Lawani identified three factors that affect the relationship between collaboration and quality as follows: individual abilities of team members, size of the team and the cohesiveness of the team [15, 16]. But McCauley has described the problem posed by multiple authored papers in naming taxonomic species, and suggested that in taxonomic papers the number of authors should be limited [17].

Scientific research is becoming an increasing collaborative endeavor. Therefore the extent of collaboration cannot be easily determined by traditional methods of survey, questionnaire, interviews or observation. Bibliometric method offers a convenient and non-reactive tool for studying collaboration in research.

**METHODOLOGY**

The data comprised of 3644 articles abstracted in the journal of the Tropical Diseases Bulletin (TDB) and Tsetse and Trypanosomiasis Quarterly (TTB) from 1990-2000. These excluded 12 anonymous papers. Principal authorships were determined since it is generally true that the name of the principal investigator is almost always mentioned first and the order in which the remaining co-authors are named in the paper does not necessarily reflect the degree of collaboration. Co-authors are sometimes arranged in alphabetical order, except for the principal investigator's name which might be placed at the beginning or at the end [18].

The 3644 articles were gathered and analysed and those that appeared as single author and never collaborated with others were identified and counted. Those that appeared as co-authors were determined according to the different levels of multiple authorship thus: 2 authorship, 3 authorship, 4 authorship...n-authorship. A direct weighted average index method was used to determine the extent or degree of collaboration. For example if 213 papers were produced such that 80 are 1 author, 35 are 2 author, 40 are 3 author, 22 are 4 author, 18 are 5 author, 10 are 6 author, 5 are 7 author, 2 are 8 author, zero for 9 author, one for 10 author, zero for 11 author, then the degree of collaboration, given in weighted average will be,

\[
c = \frac{(60 \times 1) + (35 \times 2) + (40 \times 3) + (22 \times 4) + (18 \times 5) + (10 \times 6) + (5 \times 7) + (2 \times 8) + (0 \times 9) + (1 \times 10) + (0 \times 11)}{213}
\]

\[
c = \frac{80 + 70 + 120 + 88 + 90 + 60 + 60 + 35 + 16 + 0 + 0}{213}
\]

\[
c = \frac{569}{213}
\]

\[
c = 2.67
\]
This method reflects the number of contributions or size of each level of authorship. As this number increases, the value of the weighted average also increases. This method of measuring author collaboration is considered valid and has been used in a number of previous papers (Gilvary and Ihrig, 1959; Prince and Solla, 1963; Meadows, 1974; Beaver and Rosen, 1978, 1979a, 1979b; Subramanyam; 1983, Adelakun, 1985).

**ASSUMPTIONS**

The following assumptions are held for this study:

1) All the collaborative research efforts result in one or more published papers.

2) All the collaborators are mentioned as co-authors in the publication.

3) All the co-authors mentioned in the publication have actually collaborated in the research effort.

**RESULTS AND DISCUSSION**

From Table 1, the multiple authorship was the most productive publication with a total of 2,587 (70.99%) papers while the single authorship had 1,057 (29.01%) papers. The multiple authorship was further analysed to shed more light on the pattern of collaboration. Publication with two authorship were 1,020 (27.99%) papers followed by three authorship with 673 (18.47%) papers, and four authorship had 440 (12.07%) papers followed by five authorship with 250 (6.86%) papers. The collaborative effort has extended up to 6, 7, 8, 9, 10 and 11 categories of authorship, and each of the categories with 121 (3.32%); 58 (1.59%); 12 (0.33); 5 (0.14%); 5(0.14%); and 3 (0.08%) papers respectively. The author collaboration increases as the number of publication decreases and vice versa. The study supports the fact that author collaboration increase and may not be constant as Clarke (1964) suggested.

**Table 1**

<table>
<thead>
<tr>
<th>Year</th>
<th>Single Authorship</th>
<th>Multiple Authorship</th>
<th>Total</th>
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<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>1990</td>
<td>80</td>
<td>35</td>
<td>40</td>
</tr>
<tr>
<td>1991</td>
<td>80</td>
<td>42</td>
<td>33</td>
</tr>
<tr>
<td>1992</td>
<td>118</td>
<td>137</td>
<td>68</td>
</tr>
<tr>
<td>1993</td>
<td>110</td>
<td>116</td>
<td>72</td>
</tr>
<tr>
<td>1994</td>
<td>91</td>
<td>101</td>
<td>76</td>
</tr>
<tr>
<td>1995</td>
<td>151</td>
<td>133</td>
<td>82</td>
</tr>
<tr>
<td>1996</td>
<td>81</td>
<td>34</td>
<td>40</td>
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<tr>
<td>1997</td>
<td>80</td>
<td>79</td>
<td>42</td>
</tr>
<tr>
<td>1998</td>
<td>100</td>
<td>116</td>
<td>72</td>
</tr>
<tr>
<td>1999</td>
<td>91</td>
<td>101</td>
<td>76</td>
</tr>
<tr>
<td>2000</td>
<td>75</td>
<td>88</td>
<td>63</td>
</tr>
<tr>
<td>Total</td>
<td>1057</td>
<td>1020</td>
<td>673</td>
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</table>
The study also reveals a trend that more researchers are coming together to execute research programmes in African Trypanosomiasis. The number of co-authors are relatively increasing in number for each of the ten years. This finding is supported by a number of works like Price and Beaver, (1966); Beaver and Rosen, (1978); Kretschmer (1991, 1993, 1999) among others.

Price (1963) predicted that because the proportion of multiple authored papers accelerated steadily, there is likelihood that single authorship would disappear as time went on. However, the idea of single authorship decreasing or disappearing is certainly not supported by the study on African trypanosomiasis. The reason for this may not be far-fetched. Reward for single authorship is still highly prized. An author who publishes a paper is duly credited for producing it.

In the Nigerian setting, an academic staff in the University who produces a journal article scores some marks for every such paper in promotion interviews. However, for joint authorship, score is divided among the various authors in the ratio 1:2 or 1:3 according to the number of co-authors. With this nature of rewarding system, scientists may as much as possible want to publish alone. There could be other reasons, but this is a major reason why single authorship may not completely disappear as predicted by Price (1963).

In relating authorship pattern to Shannon's entropy measure which Goffman (1977) described as a measure of diversity with the presence of a large number of single authorship in any literature indicates that the author population is highly diversified a situation that can be described as a disorderly state. But this present study has indicated author collaboration to be very high with 2,587 (70.99%) papers. This suggests a high number of invisible colleges or solidarity groups that collaborate to write papers. This can be attributed to undiffused research fronts with similar opinions held on issues and a research tradition typical of the natural and applied sciences in which two or more authors tend to collaborate to produce papers.

CONCLUSION

From the findings obtained in this study, it can be concluded that although degree of author collaboration exists in the literature of African Trypanosomiasis (Table 2) it is generally high. Further, it is higher for 1992 – 1995 and 1998 – 2000 than for that of 1990 – 1991, and 1996 – 1997.

<table>
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<th>Table 2</th>
<th>Extent of Author Collaboration in African Trypanosomiasis Literature</th>
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<tr>
<td>Number of Articles Abstracted in African Trypanosomiasis Literature</td>
<td>213</td>
</tr>
<tr>
<td>Single Authorship</td>
<td>80</td>
</tr>
<tr>
<td>Multiple Authorship</td>
<td>133</td>
</tr>
<tr>
<td>Extent of Collaboration (Using weighted average)</td>
<td>2.67</td>
</tr>
</tbody>
</table>
The area which this study examined thoroughly was the pattern of authorship and research collaboration of the contributing scientists in African Trypanosomiasis literature. The study indicates that the context of authorship could be single or collaborative and that collaboration can be said to lead to greater productivity in research. The total number of co-authored papers were 2,587 (70.99%) in African Trypanosomiasis literature which was greater than that of single authored papers 1,057 (29.01%). Generally, collaboration can be said to have the 'social function of squeezing out papers' as Subramanyam (1983) quoted Price and Beaver. In all, the study indicates that 2 and 3 authored papers were predominant, while the extent of collaboration extended up to 11 authors especially towards the latest period covered by the research. The study like others does not support Price's hypothesis (1963) of a likelihood that single authored papers would disappear as time went on. The findings have provided factual information in support of information service in the field of African Trypanosomiasis research.

The degree of author collaboration as indicated by the weighted average was 2.87 for the ten years. The implication of this study to authors of African Trypanosomiasis literature is that there is need for more collaboration in writing research papers.

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