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NUTRITION LITERATURE OF BANGLADESH: A BIBLIOMETRIC STUDY

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ABSTRACT
This paper presents the results of a bibliometric analysis of nutrition literature of Bangladesh. A list of periodical articles on various aspects of nutrition research of Bangladesh published during 1972 - 2006 was compiled for analysis. A total of 636 articles by 998 authors were identified. The articles were published in 100 local and foreign journals. The five-yearly distribution of nutrition literature shows that there is a rapid growth of nutrition literature from 1987 onwards. Lotka's law is found to be applicable to nutrition literature of Bangladesh. Bradford-Zipf distribution also appears to be applicable to the literature.

Keywords: Nutrition literature; Bibliometrics; Bangladesh; Lotka's law; Bradford-Zipf distribution

INTRODUCTION

The overall nutritional status of the population in Bangladesh is considered one of the worst in the world. Despite rapid growth in income and food production in recent years, the nutritional status has remained low. More than 50% of all children between 6 and 71 months in Bangladesh are underweight or low weight-for-age, while nearly 50% of them are stunted or low height-for-age (Bangladesh Bureau of Statistics 2002). Besides, the nutritional status of adolescent girls and women remains a key factor in the persistence of malnutrition in Bangladesh. Chronic energy deficiency, nutritional anaemia and low birth weight are common amongst women and adolescent mothers in Bangladesh.

Bibliometrics, a term introduced by Pritchard (1969), is often used to analyze scientific productivity for predicting and studying scientific progress. The use of bibliometrics for studying research activity of a country is based on the premise

that scientific publications are an essential result of that activity. This study explores the growth of nutrition literature of Bangladesh and identifies authorship pattern and journal distribution in the field.

METHOD

This study covers only periodical literature on various aspects of nutrition of Bangladesh. The periodical articles were primarily identified via National Library of Medicine's (NLM) PubMed using *Bangladesh* AND *nutrition* as MeSH terms. Although other databases could have been used, PubMed was selected because it is found to be more comprehensive than other databases in the field. We found several local journals published peer review articles on nutrition; some of these journals were not indexed by PubMed. To incorporate those articles, the contents page(s) of those journal issues were checked to identify papers pertaining to nutrition of Bangladesh, and they were then included for analysis. The references cited by the authors in their published papers were also checked and articles which have not been included earlier were added to make this study as comprehensive as possible.

In this paper, we applied Lotka's (1926) inverse square law of scientific productivity and Bradford-Zipf plot (Brookes 1968) to nutrition literature of Bangladesh. The general form of Lotka's law can be expressed as $x^n y = C$, where x stands for the number of articles, y is the number of authors with x articles, n is an exponent which have a fixed value of 2, and C is a constant depending on the specific field. Only personal authors were considered for analysis. Authors were given full credit for every publication in which his or her name appears. For Bradford-Zipf distribution, the columns were calculated as follows: column A - journal rank (i.e., 1 being the most productive journal, 2 the second most productive and so on), column B - number of submissions to the given journal title, and column C - cumulative submission of articles. Column A was then plotted against column C using semi-log paper.

RESULTS

Growth and size of nutrition literature of Bangladesh

Table 1 presents the distribution of periodical articles to show the total number of articles generated at a five-year interval. It shows that about 89% (565 articles) of the nutrition articles were published during 1987 – 2006.

Table 1: Five yearly distribution of periodical articles of nutrition of Bangladesh

Year	No. of articles	Cumulative no. of articles	% of articles	Cumulative %
1972 - 1976	11	11	1.73	1.73
1977 - 1981	20	31	3.14	4.87
1982 - 1986	40	71	6.29	11.16
1987 - 1991	166	237	26.10	37.26
1992 - 1996	150	387	23.58	60.84
1997 - 2001	136	523	21.38	82.22
2002 - 2006	**113**	**636**	**17.77**	**100.00**

The growth of nutrition literature of Bangladesh is shown in Figure 1. Initially, growth was slow but gradually picked up over time. From 1987 onwards, the literature growth was exponential. During the same period, Bangladesh made significant progress in several areas of child nutrition such as reducing underweight and stunting compared to previous years. Improvement has also been made in other areas like reducing third-degree malnutrition, higher child immunization rates, lower infant mortality rates, etc. over the last two decades.

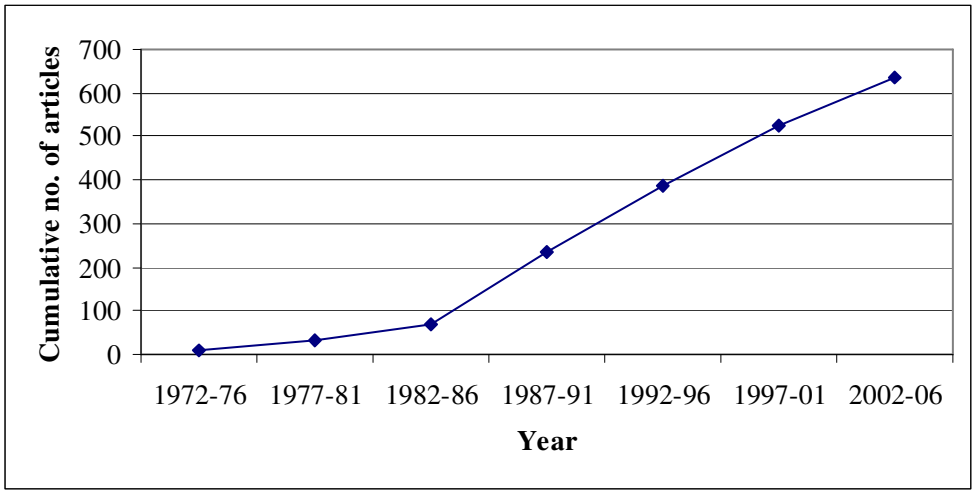

Figure 1: Growth of nutrition literature of Bangladesh

Author productivity and Lotka's law

The number of authors contributing one, two, or more articles each were counted manually. The author data shows 998 authors produced 636 articles with an average of 1.57 authors per article. Table 2 presents author productivity data for Lotka's law. Of the 998 unique author names, 639 (64%) produced one article, 169 (17%) produced two articles and so forth. The number of authors who produced more than 10 articles is quite small (only 3%). We calculated n = 2, C = 639 and the values obtained were shown in the fourth column.

Table 2: Author productivity for Lotka's law

No. of articles (x)	No. of authors observed (y)	% of authors	No. of authors with n = 2
1	639	64.00	639
2	169	17.00	160
3	53	5.31	71
4	44	4.40	40
5	17	1.70	26
6	12	1.20	18
7	10	1.00	13
8	11	1.10	10
9	7	0.70	8
10	6	0.60	6
>10	**30**	**3.00**	-

Figure 2 shows the observed versus estimated number of authors with n = 2 for the number of articles from 1 to 10. The fit is visually apparent, in fact, the observed and estimated lines can barely be distinguished. Hence, we conclude that Lotka's original formulation of inverse square law of scientific productivity applies to the nutrition literature of Bangladesh.

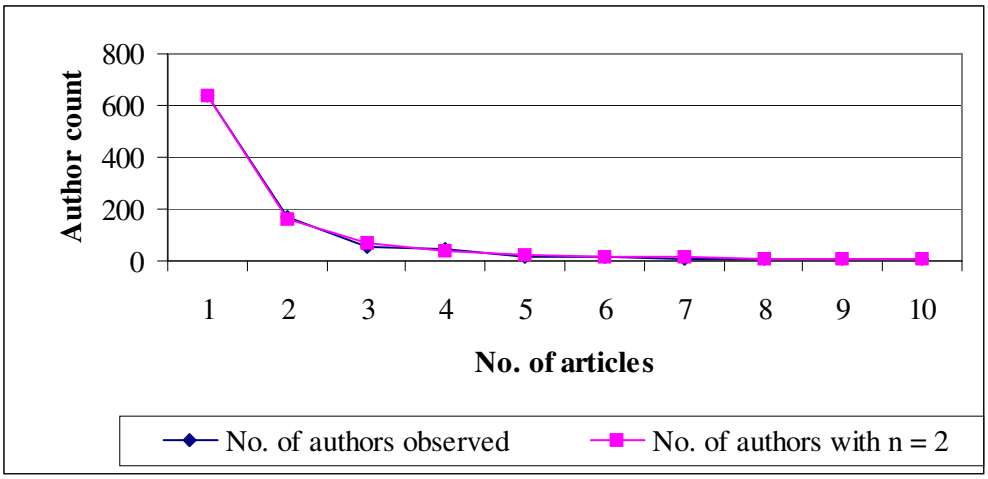

Figure 2: Observed versus estimated no. of authors with n = 2

Bradford-Zipf distribution

The publication pattern in journals shows that there is a tremendous scattering of nutrition literature of Bangladesh. Table 3 includes the list of 100 journals that published 636 articles relating to nutrition of Bangladesh during 1972 - 2006. The journals are ranked according to decreasing order of productivity. *Bangladesh Journal of Nutrition* is identified as the core journal which published 261 (41%) articles on various aspects of nutrition of Bangladesh. The ten top-ranked journals published about 70% of the total research output. These journals may be regarded as the important sets of journals in the field. Forty-seven journals published only one article on the subject.

For Bradford-Zipf distribution, journal rank numbers are plotted logarithmically along the horizontal axis, and the cumulative sums of articles are plotted along the vertical axis. Figure 3 illustrates the Bradford-Zipf plot for nutrition literature of Bangladesh. For a classic Bradford-Zipf, there should be a lengthy straight-line portion in the middle of the graph. Such a straight-line appears, and it therefore must be concluded that the Bradford-Zipf does apply to nutrition literature of Bangladesh. It is important, however, to note here that the graph did not take a typical "S" shaped plot. There is no "gross droop" at the end. After an initial rise, the graph has taken almost a straight-line, which means the periodical literature is vastly scattered and is growing.

Table 3: Ranking of contributing periodicals

Rank	No. of submissions	Cumulative submissions	Journal title
1	261	261	Bangladesh Journal of Nutrition
2	39	300	American Journal of Clinical Nutrition
3	31	331	South Asian Journal of Nutrition
4	26	357	European Journal of Clinical Nutrition
5	21	378	Bangladesh Medical Research Council Bulletin
6	15	393	Journal of Biosocial Sciences
7	14	407	Journal of Tropical Paediatrics
8	10	417	Journal of Health, Population and Nutrition
9	9	426	Journal of Nutrition (ASN)
10	9	435	Journal of Nutrition (Bangladesh)
11	9	444	Lancet
12	8	452	Public Health Nutrition
13	7	459	Health Policy and Planning
14	7	466	Indian Journal of Paediatrics
15	7	473	International Journal of Epidemiology
16	6	479	Paediatrics
17	5	484	Acta Paediatrica
18	5	489	American Journal of Epidemiology
19	5	494	Annals of Tropical Paediatrics
20	5	499	Archives of Disease in Childhood
21	5	504	Bulletin of the World Health Organization
22	4	508	British Journal of Nutrition
23	5	513	British Medical Journal
24	4	517	Food and Nutrition Bulletin
25	4	521	International Journal of Food Science and Nutrition
26	4	525	Journal of Diarrhoeal Disease Research
27	4	529	Studies in Family Planning
28	3	532	American Journal of Tropical Medicine and Hygiene
29	3	535	British Medical Journal (Clinical Research Edition)
30	3	538	Demography
31	3	541	Epidemiology and Infection
32	3	544	Indian Journal of Medical Research
33	3	547	Indian Paediatrics
34	3	550	Southeast Asian Journal of Tropical Medicine and Public Health
35	3	553	Tropical Geographical Medicine
36	2	555	Annals of Human Biology
37	2	557	Gut
38	2	559	Human Nutrition - Applied Nutrition
39	2	561	International Journal of Gynaecology and Obstetrics
40	2	563	Journal of Epidemiology
41	2	565	Journal of Human Lactation
42	2	567	Journal of Infectious Diseases
43	2	569	Journal of Paediatric Gastroenterology and Nutrition

Rank	No. of submissions	Cumulative submissions	Journal title
44	2	571	Journal of Tropical Medicine and Hygiene
45	2	573	Nursing Standard
46	2	575	Nursing Times
47	2	577	Paediatric Infectious Disease Journal
48	2	579	Public Health
49	2	581	Review of Infectious Disease
50	2	583	Science of the Total Environment
51	2	585	Transactions of the Royal Society of Tropical Medicine and Hygiene
52	2	587	Tropical Medicine and International Health
53	2	589	Women and Health
54	1	590	Acta Paediatrica Scandinavia
55	1	591	Advances in Peritoneal Dialysis
56	1	592	American Journal of Public Health
57	1	593	Asia Pacific Journal of Clinical Nutrition
58	1	594	Australian Journal of Rural Health
59	1	595	Bibliotheca Nutrition et Dieta [in French]
60	1	596	British Dental Journal
61	1	597	British Heart Journal
62	1	598	Cancer epidemiology, biomarkers & prevention
63	1	599	Clinical and Diagnostic Laboratory Immunology
64	1	600	Clinical Infectious Diseases
65	1	601	Community Dental Health
66	1	602	Dental Health (London)
67	1	603	Dental Update
68	1	604	Disasters
69	1	605	Early Human Development
70	1	606	Economics and Human Biology
71	1	607	European Journal of Endocrinology
72	1	608	Eye
73	1	609	Food and Nutrition (Roma)
74	1	610	Hormones and Behavior
75	1	611	Indian Journal of Public Health
76	1	612	International journal for equity in health
77	1	613	International Journal of Environmental Health Research
78	1	614	Journal of Clinical Microbiology
79	1	615	Journal of Epidemiology and Community Health
80	1	616	Journal of Family Health Care
81	1	617	Journal of Family Practice
82	1	618	Journal of Trace Elements in Medicine and Biology
83	1	619	Medical Anthropology Quarterly
84	1	620	Midwifery
85	1	621	Midwives Chronic
86	1	622	Mymensingh Medical Journal
87	1	623	Nursing Mirror
88	1	624	Nutrition Journal
89	1	625	Nutrition Reviews
90	1	626	Progress in Food Nutrition Science
91	1	627	Revue d'epidemiologie et de Sante Publique [In French]
92	1	628	Revue de l'infirmiere [in French]

Rank	No. of submissions	Cumulative submissions	Journal title
93	1	629	Scandinavian Journal of Infectious Diseases
94	1	630	Social Biology
95	1	631	Social Science and Medicine
96	1	632	Sygeplejersken [In Danish]
97	1	633	Toxicology and Applied Pharmacology
98	1	634	Tropical Doctor
99	1	635	Tropical Medicine and Parasitology
100	**1**	**636**	**Vaccine**

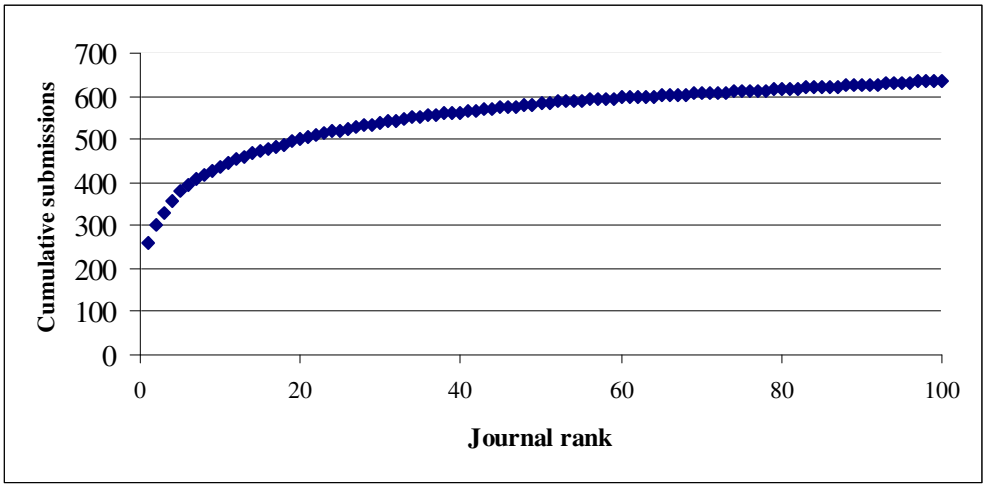

Figure 3: Bradford-Zipf distribution for nutrition literature in Bangladesh

CONCLUSION

Malnutrition is one of the most serious problems affecting Bangladesh. This study found that scientific productivity in the field of nutrition experienced a significant rise during the period 1987–2006. Lotka's original formulation of inverse square law using "full productivity" of authorship is found to be applicable to nutrition literature of Bangladesh. Bradford-Zipf distribution is also appeared to be applicable to the literature though the graph did not take a typical "S" shaped plot. This is a preliminary study on nutrition research of Bangladesh; we hope this may trigger more bibliometric studies for the purpose of evaluating nutrition research in the country. Such studies would be useful in devising appropriate policies to alleviate the nutrition status of Bangladesh.

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