

## **Bibliometric Analysis of Ceylon Medical Journal during the period from 2003 – 2012**

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### **Abstract**

Ceylon Medical Journal (CMJ) is the premier and oldest medical journal in Sri Lanka. Bibliometric studies on single journals are useful to find out the research trend in a discipline and publication trend of the journal. The objective of the study was to conduct a bibliometric study of CMJ. The study sought to identify co-authorship pattern, geographical distribution of authors, productive institutions, prolific authors, productive articles and the impact of the research work published in CMJ during the study period. The required data of all the selected articles published from 2003 to 2012, related to the analysis were collected from Scopus database. The collected data were analyzed in terms of bibliometric parameters by MS excel 2007 and Bibexcel. The study revealed multi authored articles occupy prominent position indicating cooperative research work. Three author contributions was the highest ranked authorship pattern. Majority (90%) of the authors publishing articles in CMJ were from Sri Lanka. The most prolific author contributed 18 articles during the study period. The most productive article received 57 citations recorded in SCOPUS data-base. University of Colombo and University of Kelaniya were leading institutions in publishing articles in CMJ during the study period. The study highlighted some research trends in health sciences and publishing trends of CMJ. The country distribution of authors showed that the journal reflects the research and views of health researchers mainly from Sri Lanka. The study provides suggestions to improve the impact of the research articles published in CMJ.

**Keywords:** Bibliometrics, Ceylon Medical Journal, Authorship pattern, Single journal study.

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## **Introduction**

Bibliometrics is the organization, classification and quantitative evaluation of publication patterns of all macro and micro communication along with their authorships by mathematical and statistical calculus (Sengupta, 1990). “Bibliometric assessments are based on the assumption that most scientific findings are published in international journals where they can be read and cited by other researcher” (Rehn & Kronman, 2008). According to Wan et al. (2009) it can indicate the quality, maturity and productivity of the journal in any field, in a country. In general, the journal being studied is regarded as significant in the field, important enough to be studied, and make inferences that the journal speaks for authors who publishes in the field and somehow reflect the activity of the research in the field.

Bibliometric studies are performed by researchers to measure the impact of the published work on the scientific community. It has many applications in the field of library science in identifying the research trends in the subject, publication trend of a particular journal and evaluating a journal in order to provide further suggestion to improve the journal. Bibliometric studies are useful for ascertaining indicators of scientific productivity trends and emphasis among researchers in different subject fields (Okafor, 2008).

Sri Lanka is an island in the Indian Ocean also called Ceylon. It is about 28 kilometers off the south eastern coast of India with a population of about 20 million. The Sri Lanka Medical Association (SLMA) is the national professional medical association in Sri Lanka, which brings together medical practitioners of all grades and all branches of medicine. The SLMA is the oldest professional medical association in Asia and Australasia, with a proud history that dates back to 1887. The association's journal is the Ceylon Medical Journal (CMJ), the first issue of which was published in August 1887 (Wikipedia, 2015). CMJ is the oldest surviving medical journal in Australasia, and started in 1887 as the journal of the Ceylon Branch of the British Medical Association (Uragoda, 1987).

CMJ (ISSN: 0009-0875) is a peer reviewed, open access journal published quarterly by the Sri Lanka Medical Association in the last week of March,

June, September and December. Except for a period between 1893 and 1904 when it ceased publication, the CMJ has been published without interruption up to now. In 1904, the name of this journal was Journal of the Ceylon Branch of the British Medical Association. The journal's name changed to Ceylon medical journal in 1954. The journal publishes original papers and commentaries which has relevance to medicine and allied sciences. A total of 44 medical journals were published in Sri Lanka's history, of which only 28 journals remained in publication after 2007 (Ranasinghe, Perera & Abeygunasekara, 2011). CMJ is the only medical journal in Sri Lanka indexed in MEDLINE, which is the largest medical electronic bibliographic database in the public domain. The electronic version of the journal is accessible free of charge at through Sri Lanka Journal Online (<http://www.sljol.info/index.php/CMJ/index>). Further, the journal is indexed in BIOSIS previews, EMBASE, CABI, SCOPUS and Index Medicus etc.

There are many bibliometric studies available on single journals from medical and health sciences. A single journal study on Journal of the Ayub Medical College in Pakistan analysed the growth of articles per year, authorship patterns, and number of citations per articles and collaborative nature of medical research in Pakistan (Ullah, Butt, & Haroon, 2008). The study showed that three author contributions ranked the highest; the average distribution of citations per article was 17.43. A study on the Journal of cardiothoracic and vascular anesthesia, analyzed the trends and geographic distribution of authors publishing articles from year 2000 to 2010. There were 45 different countries and United States accounted the highest number (44%), followed by India (8.3%), Germany (5.5%) and United Kingdom (4.7%). Geographic distribution of authors showed that the journal reflects the research and views of scientists from all over the world (Landoni et al., 2010).

A bibliometric analysis of Tropical medicine and international health from 1996 – 2003 analyzed the geographical distribution of authors, most common subject areas of papers and the most cited papers. Authors from Europe had the largest number of papers followed by Africa. African authored papers had been cited more than other regions (Glover & Bowen, 2004).

Mendis, Solagarchchi, & Weerabaddana(2005) analyzed Ceylon medical journal using PubMed from 1965 to 2001 was published in 2004. The study showed 90 % of the authors had 1-4 articles. Another study on Indian journal of medical research from 2000 to 2005, with regard to authorship pattern, three authors' publication occupied the top position followed by multiple authors which is more than six authors. There are no studies conducted on CMJ after this study. As such the present study is a bibliometric analysis of CMJ from 2003 to 2012.

Bibliometric analysis can indicate trends and patterns within scientific disciplines, national and international strengths and biases in areas of research.

### **Objectives**

The main objective of the study was to conduct bibliometric analyses of CMJ. The research sought to identify the trends and patterns of CMJ, co-authorship pattern, national and international strength of articles, productive authors, productive institutions, mostly cited articles and the impact of the published work on the scientific community.

### **Methodology**

Bibliometric analytical method, one of the statistical analytical methods specially employed in Library and Information science fields was used as main research method of this study. SCOPUS is the widely accepted database by the academic community and also it offers author profiles which cover affiliations, number of publications and details on the number of citations each published document has received. The data for the study was derived from this database in first week of May 2015. Required data of all the selected articles pertaining to bibliometric analysis were recorded and analysed. Five hundred and ninety four records of research articles from ten volumes of CMJ authored by 1350 authors attached to 68 different institutions published during the ten year period from 2003 to 2012 (inclusive) were taken as a sample set for the analysis of the study. The letters to the editors and organization related correspondences were excluded from the study.

Various bibliometric analytical techniques and tools such as bibliometric analytical software namely bibexcel developed by Persson, Danell, & Schneider, (2009), MS excel, Notepad++ were used in this study to find out the research trend of the CMJ.

In primary level, distributions of research articles were analyzed in terms of year wise contributions and presented in tables. Authorship patterns were identified by distribution of co-authorship. Degree of collaboration was calculated in this study by using the formula suggested by Subramanyam (1983). Author productivity, most productive countries and institutions were identified on the basis of the affiliation and address of all the authors in the articles over the study period. Mostly cited articles were identified based on the number of citations received and reported in SCOPUS database.

## **Results**

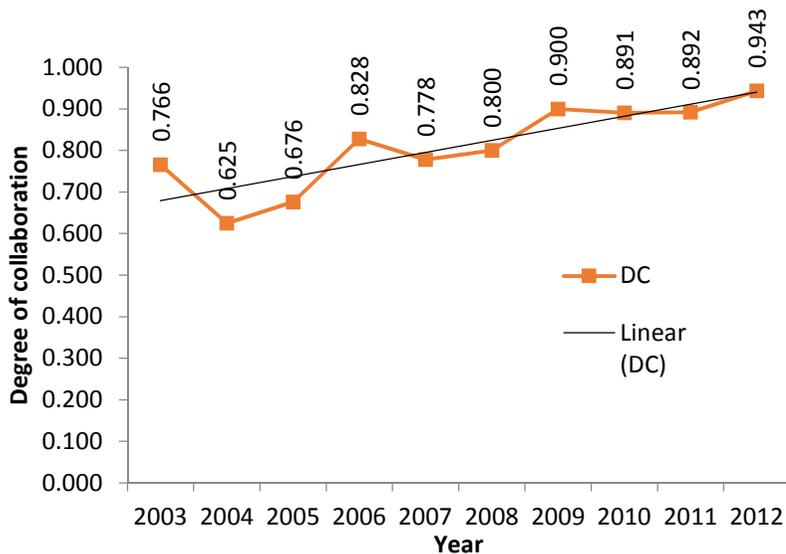
A total of 594 articles from 10 volumes in 40 issues, which cover leading articles by the editors, research papers, picture stories, case reports, brief reports and research letters published in CMJ were analyzed in this study. The number of research papers published in a year ranges from 52 to 69 (median 59 articles).

### ***Degree of collaboration***

The degree of collaboration is above 0.5 and the figure 1 shows linear relationship over the years. Degree of collaboration progressively increased over the study span. It shows that multi-authored research papers lead the prominent position indicating the cooperative research work.

### ***Authorship pattern***

Table 1 reveals the authorship pattern of articles published in CMJ during the study period. It shows that majority of authors published articles in CMJ (80%) preferred to publish multiple authorship. Only 20 % of papers were from single authorship. Three author contributions was the highest ranked authorship pattern.



**Figure 1: Degree of collaboration (DC)**

**Table 1: Authorship pattern**

Number of Authors	Number of articles	Percentage of articles
Single author	116	20 %
Two authors	124	21 %
Three authors	159	27 %
Four authors	95	16 %
Five authors	63	10 %
Six authors	19	03 %
Above six authors	18	03 %
<b>TOTAL</b>	<b>594</b>	<b>100%</b>

***Country productivity***

Table 2 presents the ranked list of productivity of countries. The majority of the authors were from Sri Lanka. Only about 10% of the authors were from countries other than Sri Lanka. International contributions were from 12 countries. Others in the table included Switzerland (9), USA (8), Bangladesh (5), Pakistan (5), Japan (4), Iran (4) and Nepal (4).

**Table 2:** Geographical distribution of authors.

<b>Rank</b>	<b>Country</b>	<b>Number of authors</b>
1	Sri Lanka	1223
2	UK	36
3	India	22
4	Australia	20
5	Malaysia	11
6	Other countries	39

***Institution-wise contribution***

Table 3 presents the types of institution wise publications. All the author affiliations were considered for this analysis. The authors of the articles were from different institutions. The institutions engaged in the publications were classified into four categories; universities, hospitals, research institutes and others. Others included the organizations, ministry of health, other health associations etc.

**Table 3:** Publications with type of institutions

<b>Type of institutions</b>	<b>Number of publications</b>	<b>Percentage of Publications</b>
Universities	878	65 %
Hospitals	388	29 %
Research Institutes	60	04 %
Others	24	01 %
Total	1350	100%

The highest contributions were from universities with 65% of the total publications. This was followed by hospitals with 29% and research institutes 04%. The remaining 01% of the articles was contributed by others, which mainly included World Health Organization, Sri Lanka Medical Association, Ministry of Health etc.

There are total of 68 institutions. Table 4 shows the ranking of the most prolific institutions, which contributed the most number of articles to CMJ. The most productive institution is the University of Colombo. The number of authors affiliated with this institution is 316, which has 23% of the total authors. The next most prolific institution is University of Kelaniya with

267(20%) authors, followed by Sri Lanka National hospital based in Colombo.

**Table: 4** Ranking of the most productive institutions

<b>Rank</b>	<b>Institution</b>	<b>Frequency</b>	<b>Percentage</b>
1	University of Colombo	316	23%
2	University of Kelaniya	267	20%
3	National hospital, Sri Lanka	188	14%
4	University of Sri Jeyawardenapura	86	06%
5	University of Ruhuna	86	06%
6	Karapitiya teaching hospital	68	05%
7	Medical Research Institute	50	04%
8	University of Peradeniya	47	03.5%

#### ***Ranking of the prolific authors***

There are a total of 1350 authors who contributed articles to CMJ from 2003-2012. Table 5 presents the ranking of the most prolific authors published more contributions to CMJ during this study period. The most prolific author is de Silva, H.J. from Faculty of Medicine, University of Kelaniya, published 18 contributions in CMJ between 2003-2012. The second prolific author is Lamabadusuriya, S.P, from University of Colombo. It was followed by de Silva N.R with 14 articles, Deen K.I with 13 articles and Senanayake M.P with 12 articles. Authors affiliated from University of Colombo and University of Kelaniya were leading institutions in publishing articles in CMJ during the study period. Further, majority of authors (73%) published only one paper in CMJ during the ten years study period. Only 3% of the authors published above 4 papers.

#### ***Frequently cited articles of CMJ***

The study attempted to know the number of citations received by the articles of CMJ published from 2003 to 2012 by other researchers. Ranking of articles, received above 10 citations reported in SCOPUS are presented in table 6 in order of their citations. These articles were checked through Google scholar also. It was found that all articles received relatively higher number of citations when compared to SCOPUS database. This may be due to the fact that Google scholar reports citations of articles of many other

sources, which are not indexed in Scopus. The first author of the highly cited article was K.Wijewardene affiliated to the University of Sri Jeyawardenapura, Sri Lanka. There were seven authors contributed in this research, which was published in 2005. In the rank order, mostly cited five articles were published between 2003 and 2005.

**Table 5:** Most prolific authors between 2003-2012 ranked by the number of publications

<b>Number of publications</b>	<b>Name of the author</b>	<b>Institution</b>
18	de Silva, H.J.	University of Kelaniya
17	Lamabadusuriya, S.P	University of Colombo
14	de Silva, N.R.	University of Kelaniya
13	Deen K.I	University of Kelaniya
12	Senanayake, M.P.	University of Colombo
11	Pathmeswaran, A.	University of Kelaniya
11	Jayasinghe, S.	University of Colombo
10	Kuruppuarachchi, K.A.	University of Kelaniya
10	Senanayake, H.	University of Colombo

**Table 6:** The mostly cited articles from CMJ

<b>Title &amp; Published year</b>	<b>Scopus</b>	<b>Google scholar</b>	<b>1<sup>st</sup> author</b>	<b>Institution</b>
Prevalence of hypertension, diabetes and obesity: Baseline findings of a population based survey in four provinces in Sri Lanka. (2005)	57	86	K. Wijewardene (7 authors)	University of Sri Jeyawardenapura
Nutritional status of schoolchildren in an urban area of Sri Lanka. (2004)	26	50	V.P .Wickramasinghe (6)	University of Colombo
Adverse effects of teenage pregnancy (2005)	24	41	IMR Goonewardene (2)	University of Ruhuna
Gender identity disorder presenting	18	25	H Perera, (3)	University of Colombo

in a girl with Asperger's disorder and obsessive compulsive disorder. (2003)				
Clinical features, risk factors and efficacy of cryotherapy in cutaneous leishmaniasis in Sri Lanka. (2003)	18	25	Siriwardena, H. V. Y. D (3)	University of Colombo
Routine antibiotic therapy in the management of the local inflammatory swelling in venomous snakebites: Results of a placebo-controlled study (2005)	17	19	Kularatne, S. A. M., (7)	University of Peradeniya
Prevalence of chronic kidney disease in two tertiary care hospitals: high proportion of cases with uncertain aetiology. (2009)	13	25	T N C Athuraliya (5)	University of Peradeniya
Locally acquired visceral leishmaniasis in Sri Lanka.(2007)	13	14	Abeygunasekera, P. H., (5)	Provincial hospital Anuradhapura
Coconut fats. (2006)	11	38	Amarasiri, W. A. D. L (1)	University of Kelaniya
Laboratory confirmation of dengue and chikungunya co-infection. (2008)	11	24	Hapaurachchi, H. A. C (5)	University of Kelaniya

Note: The numbers within parenthesis indicate total number of authors.

Table 7 presents the range of citations received by the CMJ articles. It was found that 291(49 %) articles have not yet received a single citation. Only 4% of the articles were cited either ten times or above.

**Table 7: Range and percentage of citations received per article.**

<b>Range of citations received per article</b>	<b>No of articles</b>	<b>Percentage</b>
0	291	49%
1-3	194	33%
4-6	47	08%
7-9	35	06%
10-12	19	03%
Above 12	08	01%
<b>Total</b>	<b>594</b>	<b>100%</b>

### **Discussion**

The paper highlighted some of the facets of publishing trend of research activities in CMJ. A bibliometric study of CMJ from 1965-2001 reported there was a general trend of increasing number of articles in the CMJ (Mendis, Solagarchchi, & Weerabaddana, 2005). In the present study, although there was no any growth of total number of articles per year (range from 52-69), this could be a result of editorial policies and the page layout design of the journal. Authorship pattern was analyzed to determine the scientific collaboration of research work. “Collaborative work gained a meaning for success and almost a supporting condition for receiving funding, and strengthening the position in the scientific community” (Glänzel, 2005). The study revealed that single authored papers account for only 20%. Papers with three authors found to be the majority (27%) and the degree of collaboration was above 0.5 showing a linear relationship. It is evident that multi-authorship occupies the prominent position. It was contradictory to the findings of a study on the journal ‘Electronic library’, where most of the articles were single authored (Braun, Glänzel, & Schubert, 2005).

With regard to the authors affiliation, the majority of authors (65%) affiliated in universities reflect greater involvement in research by universities. It may be the result of the educational institutes encouraging more research work mainly as a part of postgraduate courses and necessity for career progression. In a developing country like Sri Lanka, health professionals affiliated in

hospitals might not have a conducive environment to involve research activities with the day today responsibilities of managing a large workload.

A ten year analysis of Journal of cardiothoracic and vascular anesthesia published by Elsevier indicated that the article contributions were from forty five different countries (Landoni et al., 2010). In contrast the present study on CMJ showed that there were only twelve countries contributed to CMJ other than Sri Lanka. Ninety one percentage (91%) of the authors were from Sri Lanka followed by UK, where many of the Sri Lankans get opportunities to do their post graduate studies. It is suggested that there is a room to accommodate more international collaborations in research activities with developed countries to increase the research impact. In the ranking order of the most productive institution, 23% of authors are from University of Colombo, followed by University of Kelaniya (20%) and National Hospital, Sri Lanka (14%). Though there are many authors from different parts of Sri Lanka, top three institutions are located in Colombo and all prolific authors (table 5) based on the number of publications are from Colombo except one author from University of Ruhuna, which is southern part of Sri Lanka. The CMJ is also published in Colombo. The study suggests the distribution of authors may be influenced by the place of publication of the journal.

It is notably 73% of the authors publishing articles only one time and only 3 % of the authors published above 4 papers during the 10 year study period. This might be due to the fact that most of the Sri Lankan authors prefer to publish the research findings on international journals than local journals. As CMJ is an indexed open access journal, it has the same global visibility of other international journals. It has to be taken into consideration that authors have to be encouraged to publish more research papers on CMJ.

Citations are being used to quantify the impact of the papers. In a ten year bibliometric study on Journal of cardiothoracic and vascular anesthesia from 2000- 2009 showed that mostly cited articles were all published between 2000- 2004 (Landoni et al., 2010). The present study also revealed articles published in 2003-2005 received the highest number of citations. No articles published after 2009 ranked within top ten articles. However the citations for the articles published in 2010, 2011, 2012 are found to be less. It predicts

that older articles are cited more in comparisons to newer ones, possibly due to their greater visibility and also with time more citations will be added. In future, there is a possibility to receive more citations because of the open accessibility of CMJ at present. The mostly cited article (Recorded in SCOPUS 57 citations) was authored by seven authors. It is notably, none of the most prolific authors ranked based on the number of publications is the first author of any of the mostly cited CMJ articles. It shows the fact that the total number of articles published does not necessarily correlate to the impact. "If a paper receives no citation during 5-10 years after its publication, it is likely that the findings involved in the research do not contribute essentially to the contemporary of the subject field in question" (Braun, Glänzel & Schubert, 2001).

In the present study, based on the data collected from Scopus database, one paper was cited over 50 times and 26 papers were cited above 10 times. Thirty authors received above 25 citations due to the articles published in CMJ during the study period. It is evident that articles published in CMJ received a fair impact all around. A study on Tropical medicine and international health 1996-2003 showed a total of 1108 papers 362 papers received either one or no citations (Glover & Bowen, 2004). A small number of highly cited articles make effect on the impact factor of the journal (Seglen, 1994). It should be noted that, 49% of the articles published in CMJ during the study period have not yet received a single citation in this study. It may be due to the fact that this study included picture stories and case studies as well and these may not provide scientifically strong enough evidence to cite by other researchers. If these articles had been cited at least once each, the impact factor of this journal could have been significantly improved. This specific issue has to be taken into consideration by the CMJ editorial board in order to improve its impact factor in future.

### **Conclusion**

The study highlighted some of the facts of publishing trend of research activities in CMJ. Findings of the study concluded that the average number of articles per year was 59. Multi-authored research papers occupy the prominent position indicating the cooperative research work. Three authored publications ranked the highest. Degree of collaboration progressively

increased over the study span. In respect to the country productivity it could be concluded that majority of the contributions were from Sri Lanka. The country wise distribution of authors showed that the journal reflected the research and ideas of health researchers mainly from Sri Lanka. Authors from academic institutions contributed most of the articles followed by hospitals. Research papers published in CMJ received fair impact in the scientific community. Significant number of articles, which had not received a single citation, added no contribution to the impact factor of the journal. The editorial policy of the CMJ needs to consider the matter seriously to promote CMJ. Further, it is suggested the need to accommodate more international collaborations with developed and other developing countries in research to help to increase the impact factor of the CMJ.

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