

Research Article

Determinants of infant mortality in last two decades: a bibliometric analysis

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ABSTRACT

Background: Infant mortality has a great importance as a measurement of child survival year by years. The first aim of this study was to determine the predictors of infant mortality in last two decades with a bibliometric and a content analysis. A secondary objective was to examine the frequency of publications by year, the distribution of articles by country location and, to determine how data were collected and analyzed.

Methods: It was a bibliometric analysis of web of science database for years 1996-2015. A total of 289 eligible articles were identified. The publications were analyzed by publication years, contributions of the countries, data collection tools, study designs and determinants.

Results: The annual number of infant mortality related articles increased from 7 articles in 1996 to 27 articles in 2015. The largest studies were made in the USA. Many of articles used records, national statistics or cohort study for data collection. Logistic and linear analysis model were performed commonly. Illness/infection, birth weight, and gestational age were the most important factors affecting infant mortality.

Conclusions: This study provides a useful reference to researchers for the future research directions. The results of this study are also expected to provide evidence-based information to health policymakers to evaluate the best policy approaches for efforts on reducing infant mortality.

Keywords: Infant mortality, Data collection tools, Study designs, Affecting factors, Bibliometric analysis

INTRODUCTION

Mortality can be classified as endogenous and exogenous by population scientist. Death from the biological characters such as degenerative and congenital diseases, disorders and premature births are the examples of endogenous mortality. Exogenous mortality is caused by external factors such as infections, accidents and environmental determinants and it is more preventable than endogenous mortality.^{1,2}

Over the last fifty years, mortality has been considered as health system outcome for measuring the health status of the countries. Especially infant and maternal mortality rates are the most used mortality indicators in the world.³

Infant mortality is defined as the probability of dying between birth and 1 year of age.⁴ According to Alderman and Behrman (2004) infant mortality rate is considered to be one of the strongest indicators of a country's wellbeing, as it reflects social, economic and environmental conditions in which children (and others in society) live, including their health care.⁵

Infant mortality is one of the most important components of under-five mortality as a measurement of child survival.^{5,6} So it has been in the attention of international institutions such as World Health Organization, OECD and United Nations over the years. In 1990, United Nations declared to reduce it at global level, by two-thirds over the years 1990 to 2015 in millennium

development goal.⁷ In 1994, OECD announced that they were to aim to decrease the infant mortality rate to below 35 per thousand for developing countries in 2015 at Cairo Conference on Population and Development.⁸

Because of the contribution of the efforts of these institutions, infant mortality has been decreased nearly two times from 1990 (8.9 million) to 2015 (4.5 million). Global infant mortality rate is 32 per 1000 live births in 2015. It is highest in the African Region (55 per 1000 live births) while it is lowest in European region (10 per 1000 live births).⁹ Variations of this health outcome depend on different factors. These issues can be classified as proximate and socioeconomic determinants. Proximate determinants can be grouped into five parts; mother related variables, environmental variables, nutrient, injury and illness control. Socioeconomic determinants have three components such as individual level factors, household level factors and, community level factors.¹⁰

Mother's characteristics are mother's literacy status, gestational age, exposure to mass media, birth interval and, the total number of births. Environmental factors are about the availability of sanitized facilities such as access to safe water, air pollution. Nutrient deficiency, illness, injection, injury, and accident have also impacted on infant mortality. Besides these, individual factors (occupation, education, beliefs) household characteristics (household wealth, religion, race and ethnicity, residence) and community characteristics such as economic, politic and health system related issues are (health service utilization, quality of perinatal and postnatal care, number of health worker and health resources such as number of bed, immunization and health expenditures).¹⁰⁻¹² Moreover, infant related factors such as birth weight, the gender of the infant, congenital malformations and Apgar score can affect the infant mortality.

To determine the factors related to infant mortality over the years, there are types several researches were performed in the worldwide. According to one study, during the 1990s, especially improvement in malnutrition status and environmental conditions lead to a decrease in infant mortality of developing countries. Effectiveness and quality of medical care and socioeconomic factors, such as maternal education and diarrhea treatment are the next most important factors for these countries.¹³ In another study, it was found out that 37 weeks of gestation and preterm births are the most important factor for the USA and European countries in 2010.¹⁴

As seen above, the variables to explain infant mortality can change over the time and countries. So researches in this field should be carried out regularly in every time or in every country. The aim of this study was to determine the predictors of infant mortality in last two decades with a bibliometric and a content analysis. A secondary objective was to examine the frequency of publications by year, the distribution of articles by country location and to determine how data were collected and analyzed.

The results of the study could provide a useful reference to researchers for the future research directions.

METHODS

Bibliometrics is a quantitative research method of evaluation of publications.¹⁵ The term of bibliometrics was firstly defined by Alan Pritchard in his publication as the application of mathematical and statistical methods to books and other media of communication.¹⁶ It is a method of evolution of publications using different indicators such as the number of papers, citations, authors, institution or countries.¹⁷

This study was aimed to present the results of a systematic review with a bibliometric analysis. The bibliographic data was obtained from Web of Science database for the years of 1996-2015. The data were extracted using the following standardized queries:

Title=(infant AND mortality) AND (determinant OR cause OR factor OR predictor OR effect OR variation)

Following criteria were imposed for including the documents: (a) publication had to be written as an article. (b) Articles had to be written in English. So documents written in another language were excluded. (c) The publication had to be written from 1996 to 2015 in order to investigate last two decades.

A general content analysis was also performed in this study. Content analysis is a qualitative research method that has been commonly used in health studies. It includes some steps such as defining the categories of world related subject, coding the words and analyzing the results.¹⁸ In order to investigate the how data were collected and analyzed and to find the most important determinant of infant mortality, a manual content analysis was used.

RESULTS

From 1996 to 2015, a total of 478 articles published in journals were found. 306 articles were written in English. However, a total of 298 scientific papers on the infant mortality were included in this study, excluding duplicates and irrelevant fields such as zoology. In Figure 1, the volume of IM published between 1996 and 2015 was presented. According to this, the number of articles increased from 7 articles in 1996 to 27 articles in 2015. Although there were a significant increase in the number of researches in 2000 (n=23), 2015 (n=27) and in 2012 (n=29), the number of publications were declined sharply in 2002 (n=5) and 2013 (n=14).

The distribution of publications on infant mortality by first ten countries where the studies were actually carried out was given in Figure 2. The analysis of articles revealed that most studies were performed in USA (n=74) and cross-countries (n=28). The other countries were

Brazil (n=15) and Bangladesh (n=14). Only one publication was performed in Egypt, in Benin, and in Mozambique. A total of 139 articles were made in developed countries and 122 of them were located in developing countries. This result confirmed that developing countries had the nearly same amount of publication with developed countries.

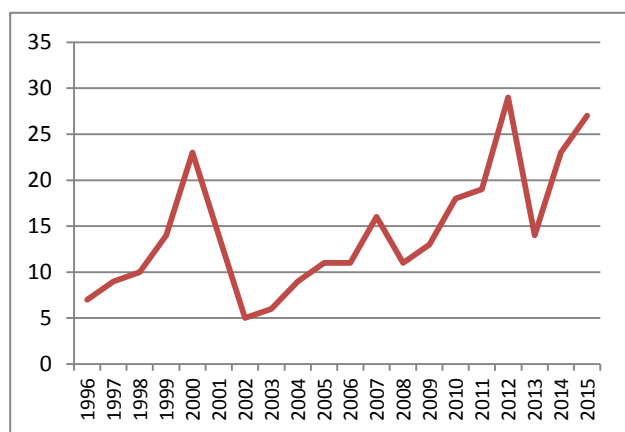


Figure 1: Distribution of publications per year on infant mortality;1996-2015.

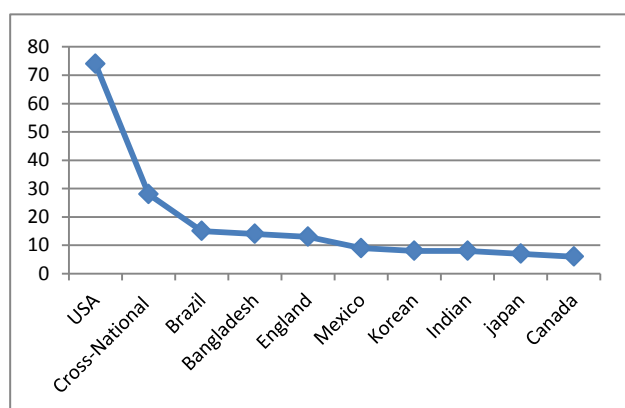


Figure 2: Distribution of publications on infant mortality by the country location of the studies; 1996-2015.

Data collection methods of articles were outlined in Figure 3. As seen, researchers mainly used the records (n=88), national statistics (n=78) and cohorts (n=42) to collect data. Records included the hospital records, data of censuses, demographic surveillance systems, and birth/death records. In contrast, cross-sectional study (n=8) and the case-control study (n=4) were used in a few articles as data collection tools to determine the predictors of infant mortality. Health survey (n=27), randomized trial (n=22) and qualitative methods (n=20) such as interview, systematic review and document investigation also used in some studies as data collection tool.

In Figure 4, the distribution of articles on infant mortality by data analysis methods published between 1996 and

2015 was presented. Logistic (n=99), linear (n=49) or Cox Hazard regression (n=32) analysis were mostly performed to investigate determinant of the infant mortality. Principal component analysis, univariate analysis and generalized estimating equation were determined as the least used data analysis methods. Meta-analysis correlational analysis and Bayesian approach were used less than ANOVA, OLS regression models and, survival analysis to identify the determinants of infant mortality.

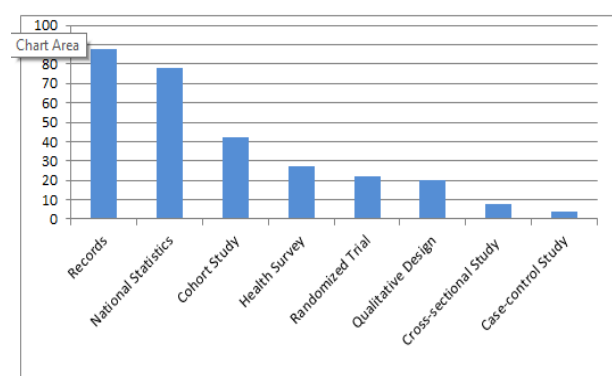


Figure 3: Distribution of publications on infant mortality by data collection methods;1996-2015.

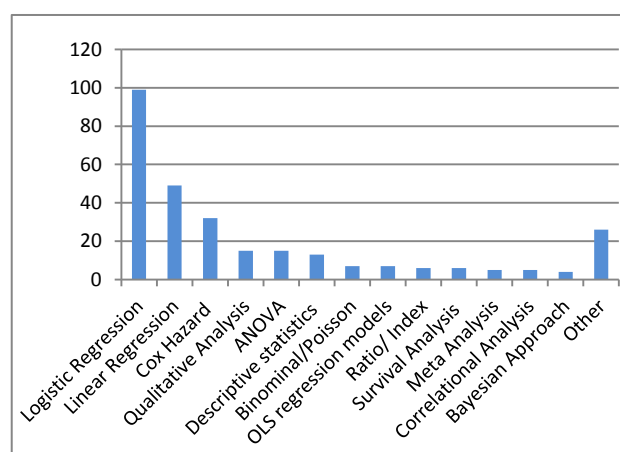


Figure 4: Distribution of publications on infant mortality by data analysis methods;1996-2015.

Content analysis was conducted to determine the ten most important factors of infant mortality. Analysis results showed that infections (sepsis and neonatal infections) and illness (cardiac illness, respiratory illness, gastrointestinal illness, hemorrhage, tetanus, and HIV) (n=61), low birth weight (n=43) and low gestational age (n=42) were the three most important factor affecting infant mortality in Figure 5. The results also showed that declining in infant mortality depended on rising in female literacy (n=31) and income level of countries or households (n=36) during the last two decades. According to the country distribution, while the race/ethnicity was the main factor in the USA, gestational age was the most important factor in Brazil.

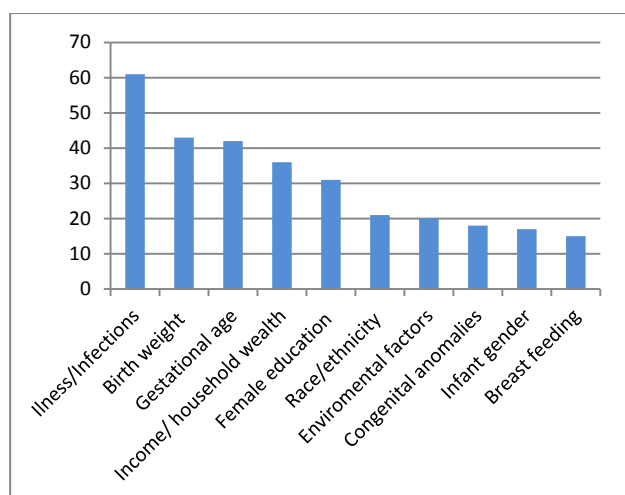


Figure 5: The ten most important factors affecting infant mortality;1996-2015.

DISCUSSION

In the last decades, some positive developments have been seen in the publication area of infant mortality. This paper tries to describe the results of the analysis of infant mortality in 1996-2015. There was a significant increase in the number of researches in 2000, in 2015 and in 2012. The most studies were commonly made in the USA, cross-countries (more than one country) and Brazil. There was no publication gap identified between developed and developing countries where the studies were actually carried out. Most of the studies used the records, national statistics and, cohorts to collect data. Logistic, linear or Cox Hazard regression analysis were mostly performed to investigate determinant of the infant mortality.

In this study, the main predictors of infant mortality were identified as diseases, birth weight and gestational age. According to these results, illness and infections, low birth weight, and low gestational age were associated with infant mortality. Some researchers also indicated that there was a significant relationship between illness and infant mortality.^{19,20} Moreover, meta-analysis was found that infections such as sepsis/pneumonia, tetanus and diarrhea were the main cause of neonatal deaths in the worldwide.²¹ In some studies, low gestational age and low birth weight were the main indicators of infant mortality.²²⁻²⁶ In contrast, some publications indicated that there was still a meaningful relationship between infant mortality and older mother age or higher birth weight.^{27,28}

The study has several limitations. The tools used to obtain the bibliometric data cannot cover all the articles on the related subject in last two decades. Also, bibliometrics was based on the utilization of bibliographic databases, changes in journal titles, limited coverage and selection strategies of journals can reduce the reliability of research evaluation. Despite the all these limitations, this study provides a useful reference to

researchers for the future research directions. This study also contributes to our understanding of infant mortality by years, country locations, study types and determinants of it. Besides this, the results of the study are also expected to provide evidence-based information to health policymakers to evaluate the best policy approaches for efforts on reducing infant mortality. Further efforts of countries to lower infant mortality have to focus on preventing diseases and low birth weight deliveries and improving female literacy.

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