Implementation of Health Belief Model in Incidence of Low Birth Weight Babies: A Bibliometric Analysis

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Received: June 2, 2024
Accepted: July 25, 2024
Available online: Agustus 10, 2024

Abstract. *LBW babies is defined by WHO as birth weight of less than 2500 grams regardless of gestational age, having adverse consequences on infant survival as well as physical and cognitive development. HBM is considered very suitable to be applied to pregnant women to reduce prevalence of LBW babies because it is based on maternal beliefs or beliefs about behaviors that can make mother herself not want baby born with LBW. The aim of study was to analyze how study on implementation of HBM on incidence of LBW babies and its trends and to find out what topics can be used as study variables in future. Study method is literature review using bibliometric analysis approach starting from defining keywords 'health belief model' and 'LBW babies' in Publish or Perish application with Google Scholar as database. Then results were narrowed down by selecting special topic on 'implementation of HBM on incidence of LBW babies', 65 related articles were obtained for review from 112 articles from the initial search results. Mendeley application was used to compile meta data and Vosviewer application was used to create research visualization trends. Results showed that classification of research on implementation of HBM on incidence of LBW babies in health sector was divided into seven clusters with topics centered on implementation of HBM on incidence of LBW babies. Themes related to implementation of HBM on incidence of LBW babies still require further research development because results of visualization analysis that two keywords have no research linkage.*

Keywords: *implementation, health belief model, incidence, low birth weight babies*

1. INTRODUCTION

Low birth weight (LBW) babies, defined by the World Health Organization (WHO) as birth weight of less than 2500 gram regardless of gestational age, has adverse consequences for baby survival and physical and cognitive development (McCormick, 1985; Barker, 1995). Very low birth weight (VLBW) babiess, defined as those with birth weight of 2500 gram or less, are at high risk of death and disease in their first year of life (Ballot, Chirwa and Cooper, 2010).

In low-income countries about 60% of all baby deaths are reported to occur in low birth weight (LBW) infants. Most of these deaths occur in the neonatal period when the risk of death is six times higher than in high-income countries (Lawn, Cousens and Zupan, 2005; Sherman, 2006; World Health Organization, 2009). LBW babies has been associated with

increased risk of respiratory disease and diarrhea (Taylor *et al.*, 1982; Victora *et al.*, 1990; Lira, Ashworth and Morris, 1996), impaired growth and mental development, and poor outcomes in young adulthood (Ashworth *et al.*, 1998; Bhutta *et al.*, 2002; Hack *et al.*, 2002). HIV infection, malaria, malnutrition, and anemia during pregnancy and younger maternal age have been reported as risk factors for LBW babies (Kramer, 1987; Brocklehurst and French, 1998; Guyatt and Snow, 2004; Rollins *et al.*, 2007).

Health belief model (HBM) can be used as suitable framework for designing and implementing educational interventions aimed at improving pregnant mothers self-care behaviors and birth weight (Izadirad *et al.*, 2021). Other studies also show that the health belief model is very suitable to be applied in improving behavior of fulfilling malnutrition such as anemia in pregnancy so that it can reduce pregnancy complications such as anemia, premature birth, LBW babies (Baharzadeh *et al.*, 2017; Dewi, Umijati and Aditiawarman, 2020; Azzizah, Faturahman and Novianti, 2021).

From description above, research, especially related to the implementation of HBM on incidence of LBW babies, still has to be done. The study is to find out, to what extent the implementation of HBM is used to reduce the incidence of LBW babies.

2. RESEARCH METHODS

A bibliometric approach was used as method of this research, which is seen from literature review. Good literature review uses systematic, explicit and reproducible method (Fink, 2019; Garza-Reyes, 2015) or mapping method with an emphasis on knowledge (Tranfield, D., Denyer, D. and Smart, 2003). Bibliometric analysis is used to examine evolution of study domain, including study topics and authors. It is based on social, intellectual, and conceptual structure of discipline (Donthu, N., & Gustafsson, 2020). Bibliometric analysis is usually utilized within discipline and focuses on quantitative studies such as journal papers, books, or other types of written communication (Stahl *et al.*, 2010).

Five steps of bibliometric analysis method used according to Fahimnia *et al.*, (2015) include defining the words "health belief model" and "infant low birth weight" as the initial search key (Defining Search Keywords), Initial Search Results, Refinement of the Search Results, Compiling Statistics on the Initial Data, and Data Analysis.

a. Defining Search Keywords

Literature search was conducted in January 2023, using keywords "health belief model" and "infant low birth weight". PoP software with database from Google Scholar was used to collect data. We first entered query into the PoP software, using the keywords "health belief model" and "low birth weight babies", and set special condition for "journals" with publication years 2017-2022 and we excluded newspapers, magazines, books, book reviews, book chapters, and anything that was not published scientific article. We also set maximum search limit of 200 journal articles. From Google Scholar database, we obtained 112 articles in initial search that had been published during 2017-2023

b. Initial Search Results

Table 1 shows the list of top ten articles identified by PoP (Unrefined Search).

Table 1 Top 10 Articles Identified by PoP (Unrefined Search)

Author(s)	Title	Citation
Beverly Rossman, Michelle M. Greene, Amanda L. Kratovil, Paula P. Meier	Resilience in Mothers of Very-Low-Birth-Weight Infants Hospitalized in the NICU (Rossman *et al.*, 2017)	62
Pia Lundqvist, Janne Weis, Bengt Sivberg	Parents' journey caring for a preterm infant until discharge from hospital-based neonatal home care—A challenging process to cope with (Lundqvist, Weis and Sivberg, 2019)	59
Shahirose S. Premji, Gianella Pana, Genevieve Currie, Aliyah Dosani, Sandra Reilly, Marilyn Young, Marc Hall, Tyler Williamson, Abhay K Lodha	Mother's level of confidence in caring for her late preterm infant: A mixed methods study (Premji *et al.*, 2017)	57
Parisa Parsa, Simin Karimi, Behnaz Basiri, Godratalah Roshanaei	The effect of kangaroo mother care on physiological parameters of premature infants in Hamadan City, Iran (Premji *et al.*, 2017)	55
Daphne N McRae, Patricia A Janssen, Saraswathi Vedam, Maureen Mayhew, Deborah Mpofu,	Reduced prevalence of small-for gestational-age and preterm birth for women of low socioeconomic position: a population-based cohort study comparing antenatal	53

Author(s)	Title	Citation
Ulrich Teucher, Nazeem Muhajarine	midwifery and physician models of care (McRae *et al.*, 2018)	
Mark J Johnson, Alison A Leaf, Freya Pearson, Howard W Clark, Borislav D Dimitrov, Catherine Pope, Carl R May e	Successfully implementing and embedding guidelines to improve the nutrition and growth of preterm infants in neonatal intensive care: a prospective interventional study (McRae *et al.*, 2018)	46
Margaret G. Parker, Munish Gupta, Patrice Melvin, Laura A. Burnham, Adriana M. Lopera, James M. Moses, Jonathan S. Litt, and Mandy B. Belfort	Racial and Ethnic Disparities in the Use of Mother's Milk Feeding for Very Low Birth Weight Infants in Massachusetts (Parker *et al.*, 2019)	44
Naseh Ghaderi, Mohammad Ahmadpour, Nadia Saniee, Fattaneh Karimi, Chiman Ghaderi, Hamed Mirzaei	Effect of education based on the Health Belief Model (HBM) on anemia preventive behaviors among iranian girl students (Ghaderi *et al.*, 2017)	43
Sabah Ramadan Hussein Ahmed, Amany Mohamed Saad Esa, Ons Said MohamedEl-zayat	Health Belief Model-based educational program about cervical cancer prevention on women knowledge and beliefs (Ahmed, Esa and MohamedEl-zayat, 2018)	23
Rebecca Dawar, Sushma Nangia, Anu Thukral, Sapna Chopra, and Rajesh Khanna	Factors Impacting Practice of Home Kangaroo Mother Care with Low Birth Weight Infants Following Hospital Discharge(Dawar *et al.*, 2019)	22

c. Refinement of the Search Results

We excluded articles that were not suitable for the screening criteria, Table 2 shows results of this process. References from articles that seemed important met requirements. From the initial 112 articles, we withdrew 65 articles. After checking the titles and abstracts, 47 articles were excluded for various reasons. Table 2 shows comparison of metric data from initial search and refined search.

Table 2 Article Screening Results

Search Screening	Total articles
Tidak Relevan (HBM dan LBW)	18
Non-penyebab Topics	12
Unidentified/citation link only	6
Bukan Jurnal	11
Topik HBM dan LBW	65
Total	112

d. Compiling Statistics on the Initial Data

Search generated after refinement was then downloaded, saved in Mendeley application and exported to RIS format to include all important information related to paper, including title, author names, abstract, keywords and journal specifications (journal of publication, year of publication, volume, issue, and pages).

e. Data Analysis

This paper presents bibliometric analysis for the keywords "health belief model" and "infant low birth weight" from the Google Scholar database. Bibliometric analysis in this paper used the PoP application and obtained 112 articles from initial search results with 1095 citations (182.50 citations/year). Filtering the search results based on predetermined categories left 65 articles (decrease of 47.11%). Citation data also changed, with 464 citations and 77.33 citations/year. Full results of the comparison of metrics before and after narrowing search are summarized in Table 3.

Table 3 Comparison Matrix

Data Matrix	*Initial Search*	*Refinement Search*
Source	Google Scholar	Google Scholar
Article(s)	112	65
Citation	1095	464
*Cites p*er years	182,50	77,33
*Cites p*er article	9,78	7,14
Author(s) per article	3,45	3,34

3. RESULTS AND DISCUSSION

Self efficacy and perceived barriers of pregnant women regarding exposure to second hand smoke at home: Journal of Education and Health Promotion is most cited article with total of 12 citations in study trend in field of HBM implementation on incidence of LBW in health sector (Diddana *et al.*, 2018). The second most cited article is Ahmed Elsobkey (2018) with the title Mothers' Health Education based on Health Belief Model to Promote Health of Preterm babies Related to Sudden Infant Death Syndrome has total of 11 citations.

After taking into account citation frequency and other metrics, we analyzed output of the PoP application into VOSviewer application to determine what keywords appeared frequently. The VOSviewer application was used to visualize the bibliometric map on three different visualizations, namely network visualization, overlay visualization, and density visualization.

Full calculation on the PoP application was performed with the number of occurrences set to

2 and resulted in 518 keywords and 89 thresholds. for each of the 89 terms, relevance score will be calculated. Based on this score, most relevant term will be selected basic option to select most relevant 60% number selected was 53. We also excluded common words such as newborn, addition, low income, nicu, health treatment center, skin, VLBR, oral helath, covid, data, lifestyle, booklet, framework, adolescent, fanctor, qualitatuve study, care, home, preterm, lbw, and tool so as to finally get seven clusters. The first cluster is intervention, mothers, nutrition, preterm infant, risk factors, and sudden infant death syndrome. with occurences values of 9, 2, 2, 2, and 2, respectively. The second cluster is barrier, experience, family, low birth weight baby, skin contact, and term low bith weight with occurences values of 3, 3, 2, 2, 2, and 2, respectively. Third cluster is educatonal package, exposure, infant mortality, and woman with occurences values of 2, 2, 2, and 2, respectively. Fourth cluster is access, determinant, low birth weight neonate, and prevalence with occurences value respectively occurences 2, 2, 2, and 4. Fifth cluster is health, health melief model, pregnant mother respectively occurences 4, 2, and 2. The sixth cluster is health melief model construct, preterm delivery, preventive behavior respectively occurences 2, 3, and 3. Seventh cluster is effectiveness and VBLW infant with occurences valuedeath 2 and 2.

From clusters mentioned, the following VOS viewer analysis results can be seen:

a. Network Visualization

Research related to implementation of HBM on occurrence of LBW babies from results of VOSviwer analysis seen from network visualization shows red. In cluster that appears to have closeness of keywords that have been researched and related to each other marked by thicker color of connecting line and bigger and thicker the color of circle means that many keywords have been examined. Results show that when viewed from keyword "health belief model" there are three interconnected clusters conducted in research with three words namely intervention, health, and pregnant mother and woman.

Figure 1 Network Visualization Analysis With Keywords Health Belief Model

When viewed from keyword "low birth weight babies" there is only one cluster with two words namely prevalence and access which are interconnected and often conducted research.

Figure 2 Network Visualization Analysis With Keywords Low Birth Weight Babies

When viewed from the keyword "low birth weight baby" there is only one cluster with words namely barrier, skin contact, family, experience, and term low birth weight which are interconnected and often conducted research.

Figure 3 Network Visualization Analysis With Keywords Low Birth Weight Babies

From three results of bibliometric analysis through network visualization, it shows that the keywords "health belief model" and "low birth weight babies" have not been researched simultaneously and have not been connected. It can be seen that there are no connecting lines either between clusters or between keywords. Results of this network visualization provide clear view of dominant research focus in literature related to implementation of HBM on incidence of LBW babies. This information can be useful for determining research trends, identifying areas that need more research, and designing further research in this field.

b. Overlay Visualization

Research related to the implementation of HBM on incidence of LBW babies from results of VOSviwer analysis seen from visualization of study year shows that one cluster is that the last study was conducted in minimum score in 2018 which is marked in purple until maximum score in 2021 fades color to yellow. In clusters that appear to have keyword entanglements that have been researched and related to each other, the older color of connecting line keyword circle, the longer study year. However, if younger color of connecting line keyword circle, younger year. Results of overlay visualization analysis show that when viewed from keyword "health belief model" there are three interconnected clusters conducted in research with three words namely intervention, health, and pregnant mother and woman. Study with keyword "health belief model" turned out to have started in 2021, but if it is associated with the keyword "intervention", then study was last researched around 2019. Study with keyword "health belief model" if it is associated with the keyword "woman", then study was last studied around the year between 2019-2020. Study with keyword "health belief model" when associated with keyword "health", then study was last studied around year between 2020-2021.

Figure 1 Overlay Visualization Analysis With Keywords Health Belief Model

If study with keyword "low birth weight babies" it turns out that starting between 2020-2021 there have been many studies associated with keywords "prevalence" and access.

Figure 5 Overlay Visualization Analysis With Keywords Low Birth Weight Babies

However, if study with keyword "low birth weght babies" turns out that starting in 2019 there have been many studies, but if it is associated with keyword "barrier" and "family", then study was last studied around 2019. Study with keyword "low birth weight babies" if associated with keyword "skin contact", then study was last studied around year between 2019-2020. Study with keyword "low birth weight babies" if associated with keyword "experience" and "term low birth weight", then study was last researched around 2020.

Figure 2 Overlay Visualization Analysis With the Keyword Low Birth Weight Baby

Overlay visualization of research years is useful tool to see trends in research related to implementation of HBM on incidence of LBW babiesover time. Results of this overlay visualization analysis provide insight into how study trends have evolved over time in context of implementation of HBM on LBW baby incidence, which can strengthen and help researchers to understand changes in research interest, shifts in focus, and identification of areas that may require further research.

c. Visualization of distribution/densit

Study related to the implementation of HBM on the incidence of LBW babies from results of VOSviwer analysis seen from visualization of distribution or density of study shows that one cluster that keywords emphasized in yellow are clearly keywords that are often researched, namely nutrition, risk factors, intervention, health, death, preterm delivery, woman, prevalence, preventive behavior, health belief models, and experience. Meanwhile, the yellow-green color and even almost green color are keywords that are still rarely researched, namely effectiveness, determinant, low birth weight babies, exposure, access, infant mortality, barrier, skin contact, low birth weight babies, family, and term low birth weight.

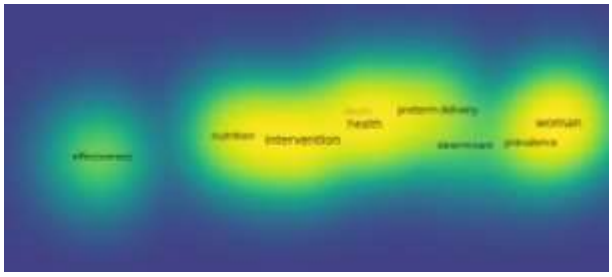

Figure 3 Scatter Visualization Analysis

Bibliometric analysis using the PoP and VoSviewer applications related to implementation of HBM on incidence of LBW babies with keywords "health belief model" and "LBW babies" with journal publication time span between 2017 - 2023 shows that two keywords do not have mutual attachment or closeness in study relationship. This is shown by results of network visualization analysis and is supported by results of visualization analysis of overlay or research year that research related to keywords is mostly researched in 2019-2021. In addition, results of density visualization analysis also show that two keywords still require research development.

HBM is conceptual formulation to determine individuals' perceptions of whether or not they accept their health. Variables assessed include individuals' desire to avoid illness, their belief that there are efforts to avoid disease (Becker and Janz, 1985). HBM is actually behavior change model that specifies individuals cognitively demonstrate healthy behaviors and efforts to get healthy or cure disease. This is based on individual beliefs or beliefs about healthy behaviors and certain treatments that can make the individual healthy or cured.

In incidence of LBW babies, HBM can actually help in reducing prevalence rate both in the world and in Indonesia. LBW babies itself is the first weight of newborn obtained after birth. For babies born alive, birth weight should be measured within the first hour of life, before significant weight loss occurs after birth. LBW babies is defined as less than 2,500 grams (Unicef, 2023).

HBM conducted to reduce incidence of LBW babies should be applied to mothers during pregnancy. Model is very suitable to be implemented in pregnant mothers, because pregnant mothers have desired that baby that will be born will not experience LBW babies. This is supported by previous research which shows that educational interventions based on health promotion patterns as one of HBM can be effective in increasing awareness, better understanding of risks, reducing barriers to healthy behavior and ultimately, improving women's health and nutritional performance during pregnancy (Khoramabadi *et al.*, 2015). Therefore, mothers would want the incidence of LBW babies to be avoided

4. CONCLUSION

This study presents bibliometric analysis using PoP and VOSviewer applications on related research publications taken from the Google Scolar database from 2017 to 2023. The Google Scolar database was used as the main source to process Bibliometric study so as to identify 112 articles from the initial search results with 1095 citations (182.50 citations/year). Filtering search results based on predetermined categories left 65 articles (decrease of 47.11%). Data on citations also changed, namely 464 citations and 77.33 citations/year. This bibliometric study showed that themes related to implementation of HBM on incidence of LBW babies still require further research development. This is evident in results of visualization analysis that keyword HBM has no research linkage with keywords either infant low birth weight or low birth weight neonate or low birth weight baby. Therefore, researchers can utilize the Google Scolar database to develop their research and find references or references to support their research.

ACKNOWLEDGMENT

Thank you to the supervisors who helped make this research possible.

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