A Review of Empirical Literature on Maternal Factors and Child Malnutrition

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Abstract

Malnutrition is a health complication leading to the downward economic development of any country. Children are the crucial group more prone to suffer from malnutrition than the other groups in the malnutrition circle. Identifying the different maternal factors affecting for child malnutrition is an important step in the process of reducing child malnutrition. The objective of this study is to accomplish a review of the empirical literature on maternal factors and child malnutrition by analyzing past empirical literature. The judgment sampling technique was utilized to select a sample of 40 research articles on the relationship between various factors and child malnutrition and the articles with the maternal factors were filtered and reviewed. Analyzing the data was achieved through the use of descriptive statistics and content analysis. The results found that more than 75% of journal articles reviewed have discussed the maternal factors affecting child malnutrition. Mothers' Education, Mothers' Breastfeeding practice, Maternal Health, Age of Mother (the current age of mother and mother's age at pregnancy), BMI of mother, Mothers' Employability and Mass Media expose are the most important maternal factors related to child malnutrition. The finding of this study suggests the future researchers study the maternal factors and child malnutrition focusing on school children since they were paid less attention by the reviewed research studies. The results may be a guide for future researchers and scholars who are interesting in the issue and may inform the health sector where effective future intervention should be improved to overcome the incidence of child malnutrition.

Keywords: Empirical literature, Historical approach, Malnutrition, Maternal factors, Research articles

INTRODUCTION

Malnutrition is a health complication leading to downward of economic development of any country. Today it has become a major global challenge nevertheless many other indicators such as life expectancy and literacy rate are well achieved. According to World Health Organization (WHO) (2020), malnutrition is a situation caused by prevailed deficiencies, excesses, or imbalances in a person's intake of energy and/or nutrients. Children are the crucial group more prone to suffer from malnutrition than the other groups in the malnutrition circle. WHO (2020) estimated that globally, 144.0 million of children under 5 are suffering from stunting, 47.0 million and 14.3 million of children under 5 are affected by wasting and severe wasting respectively while 38.3 million are overweight? Annually, more than 3 million preventable child deaths occurred due to undernutrition (Cunningham et al., 2015). Efficient labor supply and economic development depend on a healthier nation and reducing child malnutrition is a very important and essential requirement to achieve this goal. Identifying the different maternal factors affecting for child malnutrition is an important step in the process of reducing or combating child malnutrition.

Many researchers have conducted their research on the diverse maternal and other factors affecting for child malnutrition. Plenteous research papers have been published on this issue in the past by many countries in the world (eg: Demissie and Worku, 2013; Fagbamigbe et al., 2020; Hannah et al., 2017; Sargana and Mohyuddin, 2013; Magalhães and Clements, 2011; Yadav and Dixit, 2017). As an area of investigation, this has achieved enormous recognition among researchers. However, the main barrier to studying the various maternal factors that affecting for child malnutrition is the unavailability of a consistent theoretical framework or logic to guide for identifying the relationship. Generally, the relationship between maternal socioeconomic and health factors and child malnutrition is obvious. Maternal factors sturdily affect child malnutrition and finally long-term health complications. Maternal factors had significant effects on both severe and moderate malnutrition among children aged 0-59 months in Bangladesh (Rahman et al., 2009). However, the studies on investigating the maternal factors that affect for child malnutrition by reviewing past empirical studies are rare to find. The objective of this study is to accomplish a review of the empirical literature on maternal factors and child malnutrition by analyzing past empirical literature from 2005 to 2020. A review of literature of what has accomplished in the past on maternal factors and child malnutrition may direct the future researchers and scholars who are interesting in the area and may inform the health

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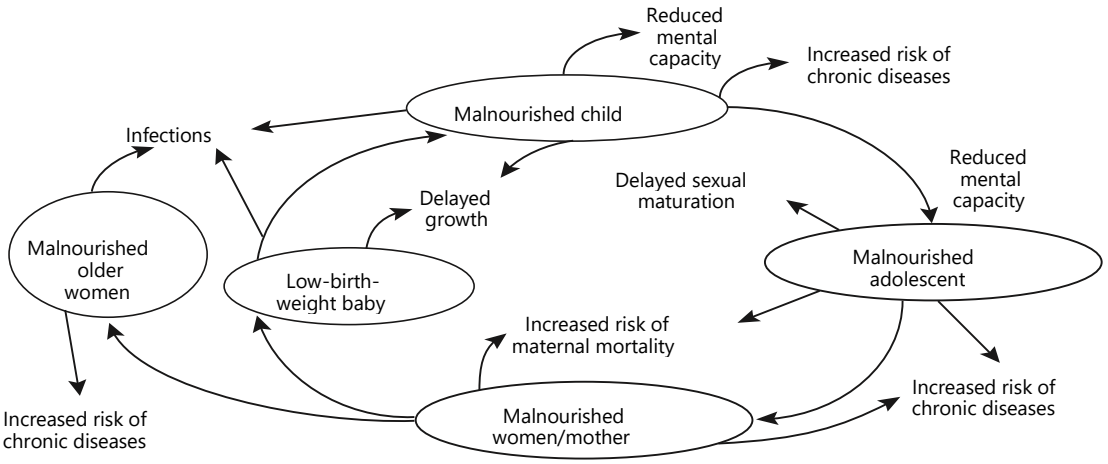
sector and other authorities where the effective future intervention should be improved to overcome the incidence of child malnutrition.

THEORETICAL BACKGROUND

A literature review means summarizing and evaluating a body of existing knowledge relating to a specific topic (Knopf, 2006; McCombes, 2019). The term literature refers to the available knowledge of a particular area of investigation of any discipline while the term 'review' means the assessment or evaluation. Literature Review is the evaluation of the available knowledge in the field of investigation in a unique way to identify research gaps which provide the rationale for the study. Literature review is conducted mainly under three types such as empirical literature, theoretical literature and methodological literature. The study attempts to review empirical literature relating to the maternal factors and child malnutrition. An empirical literature review is more commonly called a systematically examine the past empirical studies to answer a particular research question (Gohavacyf (Blog), 2020). Malnutrition refers to both undernutrition and over-nutrition (Das and Gulshan, 2017). Child malnutrition may be defined as a pathological state resulting from inadequate nutrition, including undernutrition (protein-energy malnutrition) due to insufficient intake of energy and other nutrients; overnutrition (overweight and obesity) due to excessive consumption of energy and other nutrients; deficiency diseases due to insufficient intake of one or more specific nutrients such as vitamins or minerals (Ge and Chang, 2001). Malnutrition continues as a circle and child malnutrition is predominant in this vicious cycle.

Figure 1: Malnutrition cycle



Source: Dasa, Lassib, Hoodbhoya, and Salama, 2018.

According to figure 1, when the malnourished mothers deliver baby with low birth weight, low birth weight baby becomes malnourished child with his or her growing and may suffer from this situation continuously due to some reasons such as poor economic status of family, low educational level of parents while some may recover from the situation. With the insufficient growth, when children become adolescents, they continue the malnutrition situation, as this going through out the cycle. It is associated with low mental capacity of the child. When the child is growing up as female, this situation leads to continue the malnutrition among pregnant mothers. As a result, malnourished mothers may give birth to a baby with low weight. As malnutrition mothers give birth to low-birth-weight babies, it goes throughout their lives. And also, women who are undernourished are at a higher risk of dying at the pregnancy or giving birth prematurely. If young men and women don't recover from malnutrition at their young age, they may suffer from malnutrition continuously and leading to elderly malnutrition and it remain until they die creating very adverse effects to any country in its development process.

Different types of factors are responsible for child malnutrition. Demographic factors, health factors, social factors, geographical factors and economic factors are well identified among them. Rahman and Chowdhury (2007) pointed out that the demographic characteristics are existing as the key significant factor for chronic malnutrition in the study of determinants of chronic malnutrition of preschool children in Bangaladesh. According to Fagbamigbe et al. 2020, healthcare services is a main attribute to the nutritional status of urban children. Yadav and Dixit (2017) indicated that a significant association between socioeconomic status of parents and the nutritional status of children. Rahman and Chowdhury (2007) has showed that regional differentials were significantly associated with severe as well as moderate stunting. According to Zhang et al. (2016), household economic status was a significant factor for malnutrition among children.

Many researchers have paid the attention for maternal factors through all these demographic, health, social, geographical and economic areas. Generally, the relationship between maternal socioeconomic and health factors and child malnutrition is obvious. Maternal factors sturdily affect child malnutrition and finally long-term health complications. According to Rahman et al. (2009), maternal factors had significant effects on both severe and moderate malnutrition among children. However, the separate studies focusing directly the maternal factors are limited. The main barrier to studying the various maternal factors affecting for child malnutrition is the unavailability of a consistent theoretical framework or logic to guide for identifying the relationship. However, the studies on investigating the maternal factors that affect for child malnutrition by reviewing past empirical studies are rare to find which is a huge gap in the literature.

METHODOLOGY

This study was based on the historical approach of reviewing past empirical literature on the maternal factors and child malnutrition which was filtered from the research articles on the different factors and child malnutrition. A research article is the sampling unit of analysis in this study. A sample of 40 research articles published from 2005 to 2020 was selected for getting reviewed. Since the sampling frame is unavailable and the entire population is inaccessible judgment sampling technique belonged to non-probability sampling methods was employed in selecting research articles for the sample. The electronic search was directed to search for studies used in this review by searching internet resources. The selected articles have been published in different kinds of journals. Many countries have been investigated by researchers. Case studies research articles were not considered in this study.

Data entering and data processing was the initial step for data analysis. By investigating the research papers, important points were summarized in an excel sheet. The rows were arranged for research articles while the columns were arranged for their important points. This summary includes name of author, year of publication, name of the journal, country investigated, sample size, data types, analytical approach, unit of analysis, measurement of malnutrition and maternal factors used as independent variables such as Mother's Education Mother's Breastfeeding, Maternal Health, Age of Mother (current age of mother and mother's age at pregnancy), BMI of mother, Mothers' Employability, Mass Media expose of mother and Marital Status. Data analysis was achieved using descriptive statistics and content analysis. Considering the key characteristics of the sample of research articles, size of the sample, unit of analysis, data collection method, analytical approach and statistical tests, year of publication, type of journal, country investigated are important. The minimum and maximum sample size of primary data-based studies of reviewed articles were 85 and 1792 respectively. The majority, 65% of these studies reported sample sizes of over 300. All reviewed articles here have used the child as the unit of analysis. However, 80%, the majority of studies has paid their attention to the group of children under five years while only 20% was about school age children. Considering the Sri Lankan context, only 12.5% of studies have investigated Sri Lanka. Besides, only one study has paid attention to school children in the plantation community in Sri Lanka. The articles reviewed here have employed both primary and secondary data sources. The majority of researchers, 57.5% have conducted their research based on primary data while 42.5% have conducted using secondary data. Considering the analytical approach, 58% of the research studies have employed binary or multivariate logistic regression techniques. Besides, various types of approaches such as the t-test, chi-square test, ANOVA, discriminant analysis, log linear model, and structural equation were also used.

Considering the year of publication, the highest percentage of research articles (22.5%) in the sample have been published in 2017. More than 75% of reviewed papers belonged to the immediate last ten years, from 2011 to 2020. The selected articles have been published in different kinds of journals. The majority of selected articles have come from some of the most popular medical journals including, American Journal of Public Health Research, BioMed Research International, Global Health, Science Journal of Public Health, BMC Nutrition, Annual Nutrition Metab, Rural and Remote Health, Maternal and child nutrition, Journal of Tropical Pediatrics among others such as Tropical Agricultural Research and International Journal of Social Economics. The selected studies have been conducted in many countries in the world. A majority, 60% out of 40 studies reviewed here, has been conducted in Asian countries. Therefore, the determinants investigated are more applicable to work out in Asian countries. The second place has been obtained by African countries recording 35%. Besides, an important contribution has been made by studying European countries and American countries too.

RESULTS AND DISCUSSION

There have been numerous research articles published on the maternal and other factors affecting for child malnutrition and reviewing them convinces to identify what has accomplished in the past research studies on the maternal factors affecting for child malnutrition.

Child Malnutrition

The variable, incidence of child malnutrition has played the key role in the discussion made through these reviewed articles as the dependent variable. Different types of measurements for indicating child malnutrition were applied as the dependent variable as given in the table 1.

Table 1: Indices applied to measure malnutrition

Index	Reference
BMI	Galgamuwa et al. (2017); Getaneh et al. (2019); Igbokwe et al. (2017); Kulaga et al. (2010); Tette et al. (2016); Zhang et al. (2016)
WFH	Ahsan et al. (2017); Fagbamigbe et al. (2020); Habyarimana et al. (2016); Jayawardena (2015); Keerthiwansa et al. (2014); Pravana et al. (2017); Rahman et al. (2009)
WFA	Cheah et al. (2010); Chowdhury et al. (2018); Das and Gulshan (2017); Demissie, and Worku (2013); Hannah, et al. (2017); Justice Moses et al. (2015); Kabir et al. (2018); Sargana, and Mohyuddin (2013); Yadav and Dixit (2017)
HFA	Duru et al. (2015); Gebre et al. (2019); Kandala et al. (2011); Khan and Mohanty (2018); Linnemayr et al. (2008); Mustari et al. (2017); Oliveira Assis et al. (2007); Rahman and Chowdhury (2007); Rathnayake and Weerahewa (2005); Magalhães and Clements (2011); Ubeysekara et al. (2015)
MUAC	Ayana et al. (2015); Dodos et al. (2018); Ghimire et al. (2020); Hossain et al. (2020)
CIAF	Ali Khan and Azid (2011); Endris et al. (2017
New Index	Debnath and Bhattacharjee (2014)

Source: Literature survey, 2020

Usually, there have been three methods to assess health or nutritional status representing anthropometric indicators, biochemical indicators, and clinical indicators. Among them, anthropometric measurement is the most popular, common, and easy assessment of the health and nutritional status of children. With international consistency, anthropometric indicators advocated to measure malnutrition are Birth Weight: malnutrition at birth, Weight for Age (WFA): underweight, Height for Age (HFA): stunting, Weight for Height (WFH): wasting, and body mass index.

Table 2: Percentages of each indices applied to measure malnutrition

Index	BMI	WFH	WFA	HFA	MUAC	Others
Count	6	7	9	11	4	3
Percentage	15	17.5	22.5	27.5	10	7.5

Source: Literature survey, 2020

Table 2 shows that the highest percentage, approximately 28% of researches studies have measured malnutrition in terms of HFA. It is noticeable that three indices, HFA, WFA and WFH are dominating in the context.

Maternal Factors

Table 3 shows the different maternal factors employed in the reviewed articles and they are treated as independent variables. The key attention of this study has been paid for reviewing those maternal factors that influence child malnutrition and they were filtered and reviewed from the research articles on various demographic, socioeconomic, health and geographical determinants on child malnutrition. From the reviewed research articles on determinants of child malnutrition, maternal factors have been studied by 83%. It shows the importance of the maternal factors in determining child malnutrition.

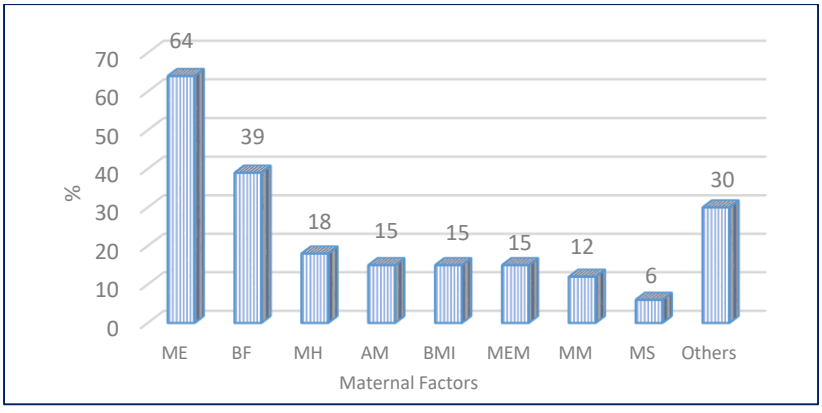
Table 3: Maternal Factors investigated by reviewed research articles

Maternal Factors	Reference
Mother's Education (ME)	Ahsan et al. (2017); Ali Khan and Azid (2011); Ayana et al. (2015); Chowdhury et al. (2018); Das, and Gulshan (2017); Dodos et al. (2018); Duru et al. (2015); Endris et al.(2017); Galgamuwa et al. (2017); Getaneh et al. (2019); Ghimire et al. (2020); Habyarimana et al. (2016); Igbokwe et al. (2017); Jayawardena (2015); Keerthiwansa et al. (2014); Linnemayr et al. (2008); Mustari et al. (2017); Pravana et al. (2017); Rathnayake and Weerahewa (2005); Tette et al. (2016); Zhang et al. (2016)
Mother's Breastfeeding (BF)	Ahsan et al. (2017); Ayana et al. (2015); Cheah et al. (2010); Debnath and Bhattacharjee (2014); Dodos et al. (2018); Gebre et al. (2019); Ghimire et al. (2020); Hossain et al. (2020); Jayawardena (2015); Justice Moses et al. (2015); Pravana et al. (2017); Rahman and Chowdhury (2007); Ubeysekara et al. (2015)
Maternal Health (MH)	Das and Gulshan (2017); Debnath and Bhattacharjee (2014); Dodos et al. (2018); Rahman and Chowdhury (2007); Rahman et al. (2009); Tette et al. (2016);
Age of Mother (AM)	Getaneh et al. (2019); Habyarimana et al. (2016); Kabir et al. (2018); Pravana et al. (2017); Tette et al. (2016)
Mothers' BMI (BMI)	Aheto et al. (2015); Habyarimana et al. (2016); Khan and Mohanty (2018); Rahman and Chowdhury (2007); Tette et al. (2016)
Mothers' Employability (MEM)	Das and Gulshan (2017); Duru et al. (2015); Galgamuwa et al. (2017); Keerthiwansa et al. (2014); Ubeysekara et al. (2015)
Mass Media expose (MM)	Keerthiwansa et al. (2014); Rahman and Chowdhury (2007); Rahman et al. (2009); Tette et al. (2016)
Marital Status (MS)	Dodos et al. (2018); Tette et al. (2016)
Others	Ahsan et al. (2017); Ayana et al. (2015); Cheah et al. (2010); Debnath and Bhattacharjee, (2014); Dodos et al. (2018); Endris et al. (2017); Fagbamigbe et al. (2020); Justice Moses et al. (2015); Oliveira Assis et al. (2008); Rahman and Chowdhury (2007)

Source: Literature survey, 2020

According to the empirical literature, maternal profile includes Mother's Education (ME), Mother's Breastfeeding (BF), Maternal Health (MH), Age of Mother (AM) (current age of mother and mother's age at pregnancy), BMI of mother (BMI), Mothers' Employability (MEM), Mass Media expose (MM) Marital Status (MS) and others.

Figure 2: Percentages of maternal factors investigated



Source: Literature survey data, 2020

Figure 2 shows the percentages of research articles of different maternal factors from the total research articles that investigated maternal factors. Maternal education was key factor investigated by the majority of the research articles. Mother's Breastfeeding practice has received the second place. Other group includes times of pregnancy and early pregnancy, place of delivery, birth interval, family planning, family headed by mother, women's decision-making autonomy and having health insurance.

Mothers' Education and Child Malnutrition: Mothers' Education is an important maternal factor. According to figure 2, from the reviewed articles that investigated maternal factors, Mothers' Education has been studied by 64% and for 95% of them the relationship was found to be significant.

Table 4 Mothers' Education and Child Malnutrition

Reference	Study/Variable	Results
Ahsan et al. (2017)	illiteracy of mother	more likely to be malnourished than child of a literate mothers
Ali Khan and Azid (2011)	mothers' education,	play an important role for child's nutritional status
Ayana et al. (2015)	maternal education	significant relationship with nutritional status as measured by wasting.
Chowdhury et al. (2018)	Completed and in completed secondary education for mothers	less likely to be underweight than uneducated mothers who had no formal schooling
Das and Gulshan (2017)	no or primary education of mother	key factors for malnutrition in both terms of stunting and underweight
Dodos et al. (2018)	educational status of caretaker (did not attend any school)	increased the sever acute malnutrition among children.
Duru et al. (2015)	no formal education for mothers	underweight was highest among children.
Endris et al. (2017)	education of mother	independent relationship with nutritional status of children
Galgamuwa et al. (2017)	being an educated mother	an important factor associated with undernutrition
Getaneh et al. (2019)	No formal education for mothers	probability of getting thin was lesser than mothers had secondary and above education.
Ghimire et al. (2020)	Illiteracy of mother (unadjusted logistics regression model)	significant predictor of severe acute malnutrition
	mother's education level (adjusted model)	no relationship with severe acute malnutrition
Habyarimana et al. (2016)	mother's education level and knowledge of nutrition by mother	key determinants of malnutrition of children
Igbokwe et al. (2017)	maternal education.	significant statistical influence on the nutritional status of children
Jayawardena (2015)	Mother's having below primary education	significantly higher risk of long- term growth failure
Keerthiwansa et al. (2014)	lower maternal education	associated with severe acute malnutrition
Linnemayr et al. (2008)	female education at the primary level	positive impact on nutrition.
Mustari et al. (2017)	education of caretakers	linked to child malnutrition
Pravana et al. (2017)	mother's educational level	not significantly associated with severe acute malnutrition
Rathnayake and Weerahewa (2005)	being a not well- educated mother	children are under nourished
Tette et al. (2016)	mother's education level and mother's literacy	related with malnutrition
Zhang et al. (2016)	maternal education	protective factor to decrease risk of undernutrition

Source: Literature survey, 2020

As given in the table 4, Getaneh et al. (2019), Chowdhury e al. (2018), Igbokwe et al. (2017), Das and Gulshan (2017), Endris et al. (2017), Tette et al (2016), Habyarimana et al. (2016), Duru et al. (2015), Ayana et al. (2015), Ali Khan and Azid (2011) concluded that there is a relationship between mother's education level and child malnutrition. Ahsan et al. (2017) and identified that illiteracy of mother as a significant factor influenced the prevalence of stunting and child of an illiterate mother was more likely to be malnourished than a child of literate mothers. Ghimire et al. (2020) too pointed out that illiteracy of mother is a significant predictor of severe acute malnutrition. Dodos et al (2018) and Mustari et al. (2017) demonstrated that the education of caretakers is linked to child malnutrition. Linnemayr et al. (2008) foundevidence of a positive impact of female education on utrition and Zhang et al. (2016) showed that maternal education as a protective factor to decrease risk of undernutrition.

Considering Sri Lanka, Rathnayake and Weerahewa (2005) found that mothers of undernourished children are not well educated. Keerthiwansa et al. (2014) examined that having malnutrition was associated with lower maternal education. Galgamuwa et al. (2017) and Jayawardena (2015) suggested

that educated and knowledgeable mothers might have better practices to reduce the malnutrition of their children. In contrast, Pravana et al (2017) found that a mother's educational level was not significantly associated with severe acute malnutrition among children. Similarly, in the adjusted model, no evidence was found to have a relationship between mother's education level and severe acute malnutrition among children by Ghimire et al. (2020).

Mothers' Breastfeeding and Child Malnutrition: Mothers' Breastfeeding practice is another important maternal factor related to child malnutrition. As shown by figure 2, 39% of the researchers that investigated maternal factors have paid their attention to Mothers' Breastfeeding.

Table 5: Mothers' Breastfeeding and Child Malnutrition

Reference	Study/Variable	Results
Ahsan et al. (2017)	absence of breastfeeding	significant factor influenced for prevalence of stunting
Ayana et al. (2015)	time of initiated breast feeding and duration the child exclusively breast fed	significantly associated with nutritional status as measured by wasting
Cheah et al. (2010)	breast feeding	significant effects on malnutrition
Debnath and Bhattacharjee (2014)	breast feeding practice	the most important factor that effects child malnutrition.
Dodos et al. (2018)	non-exclusive breastfeeding during first 6 months	significant related with sever acute malnutrition
Gebre et al. (2019)	Initiation of breast feeding	associated with wasting
Ghimire et al. (2020)	no exclusive breastfeeding practices (unadjusted logistics regression model)	significant predictor of severe acute malnutrition
	exclusive breastfeeding practices (adjusted model)	no evidence was found to have a association with severe acute malnutrition
Hossain et al. (2020)	breastfeeding duration of greater than 6 months	reduced the probability of severe acute malnutrition.
Jayawardena (2015)	breastfeeding.	low risk of malnutrition
Justice Moses et al. (2015)	longer breastfeeding duration	increased risk of malnutrition
Pravana et al. (2017)	initiation of breastfeeding and exclusive breastfeeding	not significantly associated with severe acute malnutrition
Rahman and Chowdhury (2007)	breast-feeding	significant association with both severe and moderate stunting.
Ubeysekara et al. (2015)	duration of exclusive breast feeding	no relationship with malnutrition

Source: Literature survey, 2020

According to the table 5, as found by Debnath and Bhattacharjee (2014), breastfeeding practice is the most important factor that affects child malnutrition. Cheah et al. (2010) and Rahman and Chowdhury (2007) indicated that breastfeeding had significant effects on childhood malnutrition. Ayana et al. (2015) found that nutritional status as measured by wasting was significantly associated with time breastfeeding initiated and duration the child exclusively breastfed. Initiation of breast feeding was associated with wasting (Gebre et al. (2019). According to Hossain et al. (2020), breastfeeding practices for more than 6 months have reduced the likelihood of severe acute malnutrition of the children. Ghimire et al. (2020) and Dodos et al. (2018) have established a significant relationship between no exclusive breastfeeding practices and malnutrition among children. Ahsan et al. (2017) explored that absence of breastfeeding as a significant factor influenced stunting and breastfed children were less likely to be malnourished. Jaywardena (2015) pointed out that the low risk of malnutrition during the first 6 months may also be due to the protective effect of breastfeeding.

However, Justice Moses et al. (2015) pointed out that longer breastfeeding duration increased the risk of malnutrition. Ubeysekara et al. (2015) showed that duration of exclusive breast feeding had no significant relationship with stunting, wasting or underweight. According to Pravana et al. (2017), initiation of breastfeeding, colostrum feeding, and exclusive breastfeeding were not significantly associated with severe acute malnutrition among children. Similarly, in the adjusted model, no evidence was found to have a relationship between exclusive breastfeeding practices and severe acute malnutrition among children by Ghimire et al. (2020).

Maternal Health and Child Malnutrition: Maternal health is another significant maternal factor influencing child malnutrition. A considerable contribution has been made for maternal health and it was studied by 18% of reviewed articles that investigated maternal factors according the figure 2.

Table 6: Maternal Health and Child Malnutrition

Reference	Study/Variable	Results
Das and Gulshan (2017)	Mothers' underweight	key factor for malnutrition in all three terms of stunting, wasting and underweight.
Debnath and Bhattacharjee (2014)	maternal health	interrelate with wealth index to determine child malnutrition
Dodos et al. (2018)	maternal undernutrition	have a high risk of getting malnutrition
Rahman and Chowdhury (2007)	mother's height	strongly related to child malnutrition

Rahman et al. (2009)	poor maternal nutrition level	increased the risk of wasting.
Tette et al. (2016)	complication during pregnancy	no evidence of association with malnutrition

Source: Literature survey, 2020

Table 6 shows that that maternal health was found as a variable that interrelates with wealth index to determine child malnutrition and receiving antenatal care by mothers from a health professional causes to reduce the incidence of malnutrition (Debnath and Bhattacharjee, 2014). It further shows that having low maternal malnutrition demonstrates a low incidence of child malnutrition. Dodos et al. (2018) showed that maternal undernutrition seemed to have a high risk of getting malnutrition for their children. According to Rahman et al. (2009), poor maternal nutrition level was associated with a higher risk of wasting. Das and Gulshan (2017) found that underweight mothers as a key factor for malnutrition in all three terms of stunting, wasting, and underweight. Rahman and Chowdhury (2007) have shown that a mother's height is strongly related to child malnutrition. However, in both the bivariate and multivariate analyses, there was no evidence of an association between complications during pregnancy and malnutrition (Tette et al., 2016).

Age of Mother and Child Malnutrition: Mothers' age is a key maternal demographic factor related to child malnutrition. It was investigated by 15% from the journal articles that investigated maternal factors as given in the figure 2.

Table 7: Age of Mother and Child Malnutrition

Reference	Study/Variable	Results
Getaneh et al. (2019)	age of mothers or caregivers	The risk of wasting was increasing
Habyarimana et al. (2016)	mother's age at childbirth	key determinant of malnutrition
Kabir et al. (2018)	young mothers whose age is less than 20 years	more likely to have underweight and wasting
Pravana et al. (2017)	mother's age at birth	significantly related with severe acute malnutrition
Tette et al. (2016)	mother's current age	related with malnutrition.
	mother's age at pregnancy	related with malnutrition

Source: Literature survey, 2020

As given in the table 7, Pravana et al. (2017) and Habyarimana et al. (2016) revealed that mother's age at childbirth is a key determinant of malnutrition among children. In the bivariate analysis, Tette et al (2016) identified that both mother's current age and age at pregnancy have a relationship with malnutrition. According to Getaneh et al. (2019), the risk of malnutrition among children was increasing with the age of their mothers. Kabir et al. (2018) too examined those younger mothers were more prone to have a malnourished child than their older counterparts in the study of Adivasi children age 24 – 59 months in Bangladesh.

Mother's Body Mass Index (BMI) and Child Malnutrition: Mothers' BMI too had a significant influence on child malnutrition. Figure 2 shows that from the maternal related studies retained to the sample, 15% have debated the relationship between Mother's BMI and child malnutrition.

Table 8: Mothers' Body Mass Index and Child Malnutrition

Reference	Study/Variable	Results
Aheto et al. (2015)	mothers' BMI	negative relationship with malnutrition indicating decreased malnutrition was accompanied by increased body mass Index
Habyarimana et al. (2016)	mothers' BMI	key determinant of malnutrition
Khan and Mohanty (2018)	mothers' BMI	strong and significant predictor for malnutrition in all terms of underweight, stunting and wasting
Rahman and Chowdhury (2007)	mothers' BMI	significant association with severe and moderate stunting
Tette et al. (2016)	mothers' BMI	no evidence of association with malnourishment

Source: Literature survey, 2020

According to the table 8, Khan and Mohanty (2018), Habyarimana et al. (2016), Rahman and Chowdhury (2007) illustrated that the BMI of the mother is a key determinant of malnutrition among children. Aheto et al. (2015) concluded that an increase in a mother's body mass index is associated with decreased childhood malnutrition. However, there was no evidence of an association between mother's BMI and malnutrition in both the bivariate and multivariate analyses (Tette et al., 2016).

Mothers' Employability and Child Malnutrition: Mothers' employability is a maternal economic factor associated with child malnutrition. From the reviewed articles that investigated maternal factors, 15% have discussed the relationship between Mothers' Employability and child malnutrition as shown in the figure 2.

Table 9: Mothers' Employability and Child Malnutrition

Reference	Study/Variable	Results
Das and Gulshan (2017)	mother's occupation as physical labor	key factor for malnutrition in both terms of wasting and underweight.
Duru et al. (2015)	maternal occupation	statistically significant association with nutritional status of children

Galgamuwa et al. (2017)	maternal employment	an important factor associated with under-nutrition
Keerthiwansa et al. (2014)	Mother being a housewife	associated with severe acute malnutrition
Ubeysekara et al. (2015)	mothers' unemployment	malnutrition in all terms of wasting, under-weight and stunting was higher

Source: Literature survey, 2020

As revealed by the table 9, Das and Gulshan (2017) and Duru, et al (2015) have revealed that a mother's occupation is a significant factor in the nutritional status of children. Galgamuwa et al. (2017) investigated that maternal employment appeared to be an important factor associated with undernutrition among both preschool and school children in plantation community in Sri Lanka. In contrast, Ubeysekara et al. (2015) observed that malnutrition in all terms of wasting, underweight and stunting was higher among children whose mothers are unemployed than the employed mothers. Keerthiwansa et al. (2014) identified that mother being a housewife cause to increase incidence of child in the study of malnutrition and anemia among hospitalized children in Vavuniya.

Mass Media expose of mother and Child Malnutrition: Mass Media expose of mother is one of the maternal social factors related to child malnutrition. The figure 2 shows that it was investigated by 12% of the reviewed articles that investigated maternal factors.

Table 10: Mass Media expose and Child Malnutrition

Reference	Study/Variable	Results
Keerthiwansa et al. (2014)	being in socially deprived group	increases the degree of malnutrition
Rahman and Chowdhury (2007)	mass media exposure	strongly related to the wasting
Rahman et al. (2009)	mass media exposure	strongly related to the wasting
Tette et al. (2016)	not heard of social services	more likely to have malnutrition

Source: Literature survey, 2020

Mass media exposure is strongly related to the wasting of children and children whose mothers did not expose to any mass media had a higher risk of becoming acute malnourished (Rahman and Chowdhury, 2007 and Rahman et al. 2009). Tette et al. (2016) declared that mothers who not having heard of social services were more likely to have malnutrition in children than those who have heard of such services according to the bivariate analysis. In the Sri Lankan context, Keerthiwansa et al. (2014) concluded that being in a socially deprived group increases the degree of malnutrition.

Marital Status and Child Malnutrition: Marital status is another significant social factor related to child malnutrition. It was investigated by 6% of the reviewed articles that investigated maternal factors.

Table 11: Marital Status and Child Malnutrition

Reference	Study/Variable	Results
Dodos et al. (2018)	not married/ lives alone of caretakers or mothers being unmarried	more likely to be severe acute malnourished
Tette et al. (2016)	being unmarried	increases the prevalence of malnutrition

Source: Literature survey, 2020

According to Dodos et al. (2018), the marriage status of not married/ lives alone of caretakers or mothers was more likely to be severe acute malnourished compared to their counterpart. Dodos et al. (2018) and Tette et al. (2016) have observed that being unmarried increases the prevalence of malnutrition of their children.

Other Maternal Factors and Child Malnutrition: Maternal Factors belonged to the other category represent 30% of the reviewed articles that investigated maternal factors according to the figure 2.

Table 12: Other Marital Factors and Child Malnutrition

Reference	Study/Variable	Results
Ahsan et al. (2017)	Pregnancy more than four times	Significant factor influenced for stunting
Ayana et al. (2015)	place of delivery	significantly associated with wasting
Cheah et al. (2010)	mothers' family planning	Significantly correlated with malnutrition
Debnath and Bhattacharjee (2014)	women's decision-making autonomy	negatively associated with malnutrition
Dodos et al. (2018)	early pregnancy	Related with sever acute malnutrition
Endris et al. (2017)	preceding birth interval	independently associated with nutritional status
Fagbamigbe et al. (2020)	short birth interval	affected to nutritional out come
Justice Moses et al. (2015)	not covered by national health insurance	are associated with increased risk of malnutrition
Oliveira Assis et al. (2008)	family headed by a woman	main determinant of child malnutrition
Rahman and Chowdhury (2007)	Place of delivery	significantly associated with severe as well as moderate stunting

Source: Literature survey, 2020

As shown in the table 12, there was a relationship between early pregnancy and sever acute malnutrition among their children (Dodos et al., 2018). Ahsan et al. (2017) explored that pregnancy>4 times as a significant factor influenced for prevalence of stunting and pregnancy (<4 times) were less likely to be malnourished. According to Rahman and Chowdhury (2007), place of delivery was significantly associated with severe as well as moderate stunting. Further, Ayana et al. (2015) found that nutritional status as measured by wasting was significantly associated with place of delivery. According to Endris et al. (2017), preceding birth interval was independently associated with nutritional status of children in rural Ethiopia. Fagbamigbe et al. (2020) found that nutritional outcome of children was affected by birth interval.

According to Cheah et al. (2010), mothers' family planning was significantly correlated with nutritional status. Oliveira Assis et al. (2008) found that a family headed by a woman was the main determinant of child malnutrition. According to Debnath and Bhattacharjee (2014), women's decision-making autonomy was negatively associated with malnutrition. Mothers who are not covered by national health insurance are associated with increased risk of malnutrition among children (Justice Moses et al., 2015).

CONCLUSION

Many researches have investigated maternal factors and other determinants on child malnutrition and a large volume of publications are available on this. More than 75% of reviewed research articles on determinants of child malnutrition have analyzed maternal factors. Majority of the reviewed research articles belonged to the immediate last ten years, from 2011 to 2020. Bivariate or multivariate logistic regression technique have been adopted by most of the studies as a popular approach to fit a model on malnutrition determinants where the dependent variable is with categorical nominal scale, like suffering or not suffering from malnutrition. The sample size was over 300 for 65% of reviewed articles suggesting a justifiable sample size for reliable interpretation. Maternal factors includes Mothers' Education, Mothers' Breastfeeding practice, Maternal Health, Age of Mother (current age of mother and mother's age at pregnancy), BMI of mother, Mothers' Employability, Mass Media expose of mother, Marital Status, times of pregnancy and early pregnancy, place of delivery, birth interval, family planning, family headed by mother, women's decision-making autonomy and having health insurance. Mothers' Education is the leading factor associated with child malnutrition. From the reviewed research articles that investigated maternal factors, Mothers' Education has been studied by 64% and for 95% of them the relationship was found to be significant. Low Education level of mother has increased the risk of having malnutrition among their children. Mothers' Breastfeeding practice was strongly related to the child malnutrition. Increasing the duration of breastfeeding have reduced the likelihood of malnutrition. Maternal Health is too an important variable that interrelates with wealth index to determine child malnutrition and receiving antenatal care by mothers from a health professional causes to reduce the incidence of malnutrition. Younger mothers were more prone to have malnourished children while the opposite was found by some studies. Mothers' BMI, Mass Media expose and Marital Status of mother too established a significant relationship with child malnutrition.

These findings identified that the less attention has been paid by the reviewed studies to the maternal factors related to the school children. Motivating the future researchers is suggested to study the maternal factors and malnutrition focusing school children since they are the immediate group critical for the future labor force that contributes to country development. And also, these finding may direct future researchers and scholars who are interesting in the area and may inform the health sector and other authorities where the effective future intervention should be improved to overcome the incidence of child malnutrition.

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