

The Association between Breastfeeding and childhood Obesity and Overweight

M Maisha¹, M Begum², B H N Yasmeen³

Introduction

More than 200 million children are affected with childhood obesity and overweight worldwide.¹ These rates are increasing over the years but even rapidly over the last 30 years by more than a 60% increase for those under 2 years of age. Childhood overweight and obesity are detrimental to childhood health since they are linked to comorbidities and are associated with worse health outcomes later in life.

Also, childhood obesity and overweight are associated to many comorbid conditions. These comorbid conditions may include, but are not limited to, high blood pressure, high cholesterol levels, insulin resistance, type 2 diabetes, asthma, joint problems, fatty liver disease, and gastro-esophageal reflux.^{2,3} However, these conditions are not just limited to physical ailments since it also includes psychological (like anxiety and depression) disorders and social conditions (like bullying) as well.⁴ These comorbidities and conditions illustrate the decreased quality of life that an obese or overweight child may have.

According to the Centers for Disease Control and Prevention (2021), the standard and common way of assessing childhood weight status is by using the Body Mass Index for age (BMI-for-age).⁵ This BMI-for-age is calculated by dividing a child's weight (in kilograms) with height (meters squared) by age-specific and sex-specific growth charts. A child's weight status is different than an adult's BMI because their body composition differs by age and gender, thus illustrating the importance to use age- and sex-specific growth charts. A child is considered overweight if they are between the 85th to 95th percentile, according to their respective growth

charts. Whereas a child is considered obese if they are in the 95th and higher percentiles.

In addition to this, children who are overweight and obese usually do not lose their excess weight as they transition to adulthood. Research suggests that overweight and obese children are more likely to be overweight or obese as adults as well.⁶ However their overweight/ obesity and comorbidities tend to be more severe in adulthood. Thus, it is important to address the childhood obesity and overweight crisis by implementing ways to prevent this from continuing.

Furthermore, the issue of childhood obesity and overweight are complex and multi-factorial, but understanding the largest contributors are needed to address this issue.⁷ One of the suggested preventative factors found to prevent childhood obesity is breastfeeding. However, the findings have been mixed. Some studies have found that breastfed babies are less likely to be obese and overweight in childhood than infant-fed babies.^{8,9} Whereas, other studies have found contradicting results suggesting that breastfeeding babies doesn't have much of a protective effect on childhood obesity and overweight.^{10,11}

Thus, it is important to uncover the association between breastfeeding and childhood obesity/ overweight since it may prove to be a significant protective factor against it and the many possible health consequences associated with it. Addressing this association can lead to initiating health interventions which may enable ways to prevent childhood obesity and overweight and allow children to lead healthy lives. Thus, the purpose of this literature review is to recognize whether breastfeeding lowers the risk of

¹Marjana Maisha
Life Sciences Program
University of Toronto
Ontario, Canada

²Dr. Monirun Begum
MSc, PhD
Acadia University
Nova Scotia, Canada

³B H Nazma Yasmeen
MCPS, MD, FRCP (Glasgow)
Professor and Head
Dept. of Paediatrics
Northern International Medical College
Dhaka, Bangladesh

Correspondence
Marjana Maisha
Life Sciences Program
University of Toronto
Ontario, Canada
Email: marjana.maisha1@gmail.com

childhood obesity and overweight.

Methods

A literature review was conducted to study whether breastfeeding infants alters the risk of childhood obesity. A literature search was done for relevant articles published from inception to December 1, 2021, using two databases: Ovid MEDLINE and PubMed. The inclusion criteria included studies that were restricted to humans, English, peer-reviewed, and children (birth to 18 years). These databases enabled the use of medical subject heading (MeSH) terms in the areas of medicine and health and also allowed for the search to be methodological and reproducible.

Moreover, three search concepts were used in both Ovid MEDLINE and PubMed: breastfeeding, children, and overweight/obese. The MeSH terms for each of the concepts were 'breast feeding', 'pediatric obesity,' and 'Body Mass Index'. Each of the respective MeSH headings had keywords that were included. Thus, for the MeSH term, 'breast feeding,' the keywords used were 'breastfe*' and 'breast fe*'. For the MeSH term, 'pediatric obesity,' the keywords used were 'child*' and 'paediatric.'

Finally for the MeSH term, 'Body Mass Index,' the keywords used were 'overweight' and 'obese'. Each of the respective MeSH headings and its associated keywords were combined with the Boolean operator OR, and each group were combined with the Boolean operator AND for the search.

As it was illustrated by the PRISMA diagram in Figure 1, the 2 databases yielded a combined total of 3937 articles. These articles went through a three-level screening process (titles, abstracts, and full-text screening) to select a total of 15 eligible studies that corresponded to the topic of childhood obesity/overweight and its association to breastfeeding. These articles were used for the literature review.

While following the extraction of the characteristics and data from the eligible studies, as illustrated by Table 1, three common themes were found: association between breastfeeding and obese/ overweight children, low socioeconomic status, and effectiveness of breastfeeding promotion interventions. These three themes were beneficial to compare, contrast, and connect the information to inform this literature review.

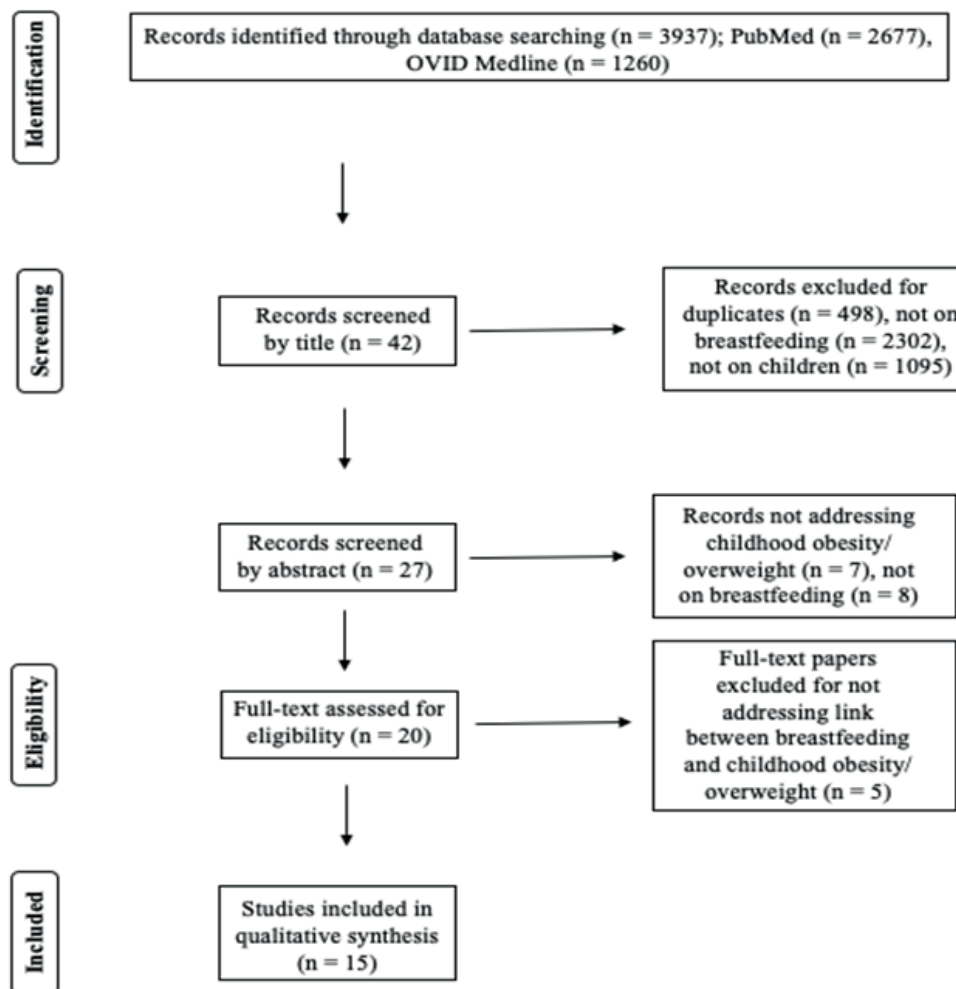


Fig. 1 : PRISMA flow diagram of paper selection process used in the present study

Table 1 : Study characteristics chart on link between breastfeeding and childhood obesity/overweight

Author (year)	Study Design	Participants	Main Findings
Ardic et al. ¹²	Prospective Cohort	294 healthy children; mean age: 36 months; mean weight: 14.6 kilograms	Less frequent childhood obesity and overweight for at least six months of breastfeeding
Dewey et al. (2021) ¹³	Systematic Review	Healthy full-term infants in countries with high/high-level of human development	Breastfeeding associated with lower risk of obese/ overweight at 2 years and older, especially if it's more than 6 months of duration
Gibbs & Forste et al. (2013) ¹⁴	Longitudinal Survey	Over 10 000 American children born in 2001	Formula-fed infants for first 6 months are 2.5% more likely to be obese than breastfed infants
Gross et al. (2019) ¹⁵	Purposive Sampling	Low-income Hispanic mothers with infants under 2 years in a RCT of early child obesity prevention intervention	Low socioeconomic status led to decreased breastfeeding and childhood obesity
Jabakhanji et al. (2018) ¹⁶	Prospective Cohort	11 134 children's data from the Growing Up in Ireland National Longitudinal Study of Children	Low socioeconomic status led to decreased breastfeeding and higher childhood BMI
Keats <i>et al</i> (2021) ¹⁷	Systematic Review	Mothers, newborn babies, children and adolescents in LMICs	Nutritional interventions within and outside health care are crucial for prevention/management of childhood obesity
Mameli et al. (2016) ¹⁸	Literature Review	Studies on children under 2 years on breastfeeding and childhood obesity	Longer duration of breastfeeding lessens risk of childhood obesity/ overweight by 15%
Marseglia et al. (2015) ¹⁹	Literature Review	Studies on children under 18 years on breastfeeding and childhood obesity	Breastfeeding and its longer duration are protective factors for childhood obesity.
Maskarinec et al (2021) ²⁰	Prospective Cohort	12 months' postpartum women who delivered a single liveborn infant at >24 weeks gestation	Longer duration of breastfeeding associated with lower childhood BMI
Ortiz-Felix et al. (2021) ²¹	RCT, parallel groups	30 women of at least 12 weeks of gestation in Northeast Mexico	Prenatal education intervention program on breastfeeding led to lessened risk of childhood obesity and overweight than those without the program
Redsell et al (2015) ²²	Systematic Review	Pregnant mothers, parents of infants under 2 years, and healthy infants under 2 years in RCTs on breastfeeding intervention	Parental interventions on breastfeeding education led to more breastfeeding and less childhood obesity and overweight
Reifsnider et al. (2018) ²³	RCT, parallel groups	174 obese pregnant Mexican Americans in Southwestern metropolitan area earning below 200% of federal poverty index and did not complete high school	Lack of success of parental educational intervention for breastfeeding-promotive program for those under low socioeconomic status
Jurado et al. (2016) ²⁴	Cross-sectional analytic	116 healthy children; mean age: 3.2 years	Less than 3 months of breastfeeding led to almost 4 times amount of risk for childhood obesity
Song et al. (2020) ²⁵	Multistage Random Sampling Survey	4 619 caregivers of children under 5 years in Central and Western China	Shorter duration of breastfeeding associated with an increased risk of childhood obesity and overweight
Yan et al. (2014) ²⁶	Systematic Review	226 508 participants from 25 studies on breastfeeding and childhood obesity and overweight in 1997 to 2014 from 12 different countries	Breastfeeding and its longer duration were protective factors for childhood obesity and overweight

RCT, randomized controlled trial; LMIC, low-income and middle-income countries

Results

Theme 1: Association Between Breastfeeding and Obese/ Overweight Children

The literature significantly solidifies the association of breastfeeding being a protective factor for childhood obesity and overweight. A large metanalysis of thirty prospective cohort studies compared breastfed infants to non-breastfed infants and

found a 15% decrease in childhood overweight occurrence.¹⁸ Another study has found a similar association that breastfeeding led to a lower average BMI in childhood.²⁰ Though, this study didn't find a difference in risk from breastfeeding directly from the breast, and feeding from bottled milk expressed from the breast. This suggests that no matter the method of breastfeeding, it is still linked to a decreased association of higher BMIs. Similarly, another study found the association of breastfeeding being a

protective factor on childhood obesity.¹⁹ These findings are not just limited to only these studies, since all eligible studies suggest the same association.²⁶

In addition to this, breastfeeding alone doesn't just have a link to the protective effects of childhood obesity and overweight because duration of breastfeeding suggests an important protective association as well. Marseglia et al.'s study found a significant association with duration of breastfeeding and childhood obesity.¹⁹ They found that the longer the duration of breastfeeding, the lower the risk of childhood obesity. Moreover, Jurado et al. (2016)'s study on 116 children found that exclusive breastfeeding of less than 3 months linked to about a 4 times higher risk of obesity in children than those breastfed for longer, illustrating a similar pattern of findings.²⁴ In addition to this, another study found a similar association as well from breastfeeding duration but on, both, risk of childhood obesity and overweight.¹² They compared duration of breastfeeding for more than 6 months, compared to babies breastfed less than 6 months. The babies breastfed for longer had the lowest risk of overweight and obesity in childhood. These studies reveal similar patterns of findings on the duration of breastfeeding and the risk of childhood obesity by suggesting that the longer the duration of breastfeeding, the less the risk of childhood obesity and overweight.

In spite of this, it is important to address that the literature reviews, surveys, cross-sectional, and prospective cohort study designs (as illustrated by Table 1) may have limitations by confounding factors. Factors like maternal BMI and overweight/obesity incidences may be important elements for determining whether the child will be overweight or obese due to learned lifestyle factors. Those studies don't control for these confounding factors. However, the large systematic reviews on breastfeeding and its association to childhood obesity and overweight are valuable in controlling for these confounding factors.^{13,26}

Yan et al. (2014)'s systematic review controlled for matched characteristics of their participants; hence this study design ensures that any exogenous factors such as maternal characteristics don't have unwanted altering effects on the results obtained.²⁶ This study found a significant association on breastfeeding with its lower risk of childhood obesity and overweight, along with the longer duration of breastfeeding and a lower risk of childhood obesity and overweight. Similarly, another systematic review found the same association, deeming that this association exists.¹³

Overall, breastfeeding is suggested to be a significant protective factor in preventing overweight and obesity in childhood. Despite

some studies having limitations in controlling for possible confounding factors, other studies that have controlled for them have also found the same pattern of findings. This suggests that the association of breastfeeding, along with its longer duration, as a protective factor for childhood obesity and overweight does significantly exist.

Theme 2: Low Socioeconomic Status

Evidently, the association of breastfeeding with its longer duration is associated to be a protective factor in preventing childhood obesity and overweight, hence, it's important to address why breastfeeding is avoided in mothers. Research illustrates that breastfeeding can sometimes be avoided due to health problems that prevent the mother from being able to breastfeed their babies and have to rely on infant formula instead.¹⁴ However this health condition is found to be uncommon. The more common reason why mothers may avoid breastfeeding their baby is due to an underlying social determinant of health.

In notion to this, social determinants of health are the underlying social and economic conditions that lead to differences of health status. Lower socioeconomic status families are more likely to have a shorter breastfeeding duration.¹⁶ A study using purposive sampling found that there was decreased duration of breastfeeding due to poor maternal diet, high stress, and limited healthy foods.¹⁵ The factors of poor maternal diet, high stress, and limited healthy foods that consequently lead to decreased duration of breastfeeding all come from the social determinant of health of low socioeconomic status. This illustrates how the social determinant directly affects health over generations since the child will be at a higher risk of becoming overweight or obese due to the shorter duration of breastfeeding.²⁵

Hence, these studies address the major underlying cause of shorter duration of breastfeeding leading to its consequent higher risk of childhood obesity and overweight. The structural social determinant of health of socioeconomic status are out of individual control. Thus, the complexity of preventing shorter duration of breastfeeding is observed and cannot be blamed on mothers.

Theme 3: Effectiveness of Breastfeeding Promotion Intervention

Indeed, interventions are quite important for the prevention of public health concerns. Research has exemplified the significant association of breastfeeding with childhood obesity and overweight. However, a few studies have done this by studying breastfeeding-promotion interventions and its effects on childhood obesity and overweight.

Studies have looked at parental education interventions as a way of promoting breastfeeding for babies. Ortiz-Felix et al. (2021)'s study investigated the effects of parental education interventions on promoting feeding practices from breastfeeding along with its associated maternal perceptions of child weight and signals of hunger and satiety. They found that the children in the intervention group were mostly all of normal weight compared to the children in the control group, where most of them were obese and overweight. This intervention had a significant effect on promoting breastfeeding and its duration to lead to a lower risk of childhood obesity and overweight.²¹ Similarly, a large systematic review found parental education interventions on breastfeeding-promotion to be effective against childhood obesity and overweight.¹⁷ Alike, a large systematic review on various randomized controlled trials also found a significant association on educational interventions for breastfeeding promotion and less risk of childhood obesity and overweight.²²

Yet conversely, Reifsnider et al. (2018)'s study on parental counseling intervention for the promotion of breastfeeding, and its duration, on expecting mothers with low socioeconomic status found different results. They found that the intervention did not reduce the risk of childhood overweight. According to this, the authors suggested that this intervention was not successful due to employment insecurity. This relates to the social determinant of health of low socioeconomic status that was also responsible for less breastfeeding. This study is important in recognizing that with the social determinant of health of low socioeconomic status, interventions on promoting breastfeeding by parental education are not likely to be effective.²³

Overall, the research suggests that parental education interventions for promoting breastfeeding and its duration to prevent childhood obesity and overweight are quite effective, but under specific conditions. These interventions are likely to work only if the household is not under low socioeconomic status. Low socioeconomic status has already been associated to less breastfeeding, while also it is associated with creating unsuccessful educational interventions on promoting breastfeeding. This is intuitive since interventions cannot alleviate the low socioeconomic status of the parents. Thus, even if the consequences of short duration of breastfeeding are informed, they may not have a choice to behave accordingly. As it was described in a prior study, the factors of poor maternal diet, high stress, and limited healthy foods associated to low socioeconomic status are the reasons for less breastfeeding and its subsequent associated risk to childhood obesity and overweight.¹⁵ Thus, interventions are needed to promote breastfeeding, but with

special considerations to those under low socioeconomic status to lessen the risk of childhood obesity and overweight.

Implications

The findings of this literature review inform research, practice, and policy. This informs research since many studies have investigated the link between breastfeeding and childhood obesity/ overweight found a significant association between them but under limiting internal factors. These limiting internal factors would be the possible uncontrolled confounders, such as maternal weight and BMI, which may have an exogenous effect on the results of the studies. However the systematic reviews have also found an association between the factors under study while controlling for the confounders, suggesting that the association does exist. There is still a limit to how much is understood on breastfeeding and childhood obesity/ overweight since a majority of the studies have uncontrolled confounders. Thus, it is important for future study designs to consider possible confounding factors which may influence the results of the study. It is imperative that the studies control for confounding to establish the study's rigor by ensuring its internal validity to allow for the results to be generalizable to the public. Matching the characteristics of the children and their parents can help to rule out any possible confounding.

In addition to this, the findings of this research also inform practice. This literature review suggests that there is indeed an association between breastfeeding and its longer duration as protective factors in childhood obesity and overweight. Thus, it is important to inform new mothers about the importance of breastfeeding and its duration from healthcare contexts so that the public health concern of childhood obesity and overweight can be fought against. This can be done by showing mandatory presentations on the importance of breastfeeding, and its duration, in clinics for new mothers. However, as the results of this literature review suggest, low socioeconomic status is a major contributing reason to why there are lower durations of breastfeeding, consequently heightening the risk of childhood obesity and overweight. While also parental educational interventions on promoting breast feeding do not seem to be successful for people with low socioeconomic status because it is out of individual control. Thus, the parental educational interventions will be beneficial from healthcare contexts for promoting breastfeeding and its duration only in people in higher socioeconomic statuses, leaving the health disparity for those under low socioeconomic status to be addressed by upstream policies.

Also, the findings of this literature review identifies that policies are needed. The health disparity for childhood obesity and overweight shows that those under low socioeconomic status are more at risk. This also leaves them prone to the negative health consequences associated with obesity and being overweight as they grow older and is a public health concern. Thus, policy changes are needed to mobilize and allocate fiscal means to new families under low socioeconomic status so that the associated factors of poor maternal diet, high stress, and limited healthy foods that are association to shorter duration of breastfeeding can be addressed. Through policies, new parents of those under low socioeconomic status should get financial incentives to allow for better maternal diet, lower financial stress, and more access to healthy foods to ensure longer breastfeeding duration. These policies are necessary to ensure that breastfeeding and its longer duration are promoted by creating equity to lower the risk of childhood obesity and overweight.

Conclusion

Childhood obesity and overweight is a public health concern as its incidence rate is growing rapidly worldwide. Obesity/ overweight in childhood are often associated to comorbidities, and even more severe obesity/ overweight and comorbidities in adulthood. This literature review analyzed the association of breastfeeding and childhood obesity and overweight by searching two databases (PubMed and OVID Medline). It was found that there is a significant association of breastfeeding, along with its longer duration, as protective factors against childhood obesity and overweight. However it was identified that the social determinant of health of low socioeconomic status is a major contributing factor for less breastfeeding. Additionally, this literature review found that educational parental intervention programs to promote breastfeeding and its duration are significantly beneficial, but not in those under low socioeconomic status. Thus, the findings from this literature review inform novel research study designs to limit potential confounding factors to gain more knowledge on the association between breastfeeding and childhood obesity and overweight. It also informs healthcare practice by solidifying the importance of breastfeeding and its longer duration to advise new mothers. It also informs policies to allocate fiscal means for new families under low socioeconomic status to promote breastfeeding and fight against childhood obesity and overweight.

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