

# Does breastfeeding lower the risk for childhood obesity: what is the evidence?

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## ABSTRACT

**Background:** Investigate the evidence to determine what the association is between exclusive breastfeeding and childhood obesity. **Method:** Systematic reviews, meta-analysis and cohort studies were used to determine the impact of breastfeeding on childhood obesity. **Results:** Five studies consisting of the highest quality research possible; two systematic reviews and meta-analysis, one systematic review and a cohort study. A total number of 110 papers were included in the analysis of the above. Twenty of the 110 papers focused specifically on exclusive breastfeeding and childhood obesity, but valuable information was obtained from the other papers. **Conclusion:** Research suggests that early breastfeeding especially of longer duration, helps to protect against childhood obesity. Higher quality studies must be undertaken to determine whether this association is absolute or confused by confounding factors.

**Keywords:** breastfeeding, childhood obesity,

## Introduction

Overweight and obesity in children is on the increase, despite European Union (EU) level action to reverse this trend.<sup>1</sup> Rates throughout Europe have rapidly increased in the last 20 years with a marked increase in recent years. England and Poland demonstrate the steepest increases. Annually a staggering additional 400,000 children across Europe are becoming overweight or obese. The evidence suggests that overweight children remain so into adult life and put themselves at a high risk of comorbidity diseases.<sup>1</sup> This has significant consequences for health; estimates show that in the EU around 2.8 million deaths per year result from obesity associated disease.<sup>2</sup>

The causes and consequences of childhood obesity (CO) have been investigated.<sup>3</sup> The authors state that associated co-morbid conditions include metabolic, cardiovascular, orthopaedic, neurological, hepatic, pulmonary and renal disorders. They also explain that CO profoundly and adversely affects children's physical health, academic performance, social and emotional well-being, self-esteem and quality of life experience.

Overweight and obesity are caused by excessive fat accumulation throughout the body. Generally, it is known that weight increases when there is an imbalance of energy intake verses energy expended. Lifestyle activity rates and dietary choices are the prevailing factors, however there is some evidence that the genetic background may also be important.<sup>3</sup>

The overall view is that CO has a broad, diverse range of serious health and social implications that are avoidable

with the correct dietary intake of energy. This is a seemingly simple solution to the numerous serious physical and mental health complications affecting quality and longevity of life. However, the implementation of correct dietary intake is complex.

Several high quality studies indicate that breastfed children have a lower risk of childhood obesity.<sup>4,5,6,7,8,9,10</sup> It is known that there is a breastfeeding crisis worldwide, with the UK having one of the lowest breastfeeding rates in Europe.<sup>11</sup> It is extensively acknowledged that infants should be nourished with nothing other than breastmilk for the first six months of life and that breastfeeding should continue with the addition of complementary foods for up to and beyond two years of age.<sup>12</sup> It is important to contemplate how the lower rates of both exclusive breastfeeding and combination of breastfeeding and formula feeding might be affecting the increasing overweight and obesity problem in children.

The focus of this report is therefore to investigate what the association is between breastfeeding and childhood obesity. The research question addressed by this paper is: In infants exclusively breastfed, what is the risk of childhood obesity?

## Background

There are different ways of measuring and understanding overweight and obesity. It is routinely defined by abnormal or excessive fat accumulation that may impair health.<sup>13</sup> Body mass index (BMI) is a recognized index and is defined in metric as a person's weight in kilograms divided by the square of their height in meters (Kg/m<sup>2</sup>). The WHO (2018) states that for children under the age of five, the following

guidelines identify overweight and obesity:

- overweight is weight-for-height greater than two standard deviations above the WHO Child Growth Standards median;
- obesity is weight-for-height greater than three standard deviations above the WHO Child Growth Standards median.

The Center for Disease Control and Prevention defined overweight as at or above the 95th percentile of BMI for age and at risk for overweight as between the 85th and 95th percentile of BMI for age.<sup>14</sup> However BMI is an indirect measurement of adiposity and is influenced by lean muscle or bone density mass. Skin folds and body fat percentage measurements are more direct measurements of subcutaneous, central and total adiposity.<sup>6</sup> Therefore BMI may not be the most accurate way of measuring infants and toddlers.

As part of the UK governmental push to evaluate this problem, the National Child Measurement Program was launched in 2006. Overseen by Public Health England and analyzed by NHS Digital, they report that there is an increase in the prevalence of obesity in children of four to five years old.<sup>15</sup> Rates have risen for the second successive year, and it rose from 9.3% in 2015<sup>16</sup> to 9.6% in 2016<sup>17</sup>. In that year almost one in four children in first year of school were overweight or obese and more than one in three by year six were overweight or obese. These shocking statistics are overwhelming and highlight this growing epidemic as a serious cause for concern.

There is a plethora of social and biological factors that influence a child's exposure to the risk of obesity. These include but are not limited to parent overweight, mother's pre-pregnancy weight, socioeconomic status (SES), single parent family, introduction to solid foods (what and when), ethnicity, genetics and the microbiome. The relationship between maternal feeding practices and child eating behaviours are also worthy of consideration with regards to childhood overweight and obesity. These are all important but confounding factors and beyond the scope of this paper. While it is important to acknowledge these processes and understand the possibility of their involvement in CO, the main focus herein is on the duration and exclusivity of breastfeeding as a risk factor for overweight and obesity in children.

Human mammals have larger adipose deposits at birth than any other species.<sup>17</sup> One theory is that this is because of the hairless neonate's need for warmth. The other and perhaps more likely theory is to compensate for the normal onset of lactogenesis II during three to eight days post-partum. The large neonatal brain requires an energy supply during this period and relies on its adipose deposits.

However, research suggests that the energy supply right after birth can be affected by the birth process itself. Birth interventions are known to compromise breastfeeding initiation by interfering with the natural cascade of biological events that are essential for ongoing success.<sup>18</sup> Suppression of breastfeeding along with suboptimal feeding patterns may result from an assisted birth.<sup>18</sup> Recent growth in the number of caesarean, induction labor, and assisted (forceps) births also put the infant at risk of physiological birth injury.<sup>19,20</sup> These often undiagnosed, non-life threatening but quality-of-life changing, musculoskeletal imbalances occurred in 83% of patients attending the Interdisciplinary Breastfeeding Clinic (IBC).<sup>21</sup> With this in mind, there is no wonder that formula is introduced, often before the mother would have wished in eight out of ten women according to the United Nations Children's Fund.<sup>22</sup> It is worth noting that natural, un-medicated vaginal birth can also lead to suboptimal feeding problems.

Breastfed and formula fed infants have different hormonal responses to feeding.<sup>7</sup> One plausible biological explanation is that formula fed infants have increased plasma insulin levels, due to the higher protein content of formula, that stimulate fat deposition and increase the number of adipocytes.<sup>6,23</sup> Early growth of adipose cells during infancy can increase the risk of obesity in adulthood.

## Methods

To investigate if exclusive breastfeeding affects the risk of childhood obesity, a literature search was undertaken from February 2018. The literature search and strategy included the following electronic databases: PubMed, Medline, Cumulative Index to Nursing and Allied Health (CINAHL) and Cochrane.

The search terms used were 'breastfeeding' AND 'paediatric/pediatric or children', 'obesity' and 'overweight' with the appropriate Boolean terms. The PubMed search included MeSH terms "breast feeding" AND "paediatric/pediatric obesity/ prevention and control" and "BMI". Each search had a combination of terms that always included breastfeeding to focus the search on this broad topic. The exclusion criteria included the age of the paper, no earlier than 2004 due to the recent advancement and interest in this area and because good quality systematic reviews included searches prior to this date. Low quality studies were also excluded. Inclusion criteria included high quality papers and only those written in the English language.

## Results

The final selection consisted of three systematic reviews, one meta-analysis and a cohort study. Yan et al. (2014) confirmed a dose-response effect of breastfeeding on the risk of childhood obesity. Twenty-five studies with 226,508 subjects met the meta-analysis criteria. They reported that

if breastfed for seven months or longer, children were significantly less likely to be obese; the risk of CO was 22% lower in breastfed children than with those who had never breastfed.

Weng et al. (2012) investigated the risk factors for childhood overweight identifiable during infancy. Their meta-analysis looked at 30 prospective studies, ten of which compared breastfeeding with other types of feeding in the first year of life. There was mixed evidence for the protective quality of breastfeeding. 'Ever breastfed' was compared with 'never breastfed' so exclusivity was not measured. Overall the findings were that breastfeeding anytime in the first year of life reduced the adjusted odds of overweight in childhood by 15% compared with not breastfeeding.

Lefebvre et al. (2012) systematic review studied 21 articles with a total of 107,177 subjects. Their predominant primary outcome was the duration of breastfeeding and its effect on BMI. Ten studies reported that breastfeeding had no significant effect on CO. Nine studies found duration of breastfeeding had a protective effect. Limitations included inability to control for all confounders.

Horta et al. (2013) updated their original 2007 review on the effect of breastfeeding on the prevalence of overweight and/or obesity and 33 new manuscripts were reviewed. A small-study effect was an issue raised, tending to overestimate the benefits of breastfeeding. Residual confounding was another concern because most studies were carried out in high-income countries where breastfeeding may have been the norm. They concluded that studies suggest a small reduction in obesity of about 10%, in the prevalence of overweight or obesity in children exposed to longer durations of breastfeeding.

Finally, a large Chinese cohort study by Zheng et al. 2014 reported that longer duration of exclusive breastfeeding was associated with lower risk of becoming overweight.<sup>26</sup>

## Discussion

The goal of this research was to determine whether breastfeeding was protective against childhood obesity. There are mixed views on the risk for child obesity relative to the type of initial feeding. This debate has been going on for some time, with the first suggestion of the protective effect of breastfeeding against childhood obesity published by Kramer in 1981.<sup>24</sup> However, this early study was fraught with biases, relying on recall, when he conducted telephone interviews of mothers of children in 1,172 school aged children. His results concluded that breastfeeding does protect against later obesity. Despite the considerable biases in that type of study, several large-scale epidemiological studies conducted during the following twenty years confirmed

his findings. There seemed to be a tendency to simply duplicate the findings. It took until 2004 for the first systematic review that focused on breastfeeding and childhood obesity. Their study attempted to address publication bias and potential heterogeneity by careful adjustment of confounders. It concluded that breastfeeding seems to have a small but consistent protective effect against CO. However publication bias cannot be totally excluded as some studies found no significant effect in a crude analysis, did not report adjusted estimates and consequently had to be excluded from the meta-analysis.

The biggest problem with epidemiological research is the confounding factors that cannot always be accurately assessed, randomized, or statistically reduced. Socioeconomic strata is a particularly difficult confounder in many studies.<sup>5</sup> It is well known that higher SES mothers are more likely to breastfeed and higher SES children are less likely to be obese. Further, breastfeeding mothers are likely to be more health-conscious, and, therefore, to promote healthy habits, which are likely to prevent overweight and obesity later in childhood. Whether there is an association between these factors or not is not conclusive. However, Harder et al. (2005) suggested that there is a strong dose-dependent association between longer duration of breastfeeding and decrease in risk of overweight.

Further, physiological factors support an association. Breast milk contains bioactive substance such as leptin and ghrelin which can influence the proliferation and differentiation of the infant's adipocytes.<sup>25,4</sup> Breastfed children tend to have slower growth patterns when compared with synthesised formula.<sup>27</sup> The early days of growth could be key in determining the number of adipocytes laid down. This is a significant factor in change in weight later in life as adipocyte can only shrink or grow in size and not reduce in number.

The problem with most studies is that they did not look at exclusive breastfeeding and often categorized different amounts of breastfeeding together, when there is probably a significant difference between exclusive breastfeeding and any breastfeeding. Many studies did not fully consider the heterogeneity in classification of feeding.

Further, it must be recognized that some caution should be taken because a difference in BMI or overweight risk may not only be attributed to a change in body fat, but also to lean tissue and bone mass.<sup>26</sup> It is well known that lean muscle tissue weighs more than fat.

It is a concern that positive results may be more likely to be published and that early findings that show "ideal" associations may be corroborated by successive studies without complete reflection. Nevertheless, there is fairly consistent,

if low-level, association between early breastfeeding and later reduced childhood obesity. The answer to the research question is that breastfeeding appears to reduce the risk for childhood obesity, at least to some extent.

## Conclusion

Research suggests that early breastfeeding is protective against childhood obesity. Higher quality studies must be undertaken to determine whether this association is real or riddled by confounding factors.

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