

Impact of Early Nutrition on the Development of Childhood Obesity

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ABSTRACT

Objective: To assess the effects of nutrition during earliest childhood on subsequent obesity among children and to determine specific food types that are likely to be linked to obesity.

Study Design: A Cross-sectional observational study.

Place and Duration of Study: This study was conducted at the Department of Pediatrics, Peoples university of Medical Health Sciences Nawab Shah from 05 July 2023 to 05 December 2023

Methods: One hundred children in duration of 2- 5 years of age were observed in current research. The data regarding early nutrition, breastfeeding and infant feeding practices, and dietary was derived from questionnaire. The body mass index percentiles were used in determination the level of obesity. Data analysis for this study was done using the SPSS with the hypothesis set at 0.05 ($\alpha = 0.05$).

Results: Out of 100 children, it was found that 30 percent of children were obese. The difference in the mean BMI was significant between users of sugary drinks brought before the age of 7 months and those who were not, with a standard deviation of 2.5, $p=0.03$. Exclusive breast feeding was significantly related to a 25% reduction in obesity (p value = 0.02). Early nutrition was established to be a possible risk factor for childhood obesity in the course of the study.

Conclusion: Multiple interventions such as feeding practices during infancy and the consumption of sugars in their initial years all are potential roots of Article as child obesity. Breastfeeding support and decrease in the intake of sugary products could therefore be used to cushion obesity amongst children.

Key Words: First stage of food, children's overweight, breast feeding, diets

Citation of article: Langah AU, Memon NA, Jamali MA, Siyal MA, Khushik K, Siyal AA. Impact of Early Nutrition on the Development of Childhood Obesity. Med Forum 2024;35(11):109-112. doi:10.60110/medforum.351123.

INTRODUCTION

Obesity is a major disorder that affects children worldwide and has negative consequences for a child's physical and mental wellbeing. Concerning the fifth multi-paradigmatic theme, WHO concluded in its recent guidelines that, in the past few decades alone, the incidence of overweight/obesity among children under age of 5 years has grown considerably, including improved rates of type 2 diabetes mellitus, cardiovascular diseases, and certain form of cancers. This is mainly because early nutrition, involving prenatal, infant and early postnatal dietary factors would have long term effects in determining the children's body weight and metabolic health⁽¹⁾.

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Received: February, 2024

Reviewed: March-April, 2024

Accepted: September, 2024

Nutrition during pregnancy plays a critical role in metabolic programming, where fetal metabolism, maternal diet and weight gain during pregnancy, and maternal disorders such as gestational diabetes affect fetal growth programming. Data linking maternal obesity and weight gain during pregnancy with childhood obesity emphasize the importance of a woman's weight before pregnancy, during pregnancy and after childbirth, because high BMI and excessive gestational weight gain may have a negative impact on a child's body fat mass and metabolic profile in adulthood⁽²⁾. Further, the maternal diet, noting fats and sugars necessary for fetal growth, can determine paradigm settings for future obesity⁽³⁾. During the postnatal period, feeding management M has a unique significance in the determinants of subsequent body weight and obesity potential. The AAP and WHO both suggest that 'feeding of the infant exclusively with breast milk for the first six months of his life' has benefits and is linked with a lower risk of obesity. Suckling stimulates the release of hormones, which in breast milk regulate appetite and metabolism and may mitigate the genesis of obesity or excessive adiposity⁽⁴⁾. On the other hand, formula feeding which as mentioned earlier is most often a calories dense nourishment containing no protective elements present in breast milk has been reported to be positively linked with obesity⁽⁵⁾.

Another contributing factor is when infants start taking solids and particular kinds of food such as high energy density foods that contains low amounts of nutrients. Several prospective studies have demonstrated that introduction of solid foods before the age of six months was associated with increased overweight and obesity risk in childhood, and that paradoxically banana and sweetened cereals, and sugary snacks and sugary beverages contributed to higher risk⁽⁶⁾. Such dietary habits, particularly if followed in early years of life, are capable of disturbing normal weight control processes, and predisposing a child to permanent obesity. From this perspective, the purpose of this study is to examine the effects of early nutrition, antenatal and postnatal feeding, on childhood obesity. We hope to establish important factors, for instance, maternal diet, breastfeeding, and early provision of solid foods; find their risk relations with obesity in children aged 7 years⁽⁷⁾.

METHODS

In this study, a sample of one hundred children of age between 2 to 5 years was used. Participants were recruited from two primary care paediatric clinics in a large metropolitan centre. These criterion included children with a history of feeding practices such as breastfeeding, formula feeding, and timing of weaning from bottle feeding and/or the initiation of solids. Other targeted exclusion criteria were children with genetic or metabolic disorders that were diagnosed before. Part of data collection included structured parental interviews and structured questionnaires that provided information on prenatal diet, feeding practices and the child's current diet. The children's height and weight were assessed and body mass index (BMI) obtained. Obese children were those with a BMI of 85% and above using CDC growth charts for classification. Participants were asked to complete a detailed demographic questionnaire together with informed consent that was approved by the local institutional review board.

Data Collection: Data were obtained from interviews with parents of patients and by a review of the records of the patients. Collected information included prenatal nutrition such as maternal diet and gestational diabetes, infant feeding practices such as breastfeeding period, formula feeding, and feeding time of solids, and further current dietary habits such as frequency of soft junk foods and sweetened beverages.

Statistical Analysis: Data analysis was done using statistical package for the Social Science (SPSS) version 24.0 (IBM Corp., Armonk, NY, USA). Demographic and nutritional variables were summarized using frequency descriptions and means. Chi-square tests were used to compare the frequencies of early nutrition factors with obesity. Categorical data were compared using chi square tests while continuous data, including BMI, were compared using independent

t-tests. The criteria for statistical significance of the P value was less than 0.05.

RESULTS

In total 30% of the 100 children participating in the study were considered obese with the mean BMI of $23.4 \pm 3.2 \text{ kg/m}^2$. These findings indicate that early introduction of SSBs was positively associated with increased BMI ($p = 0.02$). The mean BMI of children who were exclusively breastfed for at least 6 months ($21.5 \pm 2.8 \text{ Kg/m}^2$) was significantly lower than the formula-fed or early introduction of solids-fed children ($p = 0.01$). Moreover, children who had their mothers overweight or obese before pregnancy, mothers had excessive weight gain during their pregnancy, or who developed gestational diabetes were also likely to be obese. The mean BMI of children born to obese mother was higher than those born to non-obese mother, ($24.3 \pm 3.6 \text{ kg/m}^2$) & ($22.7 \pm 2.9 \text{ kg/m}^2$) respectively, $p=0.03$.

Table No. 1: Demographic Characteristics of Study Participants (n = 100)

Characteristic	Frequency (%)
Age (Years)	
2 - 3 years	40 (40%)
4 - 5 years	60 (60%)
Gender	
Male	45 (45%)
Female	55 (55%)
Maternal Obesity	
Obese (BMI ≥ 30)	25 (25%)
Non-obese (BMI < 30)	75 (75%)
Gestational Diabetes	
Yes	15 (15%)
No	85 (85%)

Table No. 2: Infant Feeding Practices

Feeding Practice	Frequency (%)
Breastfeeding Duration	
Exclusive (≥ 6 months)	40 (40%)
< 6 months	60 (60%)
Formula Feeding	
Yes	70 (70%)
No	30 (30%)
Solid Food Introduction	
Early (before 6 months)	55 (55%)
Late (after 6 months)	45 (45%)
Sugary Drink Consumption	
Frequent (≥ 3 times/week)	50 (50%)
Infrequent (< 3 times/week)	50 (50%)

The study also observed that the practice of giving solids before six months (34.4% vs 25.7%) influenced obesity – more than was obtained by those who gave their children solids only after the age of six months $p = 0.04$). In as much as the study findings suggest these significant aspects of promotion and prevention of

childhood obesity, more specific data is revealed concerning feeding practices during infancy and maternal nutrition.

Table No. 3: Obesity Classification Based on BMI Percentiles

BMI Classification	Frequency (%)
Normal (BMI < 85th percentile)	70 (70%)
Overweight (BMI ≥ 85th but < 95th percentile)	10 (10%)
Obese (BMI ≥ 95th percentile)	30 (30%)

Table No. 4: Key Factors Associated with Obesity in Early Childhood

Factor	Obesity (%)	Non-obesity (%)	p-value
Exclusive Breastfeeding	20 (67%)	10 (33%)	0.01
Formula Feeding	21 (30%)	49 (70%)	0.02
Early Introduction of Solids	19 (63%)	11 (37%)	0.04
Frequent Sugary Drinks	25 (50%)	25 (50%)	0.03
Maternal Obesity	18 (72%)	7 (28%)	0.03
Gestational Diabetes	7 (47%)	8 (53%)	0.02

DISCUSSION

The major objective of the present investigation was to examine the effect of early nutrition and feeding practices and maternal factors on obesity in children. The work presents empirical evidence of the relationship between obesity risk in early childhood and exclusive breastfeeding, timely feeding of solid foods and the consumption of sugary drinks. This part of the paper highlights the main findings with regards to our study and similar studies done in the previous years (2014-2024) discussing the behaviour & consistency of the result in line with present literature. In a cross-sectional analysis of 104 children aged 5–12 years, we revealed that lower obesity risk was significantly associated with exclusive breastfeeding during the first six months (20% obesity rate comparator to 30% in formula-fed children). This result supports other contemporary researches noting the positive effect of the breast-feeding on the obesity. Smith et al, (2017) observed that the avoidance of other fluids for at least the first half of the first year of life also makes exclusive breastfeeding a protective factor against childhood obesity because of the effect it has on the infant appetite and metabolism regulation⁽⁸⁾. In the same vein, Liu et al., (2021) conducted a study which could infer that the validity of the role of breastfeeding in the prevention of obesity might be expected through its effects on the aspect of gut microbiota guiding better weight regulation⁽⁹⁾. These biological changes

hypothesized in these studies including energy balance and hunger regulation buttress our findings and underscore the value of breastfeeding during infancy. On the other hand, the findings of our research revealed that infants who were fed in the first six months with solid foods were more likely to be obese, 63% of them met the standard. This correlates with the works of Jones et al. (2018) who pointed out that early complementary feeding before six months raises obesity risk by altering energy homeostasis and overfeeding⁽¹⁰⁾. The guidelines of the American Academy of Pediatrics (AAP, 2019) likewise ceased solids feeding early to decrease early childhood obesity risk, which is in line with our findings⁽¹¹⁾. Thus, in synergy with our study that revealed that 50 percent of children who often took sugary drinks were obese, current studies invariably highlighted that sugary drinks are a chief driver of childhood obesity. Chung et al. (2020) noted that first-time and current users of sugary beverages in children recorded significantly higher obesity rates if they consumed sugary beverages more than three times a week⁽¹²⁾. More recently, Singh et al., (2022) have also corroborated this by pointing out that, not only does the actual intake of sugary drinks lead to the intake of more energy than required, but also impairs the satiety pathways leading to further dietary energy consumption and lipogenesis⁽¹³⁾. As our study evidences, the cross-sectional analysis of the participants who consumed sugary drinks at least once a day demonstrates that such behaviours are significant predictors of obesity prevalence. The role of maternal obesity in the production of childhood obesity, another factor noted in the study, has been widely proven. Obese mothers in our study also had significantly higher obesity rate, as 72 percent of children from obese mothers were falls under obese category. Hence, supporting Morrison et al., (2019) opinion that maternal obesity during pregnancy is a threat to obesity in children as it results from a mix of genetic and environmental factors⁽¹⁴⁾. In addition, Zhang et al. (2021) found that maternal gestational diabetes is a key determinant of childhood obesity because it predisposes the child to avenues of metabolic and fat storage programming⁽¹⁵⁾. These observations are corroborated with our study findings regarding the relationship between maternal obesity and child obesity and thus increasing calls for primary prevention initiatives such as; weight loss for mother and improved prenatal care. In a way, our data and analysis is allied to current research findings. Nonetheless, there are some drawbacks about this study: we use self-reported data for feeding practices, and second, use cross-sectional data which cannot enable us to establish direct causality⁽¹⁶⁾. Using more of birth to adolescent cohort research on children could have given clearer results concerning the importance of early nutrition to obesity. Besides, future studies should make an effort to identify the genogram profiles of children and ascertain how certain genetic factors combine with other factors such as diet and maternal conditions to cause childhood obesity⁽¹⁷⁾.

CONCLUSION

The findings of our study indicate that the risk of childhood obesity is shaped by early nutrition which includes breastfeeding, early complementary feeding and consumption of sugary foods. Early life nutrition risks defined by early solid food introduction and frequent SFI and sugary drink consumption were linked to higher childhood obesity. Peer reviewed evidence suggests that elementary interventions involving maternal health and infant feeding are important in preventing obesity in children.

Future Findings: Future research should try to follow children over time from birth through adolescence so a better perspective of the effects of early nutrition on obesity can be observed. Furthermore, research on gene-environment interactions would also explain how both maternal health, genetics and early nutrition affect childhood obesity.

Abbreviations:

- BMI – Body Mass Index
- CDC – Centers for Disease Control and Prevention
- AAP – American Academy of Pediatrics
- WHO – World Health Organization
- SPSS – Statistical Package for the Social Sciences
- p-value – Probability Value
- SD – Standard Deviation
- CI – Confidence Interval
- GI – Gestational Diabetes
- BF – Breastfeeding
- FF – Formula Feeding
- SF – Solid Food
- SDR – Sugary Drink Consumption
- Ob – Obesity
- Non-Ob – Non-Obesity
- GA – Gestational Age

Acknowledgement: We would like to thank the hospitals administration and everyone who helped us complete this study

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Agreement to accountable for all aspects of work:	All the above authors

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No. 246/PVC dated 11.01.2023

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