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Original article

Relationship Between Breastfeeding and Obesity Among 7 Years Old Children in Libya

Fathia Hussien

Department of Physiology, Faculty of Medicine, Omer AlMukhtar University, Albayda, Libya

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Corresponding Email.
Kozomoahmed121@gmail.com

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ABSTRACT

***Background and aims**. The current study aimed to investigate the relationship between infant-feeding variables and body mass index BMI in a group of Libyan children aged 7 years. **Methods.** A cross-sectional study was conducted to investigate the weight status and the relationship of infant-feeding variables with BMI, in a group of libyan children in Albayda,140 student of both sexes in elementary schools (aged 7 years) was selected from different educational districts of Albayda .The purposes of research was explained to mothers and written consent was obtained from them, weights and heights of children was measured, Data on breastfeeding (BF), formula-feeding, and the timing of introduction of complementary foods (CF), was collected from the mothers using a questionnaire. **Results**. The 2.8% of the children were underweight, and the prevalence of overweight 30 % respectively, Total time of BF and duration of exclusive BF were not associated with childhood BMI. The timing of introduction of CF was inversely related to childhood BMI after controlling for other variables (β:-0.34; 95% CI:-0.58,-0.10). Children with an early introduction of CF had significantly higher mean BMI (p for linear trend=0.012). **Conclusion**. Overweight and obesity are nutritional problems among 7 years old children in Libya. Preventive strategies are needed to prevent further increases in the prevalence of overweight and obesity.*

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INTRODUCTION

Within the World Health Organization (WHO) European Region, childhood obesity remains an important public health concern. For the last decade, this diverse region has shown a north-south gradient in the prevalence of overweight including obesity with higher rates in Mediterranean countries [1-3].

The prevalence and intensity of childhood obesity have been increasing which is common not only in developed but also in developing countries [4]. It is associated with mortality and morbidity, including hypertension, cardiovascular, gastrointestinal, endocrine, respiratory and orthopaedic diseases as well as psychosocial problems both in adults and children [5].

Recently, much of the research work has been conducted to investigate the possible effects of early nutritional experiences during foetal stage and infancy on later-life obesity. There is evidence that breastfeeding (BF) may have protective effect against obesity [6,7], more recent studies have reported null effects [8,9]. Although the time when complementary foods (CF) are introduced has a potential effect on childhood obesity, its relationship with obesity is not still clear [10]. Most studies of childhood obesity focused on the relationship of potential risk factors with the prevalence of obesity, using BMI as a binary variable (obese vs non-obese).

While the risk of comorbidity may increase continuously across the whole spectrum of childhood BMI [11]. The current study aimed to investigate the relationship between infant-feeding variables and body mass index BMI in a group of Libyan children aged 7 years.

METHODS

This cross-sectional study was conducted on children aged 6-7 years in Al-Bayda. A random samples of 140 healthy children were selected in a multistage sampling technique from elementary schools,were selected at random 4 schools were enrolled in this study. In the second stage, first grade students were selected randomly from each of the 4 schools. Twins, the multifoetal, and children with specific diseases were not included in this study. The purposes and the methodology of research were explained to them by members of the study team, and written consent was obtained from them The study was approved by ethics committee of the School of Public Health in Omer Al Mukhtar University.

Anthropometric measurements

Body-weights were measured with light clothing and without shoes, using a portable analogue Seca Scale. Heights were measured in standing position, using a fixed tape meter to the nearest 0.5 cm. BMIs were also calculated using the formula kg/ m2. The 2007 World Health Organization (WHO) growth reference was used for determining child's weight status. For children, BMI is presented as a percentile, which plots the child's BMI next to other children of the same age and sex. Falling between the 5th and 85th percentiles is considered normal and healthy. Underweight: less than 5th percentile, Healthy weight: 5th percentile to less than 85th percentile, and obese: equal to or greater than 95th percentile

Infant-feeding variables

Infant-feeding variables were obtained from the mothers, using a questionnaire. Mothers were first asked what type of feeding—BF, formulafeeding, or both (categorized as mixed feeding)— had been chosen. They were asked up to what age the child was exclusively breastfed and when the child completely stopped BF. In exclusive BF, the infant only received breastmilk without any addition of other liquid or solid feeds. Information on the ages (in month) when complementary food was introduced was also collected. We also asked the mothers whether their babies were on regular formula-feeding and, if so, what the total duration of formula-feeding was.

Statistical analysis

Data were analyzed in SPSS (version23) The associations of infant-feeding variables with child's BMI (as categorical variables) were tested by chi-square. In these analyses, the term 'overweight' included both overweight and obese children. The p value of <0.05 was considered to be the level of statistical significance. The associations of infant-feeding variables with child's BMI were also analyzed using univariate linear regression and multiple linear regression.

RESULTS

A total number of 140 students were recruited for this study from 4 schools; 2.7% of the children were underweight, and the prevalence of overweight 32.7 % respectively. Approximately 93.3% of the children had been ever breastfed; 35.3% of the children were breastfed for less than 12 months (Table 1). The associations between BMI (as categorical variable), infant-feeding, are presented in Table 2.

Table 1. Infant-feeding, characteristics of participants

Characteristics	Frequency	Percentage
Type of nutrition		
Breastmilk	100	71.4%
Formula milk	10	7.1%
Both	30	21.4%
Total time of breastfeeding(month)		
≤6	24	18.1%
>6-12	22	16.5%
>12-18	35	26.2%
>18	52	39.5%
Duration of exclusive breastfeeding (month)		
≤1	17	13.1%
>1-4	15	11.6%
>4	97	75.1%
Total time of formula feeding (month)		
≤6	86	61.8%
>6	53	38.1%

Timing of introduction of Cf (month)		
≤4	13	9.3%
>4-6	65	46.7%
>6	31	22.1%
Characteristics	Frequency	Percentage
Type of nutrition		
Breastmilk	100	71.4%
Formula milk	10	7.1%
Both	30	21.4%

Type of nutrition [$\chi 2$ (2, n=140)=3.78, p=0.132], total duration of BF [$\chi 2$ (6, n=133)=8.11, p=0.331], duration of exclusive BF [$\chi 2$ (4, n=129)=6.22, p=0.112], total time of formula-feeding [$\chi 2$ (2, n=139)=2.31, p=0.170], and timing of introduction of CF [$\chi 2$ (4, n=129)=6.22, p=0.080] were not significantly associated with child's weight status.

Table 2. Infant-feeding variable, by BMI category

Variable	**BMI categories**			**P value**
	Underweight n(%	Normal n(%)	Overweight n (%)	
Type of nutrition Breast milk	4(4)	60(60)	36(36)	0.132
Formula milk or both	2(5)	28(70)	10(25)	
Total time of breast feeding (month) ≤6 month	0(0)	18(75)	6(25)	0.331
>6-12 month	1(3.1)	11(34.3)	10(31.25)	
>12-18 month	1(2.8)	22(62.8)	12(34.2)	
>18 month	2(3.7)	37(69.8)	14(26.4)	
Duration of exclusive breast feeding (month) ≤1month	1(5.8)	10(58.8)	6(35.2)	0.112
>1-4 month	1(6.6)	9(60)	5(33.3)	
>4 month	10(10.3)	61(62.8)	26(26.8)	
Total time of formula feeding (month) ≤6 month	6(6.9)	55(63.9)	25(29.06)	0.170
>6 month	5(9.4)	28(52.8)	20(37.7)	
Timing of introduction of CF (months) ≤4month	0(0)	5(38.4)	8(61.5)	0.080
>4-6month	2(3.07)	43(66.1)	20(30.7)	
>6month	3(9.6)	16(51.6)	12(38.7)	

In univariate model, variables related to child's BMI with p<0.2 were: duration of exclusive breastfeeding, total time of formula-feeding, timing of introduction of CF, Child's BMI increased with total time of formula-feeding (p=0.04) It decreased with timing of introduction of CF (p=0.010) and tended to decrease with duration of exclusive BF (p=0.112) In multiple linear regression timing of introduction of CF was the only infant-feeding variable significantly associated with child's BMI (p=0.006).When we entered CF as a categorical variable, inverse association between CF and child's BMI was found (p for linear trend=0.012) (Table 3).

Table 3. Associations of infant-feeding variables, with child's BMI

Independent variable	**Univariate linear regression**			**Multiple linear regression**		
	B	**95% CI**	**P value**	**B**	**95% CI**	**P value**
Duration of exclusive BF	-0.13	-0.31,0.05	0.112	0.08	-0.19,0.34	0.576
Total time of formula-feeding (months	0.22	0.01,0.46	0.040	0.20	-0.05,0.46	0.117
Timing of introduction of CF	-0.31	-0.54,-0.09	0.007	-0.34	-0.58,-0.10	0.006

DISCUSSION

In this study, the prevalence of underweight was 4.7 %, and the combined prevalence of overweight and obesity was 32.7% in Al-Bayda children aged 7 years. These findings show that childhood obesity is a nutritional problem in Al-Beyda children. The prevalence of childhood obesity varies across populations [12]. Cut-off values and type of reference to define obesity, the age of participants, and the time when the sample was examined differ in studies reporting prevalence of obesity, making it difficult to compare the rate of childhood obesity among populations. In the present study, the 2007 WHO growth reference was used for the calculation of prevalence because it was the most relevant BMI reference to define obesity [13]. This reference is also recommended for international use and has a potential to be the future international reference for the surveillance of overweight and obesity [14].

We also investigated the associations of infantfeeding practices and infant variables with childhood BMI at 7 years of age as early-life predictors of adiposity. In the present study, timing of introduction of CF was significantly and inversely associated with childhood BMI.

There was also a significant linear trend for the time of CF; children having CF at >4-6 months and >6 months had significantly lower BMI than children having early CF (≤4 months) (p for trend=0.012), after controlling for other variables. The time of introduction of CF is a period of particular vulnerability; however, the association between this time and later risk of obesity is not still clear. Few researches reported the time of introduction of CF and adiposity at 7 years. Vafa et al., showed that Children with an early introduction of CF had significantly higher mean BMI [15] Wilson et al., in their Dundee cohort of 674 infants, showed that, in infants with early introduction of CF (<15 weeks), weight and percentage of body fat increased significantly at 7 years of age than the ones with late introduction of CF (≥15 weeks) [16]. Reilly et al., in the Avon longitudinal study of parents and children, reported that the age of introduction of CF was not a significant risk factor of obesity at 7 years of age [9]. Other studies that explored the effect of age at introduction of CF on later adiposity in different ages also provided inconsistent results [6, 8,17]. In a recent systematic review of association between timing of introducing solid food and obesity in infancy and childhood, no clear association was found. In that systematic review, only studies of participants living in developed countries were included; so, it was not applicable to other populations [10].

In the current study, the lower prevalence of overweight in breastfed children than formula- or mixed-fed children was not statistically significant. We also did not find a protective effect of BF, neither as total time of BF nor duration of exclusive BF. These findings are consistent with those from some previous observational studies [8,9] but not from others [6,7]. Randomized controlled trial of breastfeeding (PROBIT) also showed that promotion of BF increased the duration and exclusivity of BF but did not reduce BMI and other measures of adiposity at the age of 6.5 years [18]. Meta-analyses concluded an inverse association between BF and risk of obesity at different ages; however, adjustment for confounders attenuated or abolished these associations [19 ,20 ,21]. In a meta-analysis of the effect of breastfeeding on mean BMI throughout life, mean BMI was found slightly lower among breastfed subjects [22].

There is also evidence that the relation of BF with BMI differed with age. In some studies, the inverse relationship between breastfeeding and BMI at 1 year of age attenuated at the age of 7 years or even disappeared later in childhood or adulthood [17,23,24]. Therefore, it is possible that other genetic and environmental factors, such as dietary patterns, sociocultural and economic status, and parental characteristics, diminish or undo the effects of breastfeeding on childhood BMI after 1 year of age.

There was some limitations in the current study. The cross sectional design of the study is prone to be confounded by many environmental factors; however, we cannot rule out residual confounding by other unmeasured or unknown confounders. Data on infant-feeding variables, were collected based on mother's recall, which are suspected to have recall bias. Collecting data many years later can lead to misclassified exposures and consequently inappropriate conclusions. We missed sociocultural and economic status, and parental characteristics, as well as parental BMI, we used only BMI as the measure of adiposity but it does not distinguish between fat and lean mass. We did not find any differences in BMI by BF status; however, its effects on body composition are not evident.

CONCLUSION

We observed high rates of overweight and obesity in Al-Beyda children at 7 years of age. Preventive strategies are needed to prevent further increases in the prevalence of overweight and obesity. The time of introduction of CF were independent predictors of childhood BMI. Breastfeeding (either total time of BF or duration of exclusive BF) was not associated with child's BMI at this age-group. Further studies are needed to explore the independent determinants of BMI in Libyan children to develop effective and culturesensitive prevention strategies.

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Disclaimer
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Conflict of Interest
There are no financial, personal, or professional conflicts of interest to declare.

REFERENCES

1. The WHO European Childhood Obesity Surveillance Initiative–COSI 2015/2017. *Obesity facts*, *12*(2), 226-243
2. World Health Organization. WHO European Childhood Obesity Surveillance Initiative: overweight and obesity among 6–9-year-old children: report of the third round of data collection 2012–2013 (No. WHO/EURO: 2018; 2980-42738-59613).
3. Wijnhoven T, van Raaij J, Spinelli A, Starc G, Hassapidou M, Spirosk I. WHO European Childhood Obesity Surveillance Initiative: body mass index and level of overweight among 6–9-year-old children from school year 2007/2008 to school year 2009/2010. BMC public health. 2014;14(1): 1-16.
4. Koletzko B, Girardet J, Klish W, Tabacco O. Obesity in children and adolescents worldwide: current views and future directions—Working Group Report of the First World Congress of Pediatric Gastroenterology, Hepatology, and Nutrition. Journal of pediatric gastroenterology and nutrition. 2002; 35: S205-S212.
5. Procter K. The aetiology of childhood obesity: a review. Nutrition research reviews.2007; 20(1): 29-45.
6. Hediger M, Overpeck M, Kuczmarski R, Ruan W. Association between infant breastfeeding and overweight in young children. JAMA. 2001; 285:2453-60.
7. Mayer-Davis EJ, Rifas-Shiman SL, Zhou L, Hu FB, Colditz GA, Gillman MW. Breast-feeding and risk for childhood obesity: does maternal diabetes or obesity status matter? Diabetes Care. 2006; 29:2231-7.
8. Burdette H, Whitaker R, Hall W C, Daniels S. Breastfeeding, introduction of complementary foods, and adiposity at 5 y of age. The American journal of clinical nutrition.2006; 83(3):550-558.
9. Reilly JJ, Armstrong J, Dorosty AR, et al. Early life risk factors for obesity in childhood: cohort study. BMJ. 2005;330(7504):1357. doi:10.1136/bmj.38470.670903.E0
10. Moorcroft K, Marshall J, McCormick F. Association between timing of introducing solid foods and obesity in infancy and childhood: a systematic review. Maternal & child nutrition. 2011; 7(1): 3-26
11. Bell L, Byrne S, Thompson A, Ratnam N, Blair E, Bulsara M, et al. Increasing body mass index z-score is continuously associated with complications of overweightin children, even in the healthy weight range. J Clin Endocrinol Metab. 2007; 92:517-22.
12. Wang Y. Cross-national comparison of childhood obesity: the epidemic and the relationship between obesity and socioeconomic status. International journal of epidemiology.2001; 30(5): 1129-1136.
13. Dorosty Motlagh A, Ahranjani B, Siassi F. Determination of the most relevant body mass index standard references to define obese Iranian school-age children. Iranian Journal of Nutrition Sciences & Food Technology. 2009; 4(2): 71-80.
14. El Mouzan MI, Al Herbish AS, Al Salloum AA, Al Omar AA, Qurachi MM. Regional variation in prevalence of overweight and obesity in Saudi children and adolescents. Saudi J Gastroenterol. 2012;18(2):129-132. doi:10.4103/1319-3767.93818
15. Vafa M, Moslehi N, Afshari S, Hossini A, Eshraghian M. Relationship between breastfeeding and obesity in childhood. J Health Popul Nutr. 2012 Sep;30(3):303-10.
16. Wilson A, Forsyth J, Greene S, Irvine L, Hau C, Howie P. Relation of infant diet to childhood health: seven year follow up of cohort of children in Dundee infant feeding study. BMJ .1998;316(7124): 21-25.
17. Schack-Nielsen L, Sørensen T, Mortensen E, Michaelsen K. Late introduction of complementary feeding, rather than duration of breastfeeding, may protect against adult overweight. The American journal of clinical nutrition. 2010; 91(3): 619-627.
18. Kramer M, Matush L, Vanilovich I, Platt R, Bogdanovich N, Sevkovskaya Z. Promotion of Breastfeeding Intervention Trial (PROBIT) Study Group. Effects of prolonged and exclusive breastfeeding on child height, weight, adiposity, and blood pressure at age 6.5 y: evidence from a large randomized trial. The American journal of clinical nutrition. 2007; 86(6): 1717-1721.
19. Harder T, Bergmann R, Kallischnigg G, Plagemann A. Duration of breastfeeding and risk of overweight: a meta-analysis. American journal of epidemiology. 2005; 162(5): 397-403.
20. Arenz S, Rückerl R, Koletzko B, von Kries R. Breast-feeding and childhood obesity—a systematic review. International journal of obesity. 2004; 28(10):1247-1256.
21. Owen C, Martin R, Whincup P, Smith G, Cook D. Effect of infant feeding on the risk of obesity across the life course: a quantitative review of published evidence. Pediatrics .2005; 115(5): 1367-1377.

22. Owen C, Martin R, Whincup P, Davey-Smith G, Gillman MW, Cook DG. The effect of breastfeeding on mean body mass index throughout life: a quantitative review of published and unpublished observational evidence. Am J Clin Nutr. 2005;82:1298-307.
23. Scholtens S, Gehring U, Brunekreef B, Smit H, de Jongste J, Kerkhof M, Wijga A. Breastfeeding, weight gain in infancy, and overweight at seven years of age: the prevention and incidence of asthma and mite allergy birth cohort study. American journal of epidemiology .2007; 165(8): 919-926.
24. O'Tierney P, Barker D, Osmond C, Kajantie E, Eriksson J. Duration of breast-feeding and adiposity in adult life. The Journal of nutrition .2009; 139(2): 422S-425S.