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Overweight and obesity in association with factors related to breastfeeding in Arar, Northern Saudi Arabia

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ABSTRACT

Background: There is evidence that breastfeeding (BF) may have protective effect against obesity. In some studies, a time-dependent association between duration of BF and obesity has also been shown.

Objectives: This community-based study was conducted aimed to evaluate the prevalence of overweight and obesity in children 2-12 years in association with factors related to breastfeeding in Arar City, Northern Saudi Arabia.

Participants and methods: A cross-sectional study was carried out in Arar City, mothers were selected from the attendees of the female side of 5 randomly selected primary health care centres in the city. They were interviewed and filled a questionnaire which included the needed questions.

Results: Among the 562 studied children, 54.8% were females and the estimated proportion of obese and overweight children are 39.9% and 13.9%, respectively. The BMI group proportions were significantly affected by the period of breastfeeding, father's obesity, and type of feeding; whether it was artificial or breast-feeding, or both ($P<0.05$). We found that 43% of those who were underfed; breastfed for less than 4 months only, were obese and 8.8% were overweight. Among those who were breast-fed for 4 to 6 months, 31.2% were obese and 20.8% were overweight and for those that had a 6 months to a year breastfeeding, 19.4% and 12.9% were obese and overweight, respectively.

Conclusion: In Arar City, Northern Saudi Arabia, the BMI of children 2-12 years is significantly affected by the period of breastfeeding, father's obesity, and type of feeding; whether it is artificial or breast-feeding, or both ($P<0.05$). So policy makers must condense their efforts to increase the awareness of the mothers about the protective effect of breastfeeding from obesity and its comorbidities.

Key words: Breastfeeding, Childhood, Artificial feeding, BMI, Obesity, Arar City, Northern Saudi Arabia.

INTRODUCTION

Prevalence of childhood obesity has increased markedly worldwide in the last three decades and become a major public health crisis around the world [1]. Since obesity and overweight are correlated with life-threatening diseases including diabetes, high cholesterol levels, hypertension, cardiovascular diseases, stroke, and certain types of cancers, the number of deaths related to obesity is estimated at 2.8 million per year [2]. There is evidence that breastfeeding may have protective effect against obesity [3]. In some studies, a time-dependent association between duration of BF and obesity has also been shown [4].The link between childhood obesity and breastfeeding can be explained that breast milk contains less calories and nutrients as well as bioactive substances, including leptin and ghrelin. However, the higher protein and fat levels in formula milk have been associated with higher adiposity levels [5]. Some research attributed the association to higher levels of insulin hormone and a longer response to insulin in formulae-fed infants than the breastfed ones. This increases the fat storage when high protein is present [6,7].

In a study conducted to examine the relationship between breastfeeding (BF) and odds of childhood obesity in Hispanic children, it was reported that, infants exclusively formula fed at birth were significantly more likely than fully breastfed infants to be obese at early childhood ($P <0.001$). For every additional month of any BF, obesity risk at early childhood decreased by 1%. Every additional month of full BF conferred a 3% decrease in obesity risk [8].

Another study was conducted in Iran to investigate the weight status and its relationship to infant-feeding and BMI in Iranian children, it was concluded that total time of BF and duration of exclusive BF were not associated with childhood BMI and the timing of introduction of complementary feeding was inversely related to childhood BMI. Children with an early introduction of complementary feeding had significantly higher mean BMI [9].

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The surveillance of obesity among children over time requires studies and prevalence data. Malnutrition in infancy and childhood may result in both short and long term irreversible negative health outcomes and thus studies are run to point out the factors that can affect the growth of children, make recommendations for the governmental programs and health-care system in addition to the effective interventions of the parents.

This community-based study was conducted aimed to evaluate the prevalence of overweight and obesity in association with factors related to breastfeeding.

SUBJECTS AND METHODS

Study type and period:

This cross-sectional community-based study was conducted on 562 children of both sexes, aged 2-12 years during the period from 1st October, 2017 to 30th April 2018.

The formula n = z2 p (1 – p) / e2 was used to estimate the sample size. Considering the prevalence of stunted growth in Arar is 50%, target population more than 1000, study power 95%, absolute error 5%, and a nonresponse rate 20%.

Mothers were selected from the attendees of the female side of 5 randomly selected primary health care centers in the city using systematic random sampling technique (every 3rd mother). They were interviewed and filled a questionnaire which include the needed questions about their children under 12 years old.

The questionnaire included questions about socio-demographic characteristics of the participants, including age, sex, child order between siblings, average family income per month and parents' education, work and consanguinity. In addition, the questionnaire included inquiries about type of the child feeding (breastfeeding or artificial feeding or both), period of breastfeeding, exclusive breastfeeding, presence of chronic diseases, comorbidities and some feeding related parameters of the studied children.

Child bodyweight and height was obtained to calculate the BMI. Body mass index (BMI) was calculated as per the formula BMI = weight (kg) / height (m^2). Study subjects were classified as underweight (BMI<18.5), normal weight BMI from18.5 to 25), overweight (BMI from 25.01 to 30), and obese (BMI>30).

Statistical analysis:

Data were compiled and analyzed using statistical package for the social sciences (SPSS, version 16) and results were analyzed with frequencies and Chi-squared test as appropriate. P-value was considered significant if <0.05.

Ethical consideration:

Mothers were informed that participation is completely voluntary. No names were recorded on the questionnaires. All questionnaires were kept safe.

RESULTS

Table (1) shows the socio-demographic characteristics and BMI group of the studied children. It revealed that, studied children were 562, 54.8% were females, 20.6% 8-10 years and about third 31.7% aged 10-12 years. Parental higher education (university or more) was 71.2% among mothers and 62.6% among fathers. However, 44% of mothers were housewives. The estimated proportion of obese and overweight children are 39.9% and 13.9%, respectively.

Table (2) illustrates the breastfeeding related variables among the studied children. Among those children, 40.6% were breastfed for less than 4 months and 40.9% had absolute breastfeeding in the first 6 months after birth, 52.3% had both breast and artificial feeding. It was also found that the children who were never breastfed (artificial feeding) were 33.5%. The majority suffered no chronic nor hereditary diseases.

Table (3) shows the relationship between the child's BMI and breastfeeding related variables among the studied children. The BMI group proportions were significantly affected by the period of breastfeeding, father's obesity, and type of feeding; whether it is artificial or breast-feeding, or both (P<0.05).

We found that 43% of those who were underfed; breastfed for less than 4 months only, were obese and 8.8% were overweight. Among those who were breast-fed for 4 to 6 months, 31.2% were obese and 20.8% were overweight and for those that had a 6 months to a year breastfeeding, 19.4% and 12.9% were obese and overweight, respectively. The ration seems to be decreasing in an indirect proportional relationship between time of breastfeeding and BMI. However,

the obesity prevalence increased markedly with further increase in the period of breastfeeding for more than one year; as 55.3% and 10.5% among those who were breastfed for 12 to 18 months were obese and overweight, respectively, and 42% and 22% were obese and overweight, respectively, among those who had more than 18-months period of breastfeeding.

Table (1): Socio-demographic characteristics and BMI group of the studied children, Arar, 2018 (N=562).

	No.	Percent
Age group		
2-4	116	20.6
4-6	60	10.7
6-8	92	16.4
8-10	116	20.6
10 -12	178	31.7
Sex		
Female	308	54.8
Male	254	45.2
Mothers' education		
Illiterate	10	1.8
Primary	14	2.5
Read and write	20	3.6
Secondary	94	16.7
University or more	400	71.2
Preparatory	24	4.3
Fathers' education		
Illiterate	4	.7
Primary	12	2.1
Read and write	14	2.5
Secondary	138	24.6
University or more	352	62.6
Preparatory	42	7.5
Mothers' work		
Working	315	56.0
House wife	247	44.0
Average family income		
>15000	240	42.7
< 2000	28	5.0
10000-14000	120	21.4
2000-5000	42	7.5
5000-10000	132	23.5
Consanguinity between parents		
Cousins	178	31.7
No relation	302	53.7
Of the same family	82	14.6
Child order among his/her siblings		
1st	122	21.8
3rd	68	12.1
2nd	102	18.1
4th or more	270	48.0
BMI group		
Underweight	134	23.8
Normal	126	22.4
Overweight	78	13.9
Obese	224	39.9

Table (2): Breastfeeding related variables among the studied children.

	No.	%
Type of infant feeding		
Both	294	52.3
Artificial feeding	188	33.5
Breastfeeding	80	14.2
Period of breastfeeding (in months)		
< 4	228	40.6
4-6	96	17.1
6-12	62	11.0
12-18	76	13.5
> 18	100	17.8
Absolute breastfeeding in the 1st 6 months of life		
Yes	230	40.9
No	332	59.1
Chronic diseases		
Bronchial asthma	14	2.5
Skin allergy	2	.4
liver cell failure	2	.4
Chronic anemia	2	.4
Others	8	1.4
No chronic diseases	534	95.0
Hereditary disease		
No	538	95.7
Yes	24	4.3
Mothers' Obesity		
No	402	71.5
Yes	160	28.5

Table (3): Relationship between the child's BMI and breastfeeding related variables among the studied children

Variable	BMI				Total (n=562)	P value
	Underweight (n=134)	Normal (n=126)	Overweight (n=78)	Obese (n=224)		
Sex						
Female	71	76	46	115	308	0.340
	23.1%	24.7%	14.9%	37.3%	100.0%	
Male	63	50	32	109	254	
	24.8%	19.7%	12.6%	42.9%	100.0%	
Type of child feeding						
Breastfeeding	6	22	20	32	80	0.001
	7.5%	27.5%	25.0%	40.0%	100.0%	
Artificial feeding	44	40	18	86	188	
	23.4%	21.3%	9.6%	45.7%	100.0%	
Both	84	64	40	106	294	
	28.6%	21.8%	13.6%	36.1%	100.0%	
Absolute breastfeeding in the 1st 6 months						
Yes	60	40	40	90	230	0.033
	26.1%	17.4%	17.4%	39.1%	100.0%	
No	74	86	38	134	332	
	22.3%	25.9%	11.4%	40.4%	100.0%	
Period of breast feeding (in months)						
<4	53	57	20	98	228	0.001
	23.2%	25.0%	8.8%	43.0%	100.0%	
4-6	22	24	20	30	96	
	22.9%	25.0%	20.8%	31.2%	100.0%	
6-12	24	18	8	12	62	
12-18	14	12	8	42	76	
	18.4%	15.8%	10.5%	55.3%	100.0%	
	38.7%	29.0%	12.9%	19.4%	100.0%	
>18	21	15	22	42	100	
	21.0%	15.0%	22.0%	42.0%	100.0%	
Consanguinity between parents						
Cousins	42	46	32	58	178	0.05
	23.6%	25.8%	18.0%	32.6%	100.0%	
Of the same family	16	24	10	32	82	
	19.5%	29.3%	12.2%	39.0%	100.0%	
No relation	76	56	36	134	302	
	25.2%	18.5%	11.9%	44.4%	100.0%	
Mothers' obesity						
Yes	34	36	30	60	160	0.190
	21.2%	22.5%	18.8%	37.5%	100.0%	
No	100	90	48	164	402	
	24.9%	22.4%	11.9%	40.8%	100.0%	
Fathers' obesity						
Yes	22	34	38	42	136	0.001
	16.2%	25.0%	27.9%	30.9%	100.0%	
No	112	92	40	182	426	
	26.3%	21.6%	9.4%	42.7%	100.0%	

DISCUSSION

The link between childhood obesity and breastfeeding can be explained that breast milk contains less calories and nutrients as well as bioactive substances, including leptin and ghrelin. However, the higher protein and fat levels in formula milk have been associated with higher adiposity levels [5].

This cross-sectional community-based study was conducted on 562 children of both sexes, aged 2-12 years during the period from 1st October, 2017 to 30th April 2018 to evaluate the prevalence of overweight and obesity in association with factors related to breastfeeding.

The study revealed that, the BMI group proportions are significantly affected by the period of breastfeeding, father's obesity, and type of feeding; whether it is artificial or breast-feeding, or both ($P<0.05$). Among those children, 40.6% were breastfed for less than 4 months and 40.9% had absolute breastfeeding in the first 6 months after birth. The majority suffered no chronic nor hereditary diseases.

We found that 43% of those who were underfed; breastfed for less than 4 months only, were obese and 8.8% were overweight. Among those who were breast-fed for 4 to 6 months, 31.2% were obese and 20.8% were overweight and for those that had a 6 months to a year breastfeeding, 19.4% and 12.9% were obese and overweight, respectively.

The ration seems to be decreasing in an indirect proportional relationship between time of breastfeeding and BMI. However, the obesity prevalence increased markedly with further increase in the period of breastfeeding for more than one year; as 55.3% and 10.5% among those who were breastfed for 12 to 18 months were obese and overweight, respectively, and 42% and 22% were obese and overweight, respectively, among those who had more than 18-months period of breastfeeding.

It was reported by **Kersey *et al.*** [10] that increased duration of breastfeeding in the first year of life was significantly associated with a decrease in the risk of overweight among pre-schoolers, so that each additional month of breastfeeding was associated with a 10% decreased of overweight after controlling the sample for child's sex, birth weight group, current age, prematurity, maternal weight status and maternal education level. McCrory and Layte [11] found among 7798 Ireland school-going children aged 9 years old that breastfeeding for between 13 and 25 weeks was associated with a 38% reduction in the risk of increased BMI, while being breastfed in excess of 26 weeks was associated with a 51% reduction in risk of increased BMI. No significant association was found between obesity and the children breastfed for less than 26 weeks [11].

Our study also found that the children who were never breastfed were 33.5%. This percentage is much higher than that of **Hassan *et al.*** [12] which found the corresponding percentage to be 12.8% among Egyptian children. The majority (45.7%) of the artificially-fed children were obese and 9.6% of them are overweight. In the study of **Vafa *et al.*** [9] run in Tehran, Iran, it was found that 25.8% of the both breastmilk- and formulae-fed children were overweight [10].

The study of **Alanazi *et al.*** [13], which assessed the BMI and underweight status in adolescents the same area as our study, Arar, KSA, found that only 2.7% of the participants ages 12-15 were obese and found a deviation towards underweight in comparison to international standards and findings. The total prevalence of obese children in our study is 39.9%, which is markedly higher than the findings of **Alanazi *et al.*** [13]. A marked association was found between the children obesity and fathers' obesity ($P = 0.001$), while no significant association was found between children and mothers' obesity ($P = 0.109$). Among the 40.6% that had absolute breastfeeding in the first 6 months, 39.1% were found to be obese and the relationship is insignificant ($P = 0.125$). Consanguinity between parents, and sex of child were also found to be insignificant ($P = 0.091$, and 0.337, respectively).

CONCLUSION AND RECOMMENDATIONS

In Arar city, Northern Saudi Arabia, the BMI of children 2-12 years is significantly affected by the period of breastfeeding, father's obesity, and type of feeding; whether it is artificial or breast-feeding, or both ($P<0.05$). So policy makers must condense their efforts to increase the awareness of the mothers about the protective effect of breastfeeding from obesity and its comorbidities.

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