

## Prevalence of Obesity in the Under-Fives and Its Association with Marketed Foods and Beverages for Children and Anxiety in Mothers

Noura A. Awaad\*<sup>1</sup>, Azza M. Abul-Fadl<sup>1</sup>, Ehsan M. Fahmy<sup>2</sup>, Eman S. Ahmed<sup>1</sup>

Departments of <sup>1</sup>Pediatrics, and <sup>2</sup>Neuro-Psychiatry, Faculty of Medicine, Benha University, Egypt

\*Corresponding author: Noura A. Awaad, Mobile: (+20) 01024677939, E-mail: nouraawaad96@gmail.com

### ABSTRACT

**Background:** Childhood obesity is a significant public health issue across the world. Inappropriate marketing of commercial milk formula (CMF) and unhealthy foods and beverages to young children has been found to be associated with the emergence of obesity in young children. Additionally, maternal anxiety and the stress they place on children has been suggested to influence eating habits of children. **Objective:** To investigate obesity prevalence in children aged 2-5 years and its association with early feeding practices and inappropriate marketing of unhealthy foods and beverages, as well as the anxiety levels of their mothers. **Patients and Methods:** This study employed a combination of cross-sectional and case-control study designs to investigate the prevalence of overweight and obesity in children aged 2-5 years in Qalyubia Governorate, as well as the associations between overweight/obesity and the marketing of breast-milk substitutes and unhealthy foods. The research was divided into two distinct phases. In the first phase, a survey was conducted among 1000 mother-child pairs from nurseries in the nine districts of Qalyubia. The second phase involved a case-control study, with 100 obese children and 100 non-obese children being included for analysis. **Results:** Overweight (W/A and BMI  $>+2$  Z-scores) and obesity (W/A and BMI  $>+3$  Z-scores) was identified in 15.4% and 4.2% respectively; and stunting (L-HL/A  $>-2$  Z-scores) in 47%. Children who were not breastfed or breastfed for shorter durations had higher obesity and overweight rates. 78% of the obese children and 69.5% of the overweight were not breastfed or breastfed for less than one year and stunting in the non-breastfed was 15%. Food preference for fast foods was 95.2% among obese compared to 57.8% in normal weight. One third consumed fruits and vegetables, while one half consumed fast foods (51%). Exposure to advertisements for fast foods was highest by T.V. (53.3%) and display in the shops 28.5% compared to 17.5% for fruits. **Conclusions:** The findings highlight the prevalence of overweight and obesity among children aged 2-5 years and its association with the marketing of unhealthy foods and beverages. Maternal anxiety also appears to play a role in children's weight status.

**Keywords:** Childhood Obesity, Maternal Anxiety, Prevalence, Anthropometric Measurements, Breastfeeding, Unhealthy food preferences.

### INTRODUCTION

Globally, obesity in children under the age of five years is on the rise. Obesity has grown by 2-3 times during the last 30 years <sup>[1]</sup>. Obesity is an underlying cause for many non-communicable diseases as hypertension and diabetes mellitus later in life <sup>[2]</sup>. Egypt has the highest rates of obesity with over two thirds of its adult population, especially women suffering from obesity <sup>[3]</sup>.

Breastfeeding has a major effect on a child's survival, health, nutrition, and development, and it protects against obesity, hypertension, diabetes, childhood asthma, and childhood leukaemia <sup>[4]</sup>. The World Health Organisation (WHO) recommends that all newborn breastfeed exclusively for the first six months of their lives and continue to do so for at least two years beyond that, supplementing their diets with the right foods when they are seven months old <sup>[5]</sup>.

Early infant feeding practices play an important role in the prevention of obesity. It seems likely that some modifiable habits, such as the quality of foods, the frequency and amounts a baby is fed, may raise the chance of childhood obesity or overweight <sup>[4]</sup>. Early commercial milk formula (CMF) feeding has been shown to be linked to the high rates of childhood obesity in a disadvantaged region in Australia <sup>[6]</sup>. High rates of childhood obesity were shown to be related to early introduction of bottle feeding with CMF and early feeding of solids <sup>[6]</sup>. Additionally, pacifiers and

dummies are widely offered to infants, and research has shown connections between infant dummy usage and later results in terms of hunger, temperament, eating, and weight <sup>[7]</sup>. Moreover, maternal anxiety and distress was also shown to be connected to increased body mass index (BMI) in their offspring <sup>[8]</sup>.

Marketing strategies have a role in the spread of CMF, high-carb diets, junk food, fast food, and other unhealthy meals by aggressively promoting these items to the public, in particular children and their mothers, in the different channels of media and the public places. The growth of social media and internet technology could be underlying causes. According to a Tongji "China" assessment, media exposure raises the quantity of CMF children consume, which increases their chance of developing obese <sup>[9]</sup>. Studies by **Rummo et al.** <sup>[10]</sup> and **Maddock** <sup>[11]</sup> showed that aggressive marketing of unhealthy foods was closely linked to obesity in children. The WHO has responded to such practices by releasing the World Health Assembly (WHA) resolution in 2017 <sup>[12]</sup> for prohibiting the promotion of unhealthy foods and drinks for babies and young children, as well as increasing the six-month window covered by the international code of marketing for breast-milk replacements to three years <sup>[12,13]</sup>. Despite this, a multi-country study by WHO and UNICEF showed that marketing influences mother and professional infant feeding decisions <sup>[14]</sup>. In countries with policies that

limit marketing, decreased prevalence of overweight and obesity has been demonstrated [15, 16].

In Egypt although previous studies in the past century have shown that the problem of malnutrition was characteristically linked to underweight and stunting, yet with the turn of the century, studies have shown a shift of malnutrition to overweight and obesity in children under age of 5 years particularly in urban regions [12]. More recently the problem of overweight and obesity has been shown to move onto rural areas too. This was shown in a recent study conducted in Tala district in Menoufiya Governorate in Lower Egypt, where overweight and obese children in preschool children (2-5 years) had steeply risen to 21% (15% overweight and 6% obese), indicating that one in five children under age of 7 years are overweight or obese in our communities [17]. A meta-analysis study in Egypt for preschool children showed that obesity was 13.8% in formula fed versus 5.6% among exclusively breastfed preschool children. Risk factors for obesity include meals consumed before the age of six months, packaged foods, canned beverages, and a lack of physical exercise. Colostrum feeding, exclusive breastfeeding for 6 months and continued breastfeeding for two years, nutritious diet, and consumption of fruits and vegetables were all found to be beneficial. According to the research analysed, vitamin deficiencies are often associated with obesity [18].

There are no laws against the promotion of harmful meals to youngsters in Egypt [19]. It remains to be established whether marketing of breast-milk substitutes involving infant milk formula, baby foods, beverages and unhealthy foods, are associated with the rise in childhood overweight and obesity in Egypt. Also, whether psychological factors in these mothers, in response to marketing of these products, is an underlying factor to obesity in these young children.

This study aimed to investigate obesity prevalence in children aged 2-5 years and its association with marketed foods and beverages for children, as well as the anxiety levels of mothers.

## PATIENTS AND METHODS

This study employed a combination of cross-sectional and case-control study designs to investigate the prevalence of overweight and obesity in children aged 2-5 years in Qalyubia Governorate, as well as the associations between overweight/obesity and the marketing of breast-milk substitutes and unhealthy foods. The study was conducted over a period from April 2022 to February 2023.

The research was divided into two distinct phases. In the first phase, a survey was conducted among 1000 mother-child pairs from nurseries in the nine districts of Qalyubia. The second phase involved a case-control study, with 100 obese children and 100 non-obese children being included for analysis.

The study population consisted of children aged 2-5 years attending day care nurseries. Inclusion criteria included being within the specified age range and being in a healthy condition. Exclusion criteria encompassed sick and handicapped children, as well as those with inborn errors of metabolism or chronic diseases.

Data collection involved the use of questionnaires. A questionnaire sheet was designed to gather information on various aspects, including epidemiological data, early feeding practices, breastfeeding and formula feeding, dietary habits, behaviors influencing obesity, and exposure to marketing of unhealthy foods. Another questionnaire was specifically designed for childcare givers in the nurseries to assess their knowledge, attitudes, and practices related to unhealthy food marketing and their integration of healthy feeding habits in their activities with children. Anxiety was assessed for mothers of obese children and compared to an equal age and sex-matched control group of non-obese healthy children for comparison.

Anthropometric measurements were conducted for all children in the day care nurseries, including weight, height, waist circumference (WC) and mid-arm circumference. The measurement were interpreted using WHO child growth standards (WHO, 2006) using the Z-score system. Body mass index (BMI) was calculated as weight in kg divided by height squared in meters and interpreted using BMI for age growth standards of WHO. Children who were  $>+2$  Z-score were classified as overweight, those  $>+3$  Z-score were obese, according to the weight-for-age (W/A), weight-for-height (W/H) and BMI Z-Score growth standards. Children who were  $<-2$  Z-score in the Length-height-for-age growth standards were classified as stunted. Children who were  $H <-2$  Z-score using the W/A and W/H growth standards Underweight. Mothers were also measured for weight and standing height to estimate their BMI. Mothers over 30 were classified as obese [4].

To evaluate maternal anxiety, the STAI tool (State-Trait Anxiety Inventory) was utilized. This self-report instrument measures the presence and severity of current symptoms of anxiety as well as a generalized propensity for anxiety. It is comprised of two subscales: the state anxiety scale (S-Anxiety), which measures the present level of anxiety, and the trait anxiety scale (T-Anxiety), which measures more stable features of anxiety proneness. The STAI has been validated and demonstrated good reliability in previous studies.

Validity of the data collection tools was ensured through extensive literature review and expert input, resulting in tools that were clear, relevant, comprehensive, understandable, applicable, and simple to implement. The internal consistency and reliability of the questionnaires were assessed using Cronbach's Alpha, with a value above 0.7 indicating high internal

consistency. Test-retest reliability was also examined, and a pilot study was conducted to refine the tools and estimate the required time for completion.

**Ethical consideration:** The Benha University Faculty of Medicine's Ethics Committee gave the approval. Parental or guardian consent was sought in writing, along with the child's assent, prior to participation. The managers of the nurseries where the study was done also gave their approval. Privacy and confidentiality rules were followed. The study's objectives were the only ones for which the acquired data were utilised. The study complied with the ethical principles specified in the Declaration of Helsinki of the World Medical Association for research involving human participants.

**Statistical analysis:** The collected data was processed using the SPSS 25.0. After revision, coding, and

tabulation, appropriate analyses were conducted based on the data type for each parameter. Descriptive statistics, such as frequencies and percentages for non-numerical data, were calculated. To investigate connections between qualitative variables, Chi-square test was utilised, and Fisher's exact tests was utilized when expected counts were less than 5 in over 20% of cells. Reliability testing was performed using Cronbach's Alpha to assess the internal consistency of the questionnaire. A p-value of 0.05 or below at a 95% confidence interval was regarded as significant for all statistical analyses.

**RESULTS**

Nutritional status was assessed for all studied children. 76.8% had normal weight, and 4.2% had obesity (Table 1).

**Table (1):** Distribution of nutritional status of preschool children under study in Qalyubia Governorate using the WHO growth standards (2006)

		Participants (N=1000)	
		N	%
Child weight	Normal weight	768	76.8
	Underweight	36	3.6
	Overweight	154	15.4
	Obesity by BMI	42	4.2
	Stunted	471	47.1

Children who had no breastfeeding were significantly more susceptible to overweight (44.2%) and obesity (78.9%). Breastfeeding for longer duration one vs 2 years was associated with less underweight and less stunting (34.0%) compared to breastfeeding for shorter duration (one year) where one half of the children were stunted. Stunting reduced as nursing time increased. There was virtually little difference in overweight and obesity with increasing breastfeeding time (Table 2).

**Table (2):** Distribution of nutritional status according to breastfeeding duration among children aged 12-60 months under study

Breastfeeding		Normal weight (n =768)		Underweight (n =36)		Overweight (n =154)		Obesity (n =42)		Stunted (n =471)		p
		N	%	N	%	N	%	N	%	N	%	
		No breastfeeding	81	10.5	8	22.2	68	44.2	32	78.0	72	
Breastfeeding	Breastfeeding <1 year	315	41.0	16	44.4	39	25.3	4	9.8	239	50.7	<0.001
	Breastfeeding till 2 years	372	48.4	12	33.3	47	30.5	5	12.2	160	34.0	<0.001

Frequency of preferring fast food, canned food, sweets and chocolates were significantly higher among the children with overweight, obesity and stunting (Table 3).

**Table (3):** Distribution of nutritional status according to preference of unhealthy food among the children aged 12-60 months under study

		Normal weight (n =768)		Underweight (n =36)		Overweight (n =154)		Obesity (n =42)		Stunted (n =471)		p
		N	%	N	%	N	%	N	%	N	%	
Child prefers fast food	No	324	42.2	33	91.7	1	0.6	2	4.8	174	36.9	<0.001
	Yes	444	57.8	3	8.3	153	99.4	40	95.2	297	63.1	
Child prefers canned drinks	No	246	32.0	4	11.1	59	38.3	11	26.2	134	28.5	<0.001
	Yes	522	68.0	32	88.9	95	61.7	31	73.8	337	71.5	
Child prefers sweets and chocolates	No	145	18.9	4	11.1	28	18.2	1	2.4	86	18.3	<0.001
	Yes	623	81.1	32	88.9	126	81.8	41	97.6	385	81.7	

Thumb suckling was significantly associated with obesity, head hitting was significantly associated with underweight and overweight, diurnal enuresis was significantly associated with underweight, others was significantly associated with underweight P<0.001 (Table 4).

**Table (4):** Association of child nutritional status with behavioral disorders

Behavioral disturbances	Normal weight (n =768)		Underweight (n =36)		Overweight (n =154)		Obesity (n =42)		Stunted (n =471)		p
	N	%	N	%	N	%	N	%	N	%	
No	328	42.70	4	11.10	57	37.00	0	0.00	187	39.7	<0.001
Thumb sucking	108	14.10	8	22.20	27	17.50	42	100.00	70	14.9	<0.001
Nightmares	32	4.20	0	0.00	3	1.90	0	0.00	20	4.2	0.176
Head hitting	32	4.20	4	11.10	18	11.70	0	0.00	23	4.9	<0.001
Nocturnal enuresis	84	10.90	4	11.10	15	9.70	0	0.00	39	8.3	0.155
Diurnal enuresis	28	3.60	8	22.20	7	4.50	0	0.00	0	0.0	<0.001
Inability to control stool	24	3.10	0	0.00	9	5.80	0	0.00	24	5.1	0.119
Neurological conditions	80	10.40	0	0.00	6	3.90	0	0.00	6	1.3	0.102
Others	52	6.80	8	22.20	12	7.80	0	0.00	55	11.7	0.001

Preference of unhealthy food (fast food, canned food, sweets and chocolates), when compared to children without behavioural problems, was considerably greater in children with behavioural disorders P<0.001 (Table 5).

**Table (5):** Association between consumption of unhealthy food and behavior disorders

		Behavior disorders				P value
		Yes (n =611)		No (n =389)		
		N	%	N	%	
Preferred food and drinks	Child prefers fast food	486	79.5	154	39.6	<0.001
	Child prefers canned drinks	447	73.2	233	59.9	<0.001
	Child prefers sweets and chocolates	602	98.5	220	56.5	<0.001

Table (6) showed that maternal anxiety of moderate and above moderate score assessed by STAI for state and trait anxiety severity were shown to be higher in the case control study conducted for the 100 obese children versus the 100 normal weight children aged 2-5 years at P<0.001.

**Table (6):** Comparison of mothers with obese children with non-obese by severity state trait anxiety inventory in the case control study (Stage II study)

STAI		Normal weight		Obesity		P
		N	%	N	%	
State anxiety severity	No anxiety	29	29.0	3	3.0	<0.001
	Low level	33	33.0	14	14.0	<0.001
	Below moderate	13	13.0	10	10.0	>0.05
	Moderate	2	2.0	11	11.0	<0.001
	Above moderate	23	23.0	62	62.0	<0.001
Trait anxiety severity	No anxiety	41	41.0	6	6.0	<0.001
	Low level	18	18.0	9	9.0	>0.05
	Below moderate	13	13.0	12	12.0	>0.05
	Moderate	8	8.0	19	19.0	<0.001
	Above moderate	20	20.0	54	54.0	<0.001

## DISCUSSION

The current study, nutritional status showed the fact that the total prevalence of obesity was 4.2% in preschool children (2-5 years old) in Kaluibiya Governorate in Egypt, while 3.6% were underweight, 15.4% were overweight and 47.1% were stunted. In Egypt a systemic review and meta-analysis study from 24 studies in Egypt; **Al-Jawaldeh and Abul-Fadl** <sup>[20]</sup> found that obesity was more common (10.6%) among school-aged youngsters. In the USA affiliated the prevalence rate is progressively rising from 10% at 2 years to 23% at 8 years <sup>[21]</sup>. Other studies in other parts of the world demonstrated similar trends. One study reported a prevalence of overweight of 10.6% and 7.6% obesity <sup>[22]</sup>.

Another study with a larger sample of 7028 reported a prevalence of overweight of 13% and 8.4% had obesity, of which 2.1% were classified as having severe obesity <sup>[23]</sup>. Similarly, **Karki et al.** <sup>[24]</sup> reported that out of 575 children, 18.6% (95% CI: 15.4–21.8) were overweight and 7.1% (95% CI: 5.0–9.2) were obese. About 11% of the children were underweight. **Chen et al.** <sup>[25]</sup> reported that in preschoolers aged 2 to 7 years, the prevalence of overweight and obesity was 10.91 and 5.66%, respectively. In the same line, in the study by **Al-Taiar et al.** <sup>[26]</sup> of the 5119 children, 163 (3.18%) and 332 (6.48%) were obese or overweight children. The emerging state of obesity at such a young age appears to be a worldwide problem as shown in the above-mentioned studies. However, among Egyptian children the combined with undernutrition and stunting, indicates a chronic state of malnutrition which is not based on food deprivation but rather of poor dietary practices. This is why we went on to analyse dietary practices and in particular the rising problem of intake of unhealthy foods that seems to be closely linked with the era of aggressive marketing of industrially ultra processed food that carry many risks including obesity, chronic diseases and cancer <sup>[27]</sup>.

CMF is the first and most common ultra processed to which children are exposed to. In the present study, children who had no breastfeeding were significantly more susceptible to overweight (44.2%) and obesity (78.9%). Breastfeeding for longer duration one vs 2 years was associated with less underweight and less stunting (34.0%) compared to breastfeeding for shorter duration (one year) where one half of the children were stunted. Stunting decreased with longer duration of breastfeeding. There was very little difference in overweight and obesity with increased duration of breastfeeding. **Al-Jawaldeh and Abul-Fadl** <sup>[20]</sup> conducted a metanalysis study for preschool children and compared nutritional status of children aged 6–59 months among formula versus exclusively breastfed infants (EBF). They reported that comparing IFM and EBF revealed that, respectively, overweight was 5.4% compared 3.45%, obesity was 13.8% versus 5.65%, stunting was 21.6% versus 1.15, and wasting

was 9.7% versus 0.85%. Regardless of the technique of feeding, males were more likely to be obese and overweight, whereas females were more likely to be stunted and wasting. Risk factors for obesity include meals consumed before the age of six months, packaged foods, canned beverages, and a lack of physical exercise. Colostrum feeding, exclusive nursing for a longer period of time, a nutritious diet, and consumption of fruits and vegetables all offer protection. According to studies, vitamin deficiencies are frequently associated with obesity <sup>[14]</sup>.

**Chen et al.** <sup>[25]</sup> reported that Obesity in preschoolers is associated with birth weight and infant eating practises. Infant formula feeding and early introduction of solid meals are significant contributors to childhood obesity. Although confounding perinatal factors may play a role in this high rate of obesity, yet our study showed no relationship between birthweight or caesarean delivery with obesity. This is similar to **Al-Lahham et al.** <sup>[28]</sup>, who reported that delivery mode, and birth weight were unrelated to BMI categories.

In the current study, frequency of preferring fast food, canned food, sweets and chocolates were significantly higher among the children with overweight, obesity and stunting at  $P < 0.001$ . Similarly, **Karki et al.** <sup>[24]</sup>, reported that on weekdays, there was no significant link between sedentary activities and childhood OW/OB, but on weekends, there was. In addition, based on an examination of the relationship between the family's monthly income and intake of junk food, it was shown that children from households with monthly earnings of more than 50,000 NRs ( $> 487.8$  dollars) were 1.7 times more likely to have excessive junk food intake than those from homes with monthly incomes of less than 10,000 NRs ( $< 97.6$  \$). Also, **Al-Lahham et al.** <sup>[28]</sup>, reported that according to the meal frequency questionnaire, sweets ( $P = 0.04$ ) and chocolate ( $P = 0.016$ ) significantly impacted the children's BMIs.

**Chen et al.** <sup>[25]</sup>, reported that several stepwise regression analyses revealed that children who disliked sports, favoured fatty meals, and were introduced to solid foods sooner as new-borns were more likely to be obese ( $p < 0.05$ ). **Wang et al.** <sup>[29]</sup> did a review of intervention studies in industrialised nations and found evidence for the effectiveness of family-based therapy in schools and family- and community-based food and physical activity interventions in schools. **Feng et al.** <sup>[30]</sup> conducted a systematic analysis of intervention studies in mainland China and discovered that complete treatments including food and exercise in schools had a greater impact on juvenile obesity; however, reliable and accessible intervention strategies are still missing.

In the current study, thumb sucking and behavioural issues were shown to be highly correlated with obesity. On the other hand, head hitting was substantially related to both underweight and

overweight, suggesting that children who exhibit this behaviour are more likely to fall into either weight extreme. Diurnal enuresis, which refers to daytime urinary incontinence, was significantly associated with underweight, implying that children experiencing this condition are more likely to be classified as underweight. Additionally, other unspecified behaviours were also found to be significantly associated with underweight. These results demonstrate the significance of incorporating behavioural aspects when analysing the weight status of children, as they can provide valuable insights into the potential risk factors and associations with different weight categories. The aggressive marketing and overeating of such products may be accentuating such behaviour disorders [31].

In this study, it was observed that children with behavioural disorders demonstrated a significantly higher preference for unhealthy foods such as fast food, canned food, sweets, and chocolates, in comparison to children without these disorders. This finding suggests a potential association between behavioural disorders and an increased inclination towards consuming unhealthy food choices. The results highlight the importance of considering the dietary habits and preferences of children with behavioural disorders, as they may be more susceptible to making less nutritious food choices, which can have implications for their overall health and well-being [16, 17].

In the present study, in comparison to moms of children of normal weight, both State and Trait anxiety levels were substantially greater in mothers of obese children at  $P < 0.001$ . Mothers with moderate and above moderate State and Trait anxiety had obese children. The difference was statistically significant ( $P < 0.001$ ). Our results were comparable with **Akay et al.** [32], who reported that maternal state anxiety was substantially greater in the obese group compared to the control group ( $p = 0.03$ ). Affective participation ( $p = 0.05$ ) and behaviour control ( $p = 0.00$ ) ratings on the Family Assessment Device were considerably higher for individuals with obesity. Similarly, **Leppert et al.** [33], observed that maternal stress had a positive longitudinal association between children's BMI z-scores up to 5 years of age. In the same line, previous research by **Tate et al.** [34] showed a connection between prenatal mother stress and childhood obesity risk. Anxiety has also been shown to be higher among mothers who did not breastfeed.

According to **Al-Jawaldeh and Abul-Fadl** [20] study, early and prolonged formula feeding, meals consumed before the age of six months, packaged foods, canned beverages, and a lack of physical exercise are all risk factors for obesity. Colostrum feeding, exclusive nursing for a longer period of time, a nutritious diet, and consumption of fruits and vegetables all offer protection. According to studies, vitamin deficiencies are frequently associated with

obesity. Because breastfeeding is associated with higher levels of the calming or soothing- love hormones oxytocin and prolactin, it seems that this can contribute to their lower state of anxiety. Hence there may be a link between maternal early infant feeding practices and infant ultimate nutritional status and thereby their long-term vulnerability to exposure to noncommunicable diseases. Lowering maternal stress by breastfeeding and reducing exposure to unhealthy ultra processed foods are important issues to consider when preventing the rising trend of obesity. The most important intervention point for maternal stress-based policies and initiatives may be avoiding and managing mother stress when children are toddlers [35].

## CONCLUSION

The findings draw attention to the prevalence of overweight and obesity in children aged 2 to 5 years and its link to the promotion of harmful foods and drinks. Maternal anxiety also appears to play a role in children's weight status.

## RECOMMENDATIONS

These results emphasize the need for targeted interventions to reduce childhood obesity, including regulation of marketing practices for unhealthy ultra processed foods starting to IFM, fast foods and packed foods high in salt and sugars to young children. Strict legal measures must be taken by countries to abide by the WHA resolution in 2016 for prohibiting the marketing of inappropriate foods and beverages for infant and young children and extending the scope of the international Code of Marketing of breast-milk substitutes from 6 months to 36 months.

We also recommend updating maternity care guidelines for antenatal and perinatal care by providing community centered support that provides tangible and intangible counseling services to breastfeeding mothers to address mental health issues as maternal anxiety and child behavioral disorders.

**Sponsoring financially:** Nil.

**Competing interests:** Nil.

## REFERENCES

1. **Saha J, Chouhan P, Ahmed F et al. (2022):** Overweight/obesity prevalence among under-five children and risk factors in India: A cross-sectional study using the national family health survey (2015-2016). *Nutrients*, 14(17):3621. doi: 10.3390/nu14173621.
2. **Leitner D, Frühbeck G, Yumuk V et al. (2017):** Obesity and type 2 diabetes: Two diseases with a need for combined treatment strategies - EASO can lead the way. *Obes Facts*, 10:483-92.
3. **Aboughate M, Elaghoury A, Elebrashy I et al. (2021):** The burden of obesity in Egypt. *Front Public Health*, 9:718978. doi: 10.3389/fpubh.2021.718978
4. **Apovian C (2016):** Definition of obesity by Body Mass Index as above 30 is considered obese. *Am J Manag Care*, 22(7): 176-85.
5. **Yi D, Kim S (2021):** Human breast milk composition and function in human health: From nutritional components to

- microbiome and microRNAs. *Nutrients*, 13: 3094. doi: 10.3390/nu13093094
6. **Appleton J, Laws R, Russell C et al. (2018):** Infant formula feeding practices and the role of advice and support: an exploratory qualitative study. *BMC Pediatr.*, 18: 12. doi: 10.1186/s12887-017-0977-7.
  7. **Mannan H (2018):** Early infant feeding of formula or solid foods and risk of childhood overweight or obesity in a socioeconomically disadvantaged region of Australia: A longitudinal cohort analysis. *Int J Environ Res Public Health*, 15(8):1685. doi: 10.3390/ijerph15081685.
  8. **Hohman E, Savage J, Birch L et al. (2018):** Pacifier use and early life weight outcomes in the intervention nurses start infants growing on healthy trajectories study. *Child Obes.*, 14:58-66.
  9. **Zhou X, Rao L, Yang D et al. (2023):** Effects of maternal pre-pregnancy body mass index and gestational weight gain on antenatal mental disorders in China: a prospective study. *BMC Pregnancy Childbirth*, 23:188. doi: 10.1186/s12884-023-05502-y
  10. **Rummo P, Cassidy O, Wells I et al. (2020):** Examining the relationship between Youth-targeted food marketing expenditures and the demographics of social media followers. *Int J Environ Res Public Health*, 17(5):1631. doi: 10.3390/ijerph17051631.
  11. **Maddock J (2004):** The relationship between obesity and the prevalence of fast food restaurants: state-level analysis. *Am J Health Promot.*, 19:137-43.
  12. **World Health Organization (2017):** Guidance on ending the inappropriate promotion of foods for infants and young children: implementation manual. <https://www.who.int/publications/i/item/9789241513470>
  13. **World Health Organization (1981):** International code of marketing of breast-milk substitutes: World Health Organization. <https://www.who.int/publications/i/item/9241541601>
  14. **World Health Organization (2022):** How the marketing of formula milk influences our decisions on infant feeding. Geneva: World Health Organization and the United Nations Children's Fund (UNICEF). <https://www.who.int/publications/i/item/9789240044609>
  15. **Unar-Munguía M, Santos-Guzmán A, Mota-Castillo P et al. (2022):** Digital marketing of formula and baby food negatively influences breast feeding and complementary feeding: a cross-sectional study and video recording of parental exposure in Mexico. *BMJ Glob Health*, 7(11):e009904. doi: 10.1136/bmjgh-2022-009904.
  16. **McClure A, Tanski S, Gilbert-Diamond D et al. (2013):** Receptivity to television fast-food restaurant marketing and obesity among U.S. youth. *Am J Prev Med.*, 45:560-8.
  17. **Boylard E, Harrold J, Kirkham T et al. (2011):** Food commercials increase preference for energy-dense foods, particularly in children who watch more television. *Pediatrics*, 128: 93-100.
  18. **Abdelkarim O, Ammar A, Trabelsi K et al. (2019):** Prevalence of underweight and overweight and its association with physical fitness in Egyptian schoolchildren. *Int J Environ Res Public Health*, 17: 75. doi: 10.3390/ijerph17010075
  19. **Khalil N, Megahed A, Ellahony D (2020):** Overweight and obesity among preschool children attending a rural family health unit in Menoufia Governorate. *The Egyptian Family Medicine Journal*, 4:36-50.
  20. **Al-Jawaldeh A, Abul-Fadl A (2021):** Regional disparities in prevalence of obesity among school-aged children in Egypt: A country case study from The Eastern Mediterranean Region. *Indian Journal of Child Health*, 8(8): 262-8.
  21. **Kovic Y, Noel J, Ungemack J et al. (2018):** The impact of junk food marketing regulations on food sales: an ecological study. *Obesity Reviews*, 19:761-9.
  22. **Novotny R, Fialkowski M, Li F et al. (2015):** Systematic review of prevalence of young child overweight and obesity in the United States-affiliated pacific region compared with the 48 Contiguous States: The Children's Healthy Living Program. *Am J Public Health*, 105: 22-35.
  23. **Fatemeh T, Mohammad-Mehdi H, Toba K et al. (2012):** Prevalence of overweight and obesity in preschool children (2-5 year-olds) in Birjand, Iran. *BMC Res Notes*, 5: 529. doi: 10.1186/1756-0500-5-529.
  24. **Karki A, Shrestha A, Subedi N (2019):** Prevalence and associated factors of childhood overweight/obesity among primary school children in urban Nepal. *BMC Public Health*, 19:1055. doi: 10.1186/s12889-019-7406-9.
  25. **Chen J, Hu C, Zeng G et al. (2019):** Trends and prevalence of overweight and obesity among children aged 2-7 years from 2011 to 2017 in Xiamen, China. *Obes Facts*, 12:476-88.
  26. **Al-Taiar A, Alqaoud N, Sharaf-Alddin R et al. (2022):** Mothers' perceptions of their children's weight: opportunity for health promotion in Kuwait. *East Mediterr Health J.*, 28:904-8.
  27. **D'Auria E, Borsani B, Penderzza E et al. (2020):** Complementary feeding: Pitfalls for health outcomes. *Int J Environ Res Public Health*, 17(21):7931. doi: 10.3390/ijerph17217931.
  28. **Al-Lahham S, Jaradat N, Altamimi M et al. (2019):** Prevalence of underweight, overweight and obesity among Palestinian school-age children and the associated risk factors: a cross sectional study. *BMC Pediatr.*, 19:483. doi: 10.1186/s12887-019-1842-7.
  29. **Wang Y, Cai L, Wu Y et al. (2015):** What childhood obesity prevention programmes work? A systematic review and meta-analysis. *Obes Rev.*, 16: 547-65.
  30. **Feng L, Wei D, Lin S et al. (2017):** Systematic review and meta-analysis of school-based obesity interventions in mainland China. *PLoS One*, 12:e0184704. doi: 10.1371/journal.pone.0184704.
  31. **Boylard E, Whalen R (2015):** Food advertising to children and its effects on diet: review of recent prevalence and impact data. *Pediatr Diabetes*, 16: 331-7.
  32. **Akay A, Ozturk Y, Avcil S et al. (2015):** Relationships between pediatric obesity and maternal emotional states and attitudes. *Int J Psychiatry Med.*, 50:178-90.
  33. **Leppert B, Junge K, Röder S et al. (2018):** Early maternal perceived stress and children's BMI: longitudinal impact and influencing factors. *BMC Public Health*, 18:1211. <https://doi.org/10.1186/s12889-018-6110-5>
  34. **Tate E, Wood W, Liao Y et al. (2015):** Do stressed mothers have heavier children? A meta-analysis on the relationship between maternal stress and child body mass index. *Obes Rev.*, 16: 351-61.
  35. **Dieterich C, Felice J, O'Sullivan E et al. (2013):** Breastfeeding and health outcomes for the mother-infant dyad. *Pediatr Clin North Am.*, 60:31-48.