

## Regional disparities in prevalence of obesity among school-aged children in Egypt: A country case study from The Eastern Mediterranean Region

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### ABSTRACT

**Background:** This study is a review of recent research conducted in Egypt on the problem of rising prevalence rates of obesity among school-aged children. **Methods:** The search was conducted in three phases. The key words used were obesity, overweight, school-aged children, and nutritional status specifically for Egyptians over the past decade (2010–2021). Online research sites and the libraries of the Egyptian universities of the eluc.org, websites were searched along with on-site visits to the libraries of thesis universities and other research institutes in Egypt, to obtain full research material. Finally, retrieved data were analyzed statistically. **Results:** The search identified 24 studies that covered 15 governorates and one national survey that covered 25 governorates. The prevalence of obesity in the pooled populations was 10.6%. Prevalence rates of obesity were highest in Lower Egypt (LE) (10.0%) and urban governorates (9.2%) compared to Upper Egypt (UE) governorates (6.3%,  $p>0.05$ ). Obesity in the children over 10 years was slightly higher among females in the urban (5.1%) and LE governorates (5.2%) compared to males (4.1 and 4.8%, respectively). However, it appeared higher in males (5.2%) compared to females (3.2%) in UE governorates ( $p>0.05$ ). **Conclusion:** Obesity in Egypt is rising and is related primarily to high consumption of unhealthy foods. Member states must take active steps to regulate marketing of unhealthy foods to children.

**Key words:** Adolescents, Egypt, Malnutrition, Obesity, School-aged children

Obesity is a grave problem that is associated with much morbidity in adulthood. It is estimated that 44% of the diabetes burden, 23% of the ischemic heart disease burden, and 7–41% of certain cancer burdens are attributable to overweight and obesity. Obesity is ranked as the fifth leading global risk for mortality [1].


Egypt Landscape analysis report in 2012 has shown that despite several nutritional interventions, instituted by the government to combat the problem of malnutrition, many challenges remained [2]. The problem of obesity in Egypt is by far the greatest challenge [3]. Studies have shown that high-energy intakes and low physical exercise are the drivers for obesity in Egypt [4]. Although the government invests USD 110 million per year on the National School Feeding Programme which reaches 12.5 million primary school pupils, yet thesis meals are calorie dense and are not in line with the recent recommendations of healthy foods. Foods being consumed from the school canteens, are usually unhealthy, fast, and packed foods with high saturated fat, sugar, and salt. Such unhealthy dietary practices predispose to

the rising pandemic of overweight and obesity coupled with short stature and other related micronutrient deficiencies [3-5].

The origins of obesity begin early in the childhood years. In countries like United States of America, obesity in children has tripled since the 1970s [6]. Epidemiological studies on obesity showed that the prevalence varies by age group, gender and are associated with a variety of dietary and behavioral patterns and lifestyles of an individual [7]. In the United Kingdom, it has been recommended that the school meal should carry the combination of fruit and vegetable snack along with daily physical activity [8]. Physical activity has many health benefits on cognition, fitness, bone health, and heart health [9].

In Egypt, there is a need to develop strategies, from successful interventions, that can be used to develop national plans to control the problem of obesity. Dietary habits are also influenced by urbanized lifestyles, where marketing of fast foods and sugary beverages prevail. Obesity carries the risk of micronutrient deficiency states as well as development of fatal non-communicable diseases in future [10].

The aim of this study is to review the literature from the past decade that describes the prevalence of obesity among the school-going children from different regions of Egypt and to discuss

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some of the underlying factors that lead to the high prevalence of obesity in this age group.

## METHODS

The search for the studies was conducted in three phases.

### Search Strategy and Data Sources

The key words used for searching included body mass index (BMI), obesity, overweight, school children, and nutritional status specifically for Egyptians during 2010–2021. Detailed search was done by searching Google, PubMed, and Medline search engines. Thesis searches identified a limited number of published articles. Next, we searched the central library of the Egyptian universities' consortium ([www.eulc.edu.eg](http://www.eulc.edu.eg)) and research institutes in Egypt. The libraries in the affiliated faculties of each Central University were also searched. We identified many thesis studies conducted by the faculties of medicine, nursing and public health institutes; and our research focused on them. Thereafter, we conducted on-site visits to the libraries of thesis universities and other research institutes in Egypt including the Nutrition Institute and the Academy of Scientific Research with the Ministry of Higher Education, to obtain the original theses in hard copy, and to review it for quality assessment.

### Inclusion and Exclusion Criteria

Theses that covered children >6 years of age with overweight and obesity and gender differences were included for this study. A small group of theses were included for ages >10 years, that is, adolescents, for discussion purposes. Obesity was assessed by weight for height (for overweight) and BMI for obesity. The studies used interpretation of the overweight and obesity based on the standard BMI cutoff for overweight (85<sup>th</sup>-<95<sup>th</sup> centile or BMI=25<30) and obesity (>95<sup>th</sup> centile or >30). The BMI charts used included the Cole cutoffs [11], the World Health Organization (WHO) growth standards (2006) [12,13], and the Egyptian growth charts [14]. The study designs used cross-sectional stratified sampling for including a representative sample for gender, age, and place of residence and province or region covered. All studies described the methods for taking the anthropometric measurements in a standardized way referring to standard references.

### Ethical Considerations

All researches reviewed were approved by the ethical committee of the universities to which they were affiliated and mentioned it in their study methods.

### Statistical Analysis

Mean, median, and standard deviation (SD) were calculated and statistical analysis was carried out using ANOVA to calculate the

F-ratio. Comparisons were made between males and females in each region (urban governorate, Upper Egypt [UE], and Lower Egypt [LE]), between governorates and between total males and females.  $p < 0.05$  was considered statistically significant. Comparison was made between regions in the country for the data collected using IBM-SSPS package 2020.

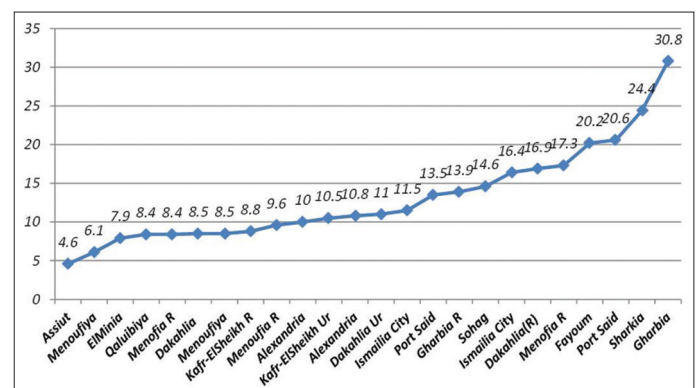
## RESULTS

The most commonly used growth charts depending on the publication year, varied from Cole cutoffs of BMI [11], WHO/NCHS [12], WHO, 2006 [13], and the Egyptian growth charts [14].

A total of 32 studies fit the inclusion criteria of this study on the prevalence of obesity and overweight among school-aged children. Among these, 24 studies included children aged 6–12 years and eight studies included children >10 years. The estimates from the national demographic survey for Egypt (EDHS of 2014) [4] were used to compare with the included thesis dissertations from 15 governorates in Egypt, conducted during 2011–2021. The pooled data from the sampled children from all the studies were 40,753 school children (aged 6–12 years) were representing both rural and urban, as shown in Table 1. Population samples were below 500 in two studies, 500–1000 in three studies and 1000–2000 in five studies and >2000–5000 in eight studies (with a minimum of 127 in AlMinia and a maximum of 5129 in Menoufiya, mean 2088.4±1541.6). Difference of estimated numbers and prevalence rates reported by studies in-between males and females was not statistically significant ( $p > 0.05$ ).

Table 2 shows that prevalence rates of obesity were higher in urban (9.2%) and LE (10.5%) governorates compared to UE governorates (6.3%). Differences between the number of obese or percentage obesity between the regions (urban governorates, UE, and LE) were not significant ( $p > 0.05$ ), neither are the comparison between males and females.

Fig. 1 shows the trends in obesity across the 15 different governorates in Egypt. Fig. 2 shows the trends in obesity between male and female children across the regions under study. Fig. 3 demonstrates the percentage obesity (age >10 years) in the urban governorates, LE, and UE.



**Figure 1:** Prevalence of obesity among school-aged children (6–12 years) from the reviewed studies in the period from 2011 to 2020 in 15 different governorates in Egypt

Table 1: Review of studies on prevalence of obesity in pre-pubertal school-aged children (6–12 years) by region in Egypt

Author and supervisors	Study reference details	Sample	Region	Male obese BMI >2 SD		Female obese BMI >2 SD		Total	
				No	%	No	%	No	%
Fawzy <i>et al.</i>	MSc. Th. Ped. Cairo University, 2012	852	Port Said	55	6.5	60	7	115	13.5
Amer <i>et al.</i>	MSc. Th. Ped. Benha University, 2012	600	Qaluibiya	28	4.6	22	3.7	50	8.4
Yosef <i>et al.</i>	MSc. Th. Ped. Benha University, 2012	500	Sharkia	57	11.4	65	13	122	24.4
Metwaly <i>et al.</i>	2012	1710	Dakahlia	62	3.6	83	4.9	145	8.5
Ismail <i>et al.</i>	MSc. Th. Ped. Menoufia University, 2012	1488	Menoufiya	46	3.1	45	3.2	91	6.1
Koriesh <i>et al.</i>	MSc. Th. Ped. Benha University, 2014	1000	Gharbia	164	16.4	144	14.4	308	30.8
Sleem <i>et al.</i>	MSc. Th. Ped. Menoufia University, 2013	4614	Dakahlia (R) (Mit Ghamr district)	165	7.4	227	9.5	392	16.9
Ayad <i>et al.</i>	MSc. Th. Ped. Menoufia University, 2013	5129	Menoufiya (ElBagour district)	186	3.6	251	4.8	437	8.5
Abo Zeed <i>et al.</i>	MSc. Th. Ped. Menoufia University, 2013	4047	Menoufia (Menouf district)	221	5.4	168	4.1	389	9.6
El-Moghazy <i>et al.</i>	MSc. Th. Ped. Menoufia University, 2013	3619	Kafr El-Sheikh district – urban	180	5	200	5.5	380	10.5
Rageh <i>et al.</i>	MSc. Th. Ped. Menoufia University, 2013	2500	Kafr Sheikh (Kalin district – rural)	94	3.8	126	5.0	220	8.8
Ramadan	MSc. Th. Ped. Cairo University, 2013	1462	Al-Fayoum	143	9.8	153	10.5	296	20.2
Sallam <i>et al.</i>	MSc. Th. Ped. Menoufia University, 2014	3500	Menofia (Berket El-Sabea District)	109	3.1	184	5.3	293	8.4
Dohein <i>et al.</i>	MSc. Th. Ped. Menoufia University, 2014	3500	Alexandria	127	4.8	187	5.2	314	10
ElShaer <i>et al.</i>	MSc. Public Health. Mansoura University, 2014	1054	Dakahlia (Mansoura District)	56	10.9	59	11.2	115	11
El-Hudairy <i>et al.</i>	MSc. Th. Ped. Suez Canal University, 2015	1510	Ismailia	117	7.8	127	8.5	244	16.4
Hassan <i>et al.</i>	MSc. Th. PH, Menoufia University, 2015	306	Menofia R	18	5.8	35	11.4	53	17.3
Dosoky <i>et al.</i>	MSc. PH. Cairo University, 2015	127	ElMinia	5	4	5	3.9	10	7.9
Youssef <i>et al.</i>	MSc. Th. PH Nutrition. HIPH, Alexandria University, 2016	2185	Alexandria	97	4.8	140	5.9	237	10.8
Abdeleziz <i>et al.</i>	MSc. Th. Ped. Menoufia University, 2019	1050	Gharbia R	71	6.8	75	7.5	146	13.9
Total and % (pooled data)		40753		2057	4.78	2494	5.77	4551	10.5 (5)
Mean obese from studies				100.05	6.43	117.80	7.22	217.8500	13.09
Median				95.5000	5.20	126.50	5.70	228.50	10.65
±SD				±61.42	±3.41	±71.59	±3.36	±129.69	±6.30

Overweight and obese (BMI >25); (COLE, 2000)\*; (WHO, 2006)\*\* MSc. Master of Science, TH: Thesis, Ped: Pediatrics, PH: Public Health, HIPH: High Institute of Public Health. BMI: Body mass index

## DISCUSSION

The current review of the Egyptian studies on prevalence of obesity in school-aged children (6–12 years) from 15 governorates in Egypt showed that the overall prevalence of obesity was

10.6% being higher in girls (5.8%) than in boys (4.8%). Egypt is on track to meet sustainable development goals, to halve the proportion of people suffering from hunger. It has sought to improve the nutritional status of children through the promotion of exclusive breastfeeding (EBF) and fortification of foods for

Table 2: Review of studies on prevalence of obesity in pubertal children (&gt;10 years) by region

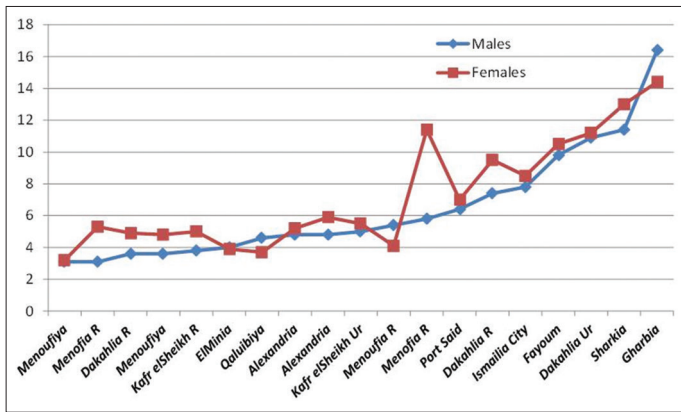
Study/authors	Study source/type year	Sample size	Region	Male obese BMI >2 SD		Female obese BMI >2 SD		Total	
				No	%	No	%	No	%
Urban governorates									
MoH, ElZanaty	EDHS, 2005	3630	Urban Gov.	131	3.6	137	3.8	268	7.4
MoH, ElZanaty	EDHS, 2008	2970	Urban Gov.	118	4	122	4.1	240	8.1
Kotb <i>et al.</i>	M.Sc. Ped. Thesis. Suez Canal University, 2010	2500	Port Said	135	5.4	170	6.8	305	12.2
ElSayed <i>et al.</i>	M.Sc. Fam. Med. Thesis. Mansoura University, 2016	200	Cairo	0	0	0	0	44	22
Total		9300		384	4.1	429	5.1	857	9.2
Mean obese from studies				128.0	4.3	143	4.9	214.25	12.4
Median				131.0	4.0	137	4.1	254.0	10.2
±SD				±8.9	±0.95	±24.6	±1.65	±116.6	±6.7
LE									
MoH, ElZanaty	EDHS, 2005	2387	Urban LE	83	3.5	163	6.8	246	10.3
MoH, ElZanaty	EDHS, 2005	6867	Rural LE	308	4.5	287	4.2	595	8.7
MoH, ElZanaty	EDHS, 2008	1946	Urban LE	55	2.8	62	3.2	117	6.0
MoH, ElZanaty	EDHS, 2008	5366	Rural LE	109	2.0	108	2.0	217	4.0
MoH, ElZanaty	EDHS, 2015	3571	Urban LE	268	7.5	224	6.3	492	13.8
MoH, ElZanaty	EDHS, 2015	11,722	Rural LE	846	7.2	727	6.2	1573	13.4
Agamy <i>et al.</i>	M.Sc. Ped. Thesis. Suez Canal University, 2011	2400	Ismailia	59	4.45	74	3.1	133	5.5
Total and % (pooled data)		34,25(9)		172(8)	4.8	16 (45)	5.2	337(3)	10.0
Mean obese from studies				223.0	4.6	222.9	5.8	445.9	8.0
Median				96.0	4.6	150.5	6.2	231.5	8.4
±SD				±270.7	±1.9	±217.2	±2.9	±486.5	±4.7
Upper Egypt (UE)									
MoH, ElZanaty	EDHS, 2005	2891	Urban UE	107	3.7	116	4.0	223	7.7
MoH, ElZanaty	EDHS, 2005	6786	Rural UE	190	2.7	186	2.7	376	5.5
MoH, ElZanaty	EDHS, 2008	1988	Urban UE	61	3.1	100	5.0	162	8.1
MoH, ElZanaty	EDHS, 2008	4872	Rural UE	77	3.0	99	4.3	176	3.6
Mohamed <i>et al.</i>	M. Sc. Ped. Thesis. Sohag University, 2009	816	Beni Suef	4	0.5	8	1	12	1.5
MoH, ElZanaty	EDHS, 2015	3949	Urban UE	206	5.2	151	3.8	357	9.0
MoH, ElZanaty	EDHS, 2015	9364	Rural UE	266	2.8	226	2.4	492	5.2
ElHakim <i>et al.</i>	M.Sc.Physical Therapy. Thesis. Cairo University 2016	1021	Giza	55	5.4	95	9.3	150	14.7
Hassan <i>et al.*</i>	Eg. J. Community Med. 36(2):1-11, 2017	736	Fayoum	73	17.0	37	12.1	110	14.9
Total (%)		3242(3)		103(9)	3.2	101(8)	3.1	205 (8)	6.3
Mean obese from studies				115.4	4.8	113.1	4.9	228.7	7.8
Median				77.0	3.1	100.0	4.0	176.0	7.7
±SD				±85.7	±4.79	±68.0	±3.53	±150.8	±4.6

\*By Egyptian standards \*\* By Cole standards cutoffs. EDHS used the WHO/NCHS before 2014 survey and WHO, 2006. %: Percentage

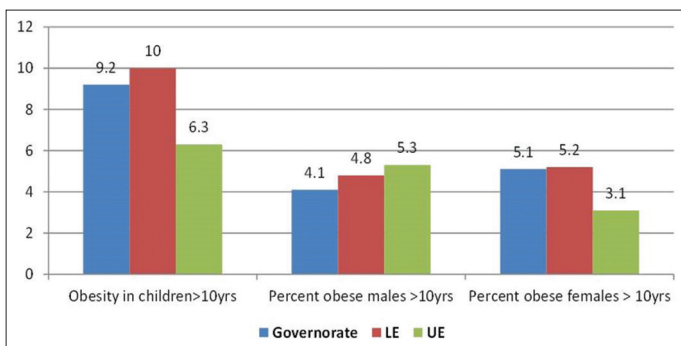
the population at large and provision of school meals for school children in public schools. The origins of obesity begin from early childhood. In Egypt, EBF rates have declined from 54% to 39% due to the nationwide distribution of subsidized milk formula and its marketing [15,16] together with the impediments to progression of baby-friendly hospitals for protecting, promoting, and supporting breastfeeding in maternity facilities [17,18]. Continued breastfeeding for 2 years has declined from 40% to

20% [4] and has been replaced by unhealthy foods and feeding practices. This has resulted in deterioration of the nutrition indicators in Egypt [19] confounded recently by short stature and anemia linked to the rising rates overweight and obesity [5].

In this study, the highest rates of obesity were seen in the urban governorates and urban regions of LE and UE. The reviewed studies indicate that the risk of obesity in females increases nearing puberty. Possible reasons may be the more



**Figure 2: Prevalence of obesity in the reviewed studies among school-aged children (6–12 years) by sex in the period from 2011 to 2020 in 15 different governorates in Egypt representing both urban (Ur) and rural (R) areas**



**Figure 3: Percent obesity in children during puberty by region and gender in children over 10 years**

sedentary lives and are exposed to TV and media ads with the surge in the urbanization of rural communities and the invasion of readymade and fast foods in the market of urban populations to mimic the trend of modernization in the west [20-22]. In the early 2000s, westernized communities became increasingly aware of the environmental risk factors of fast food restaurants on the increasing prevalence of obesity [23]. Thesis chains of fast foods began expanding their markets to developing countries and intensifying their marketing tactics with promotion through media and individualized marketing tactics to attract different communities. For example, MacDonaldd founded in the USA 60 years ago opened its first outlet in Egypt in 1994. Today, over 80,000 customers are served at more than 114 stores in 2019 in Cairo, Giza, Alexandria, Hurghada, Port Said, Ismailia, Qalubiya (Benha), Sharkia (Zagazig), Ismailia, Mansoura, Gharbia (Tanta), Assiut, Minia, and many others. Globally, foodservice retailer McDonald franchised a total of 39,198 restaurants worldwide in 2020, with a substantial steep climb over the past 16 years in 39 thousand locations in over 119 markets [24]. Moreover, the marketing ads on television [25] and digital marketing for foods and sugary drink brands maintain millions of adolescent followers [26] that have increased remarkably over the past decade and have created the deadly obesogenic environment for future generations [27]. A study that examined policies that restrict marketing looked into 79 countries in the EuroMonitor

and defined 49 countries with policies and 30 with no policies of which Egypt was one. All policy countries regulated junk food ads on TV, also marketing in schools (43 countries) and internet (42 countries). Most of the policies were restrictions followed by guidance and mandated messages. The latter resulted in a decrease in junk food consumption. Countries with no policies saw an increase in consumption by 13.9%, while countries with policies saw an average decrease (−2.0%) which was strongest for statutory polices (−8.9%) [28].

In this study, the lowest rates of obesity were seen in UE. This coincides with the high rates of underweight and poverty reported in UE by the demographic health surveys and national studies. Worldwide, 700 million people have lived in extreme poverty. The percentage of Egyptians, who live in extreme poverty, rose to 32.5 in 2018 from 27.8 in 2015, with an increase of 4.7% [29]. The highest percentage of poverty among 99 million Egyptians was recorded in UE, mainly in Assuit and Sohag, with 66.7% and 59.6%, respectively.

Although rural UE represents 25% of Egypt’s population, it accounts for 41% of births, reflecting the very high positive correlation between fertility rates and the multiple indicators of poverty. The large number of rural births is attributed particularly to the high reproductive rates among women of the age group 20–24 and 25–29 [30]. Birth interval (BI) has a negative impact on the child’s nutritional status in children within BI <24 months [30].

Chronic poverty is predominant in rural UE with 30% of its population chronically poor and representing 62.2% of all chronic poor in Egypt in 2011. Multidimensional poverty which assesses the nature and intensity of poverty by identifying multiple deprivations (in health, education, and standard of living) and the extent of thesis at the individual level was highest in UE (18%) being much higher than LE and urban governorates (8.7% and 6.8%, respectively). Moreover, poor living conditions are higher in rural areas where there is deprivation of sanitation in 87% in rural UE and 47% in rural LE. UE governorates that demonstrate the highest rates of extreme multidimensional poverty include Menia, Assuit, Sohag, Bani Suef, Fayoum, and Qena [31]. Moreover, chronic food insecurity is concentrated in UE (88%) of which 74.3% are in rural UE and 13.7% in urban UE. Rural UE, in particular, remains the most food insecure region in Egypt, both in terms of chronic food insecurity [31,32].

In relation to gender, obesity was lowest in UE females which is consistent with other researchers [33] who demonstrated that in rural UE, obesity significantly decreased with age and was lower in females than males in UE in contrast to LE with a significant different in the age group of 10–13 years. The authors reported that age, reduced poultry consumption, and escaping breakfast were risk factors for malnutrition, while daily fruit consumption was a protective [33,34]. Obesity increased near adolescence in females but was higher in LE than in UE (38.5%) [35-37]. It was associated with higher rates of anemia, arthritis, diabetes mellitus, and bronchial asthma [35]. Other studies have shown that obesity increases with age particularly among females and is linked with menarche and could be associated with stunting [38,39].

Limitations of this study include not accessing other studies due to absence or structural problems of renovations and tight restrictions and regulation of access to the theses. However, we were able to retrieve a considerable number of theses that were conducted in this period and to cover 15 out of the 27 governorates with data. More elaborate future searches may permit retrieval of more information. Furthermore, the lack of information from the demographic surveys does not permit verification of this data at national level.

## CONCLUSION

In Egypt, obesity among school children was scarcely reported by studies before 2010 but surge in studies that reported the emergence of this problem escalated after this date. The problem is more prevalent in urban governorates and LE governorates and the urban regions in UE. The lowest prevalence of obesity was in rural UE. Females of urban areas are more vulnerable to obesity compared to the females in the regional areas in UE and LE and to males in all regions.

According to the WHO recommendations for the prevention of obesity in childhood [40] member states (MS) should set standards, policies, and regulations for the marketing of fast foods and sugary beverages. MS should provide healthy foods in school canteens and market them on radio, television, social media. MS should also control street catering of unhealthy and unhygienic foods to school children. Moreover, MS should increase physical training in schools and provide public outlets for both boys and girls to practice sports and other forms of exercises. The food industry has a responsibility to ensure that its marketing practices respect all the rights of the child. Hence, it is recommended that future demographic surveys should include nutritional assessment of this age group.

## REFERENCES

1. Caprio S. Influence of race, ethnicity, and culture on childhood obesity: Implications for prevention and treatment. A consensus statement of Shaping America's health and the obesity society. *Diabetes Care* 2008;31:2211-21.
2. Ministry of Health (MoHP) Egyptian Nutrition Landscape Analysis Report; 2012.
3. Metwally AM, El-Sonbaty MM, El-Etriby LA, Salah EIDin EM, Abdel Hamid N, Hussein HA, *et al.* Impact of national Egypt school feeding program on growth, development and school achievement of school children. *World J Pediatr* 2020;16:393-400.
4. Ministry of Health and Population Egypt, El-Zanaty and Associates Egypt, and ICF International. Egypt Demographic and Health Survey 2014. Cairo, Egypt and Rockville, Maryland, USA: Ministry of Health and Population and ICF International; 2015.
5. El-Shafei A, Kasemy Z, Omar M. Prevalence of short stature and malnutrition among Egyptian primary school children and their co-existence with anemia. *Ital J Pediatr* 2020;46:91.
6. Hales CM, Carroll MD, Fryar CD, Ogden CL. Prevalence of obesity among adults and youth: United States, 2015-2016. *NCHS. Data Brief* 2017;288:1-8.
7. Canoy D, Buchan I. Challenges in obesity epidemiology. *Obes Rev* 2007;8:1-11.
8. Zarnowiccki DM, Dollman J, Parletta N. Associations between predictors of children's dietary intake and socioeconomic position: A systematic review of the literature. *Obes Rev* 2014;15:375-91.
9. Schwartz MB, Novak SA, Fiore SS. The impact of removing snacks of low nutritional value from middle schools. *Health Educ Behav* 2009;36:999-1011.
10. Felisbino-Mendes MS, Cousin E, Malta DC, Machado IE, Ribeiro AL, Duncan BB, *et al.* The burden of non-communicable diseases attributable to high BMI in Brazil, 1990-2017: Findings from the Global Burden of Disease Study. *Popul Health Metrics* 2020;18:18.
11. Wang Y, Wang JQ. Standard definition of child overweight and obesity worldwide. Authors' standard compares well with WHO standard. *BMJ* 2000;321:1158.
12. Cole TJ. The development of growth references and growth charts. *Ann Hum Biol* 2012;39:382-94.
13. World Health Organization. Child Growth Standards. Geneva: World Health Organization; 2006. Available from: <https://www.who.int/tools/child-growth-standards>.
14. Ghalli I, Salah N, Hussien F, Erfan M, El-Ruby M, Mazen I, *et al.* In: Sartorio A, Buckler JM, Marazzi N, editors. *Egyptian Growth Curves 2002 for Infants, Children and Adolescents*. Crescerenel Mondo: Ferring Publisher; 2008.
15. World Health Organization, UNICEF, IBFAN. Marketing of Breast Milk Substitutes: National Implementation of the International Code, Status Report Geneva: World Health Organization; 2020.
16. Pivoz E, Hoffman S. The impact of marketing of breast-milk substitutes on WHO recommended breastfeeding practices. *Food Nutr Bull* 2015;36:373-86.
17. UNICEF. Country Profile for Egypt BFHI Analysis Report, Nutrition Section. New York: UNICEF; 1999.
18. Al-Jawaldeh A, Abul-Fadl A. Assessment of the baby-friendly hospitals in the Eastern Mediterranean region. *Children (Basel)* 2018;5:41.
19. UNICEF. UNICEF/UNFPA Nutritional Status of the Egyptian Population. New York: UNICEF; 2010.
20. ElSayed GE. Nutritional Status among Primary Governmental School Students. In: Habib NS, Ismail GM, editors. Thesis, Master in Community Health Nursing. Faculty of Nursing, Cairo University; 2016.
21. El-Shafie AM, Kasemy ZA, Omar ZA, Alkalash SH, Salama AA, Mahrous KS, *et al.* Prevalence of short stature and malnutrition among Egyptian primary school children and their coexistence with anemia. *Ital J Pediatr* 2020;46:91.
22. Abo-Grifa NM. Prevalence and Risk Factors of Overweight and Obesity among Adult Females at Al-Salam Family Health Center, Ismailia City. In: Ismail MA, Zei WA, editors. Master in Family Medicine. Faculty of Medicine, Suez Canal University; 2018.
23. Maddock J. The relationship between obesity and the prevalence of fast food restaurants: State level analysis. *Am J Health Pharm* 2004;19:137-43.
24. The Big Mac Index: Burgernomics. The Boig Mac index. Our interactive currency comparison. Available from: <http://www.economist.com>. [Last accessed on Apr 2021].
25. Boyland EJ, Nolan S, Kelly B, Tudur-Smith C, Jones A, Halford JC, *et al.* Advertising as a cue to consume: A systematic review and meta-analysis of the effects of acute exposure to unhealthy food and nonalcoholic beverage advertising on intake in children and adults. *Am J Clin Nutr* 2016;103:519-33.
26. Rummo PE, Cassidy O, Wells I, Coffino JA, Bragg MA. Examining the relationship between youth-targeted food marketing expenditures and the demographics of social media flowers. *Int J Environ Res Public Health* 2020;17:1631.
27. Osei-Assibey G, Dick S, Macdiarmid J, Semple S, Reilly JJ, Ellaway A, *et al.* The influence of the food environment on overweight and obesity in young children: A systemic review. *BMJ Open* 2012;2:e001538.
28. Kovic Y. The Impact of Junk Food Marketing Regulations on Food Sales: An Ecological Study. Master Thesis, 1324. University of Connecticut; 2019.
29. Ellaithy H, Armanios D. Published by CAPMAS and World Food Program (WFP), Cairo, Egypt; 2013.
30. Egypt Network for Integrated Development. Profile of Poverty Across Egypt and Recommendations. Cairo, Egypt: Policy Brief, 015: CAPMAS, Population Department; 2015.
31. El-Tawila S, Gadalla M, Ali E. Income Poverty and Inequality in Egypt's Poorest Villages. The World Bank and Social Contract Center, Experts' Group Meeting, May 27<sup>th</sup>, Cairo, Egypt; 2013.
32. World Health Organization, Ministry of Health and Population Egypt, Partnership for Maternal, Newborn and Child Health, WHO, World Bank and Alliance for Health Policy and Systems Research. Success Factors for Women's and Children's Health: Egypt. Geneva: World Health Organization; 2014.

33. Gad TM. Prevalence and Risk Factors of Obesity among Primary School Children in Assiut City. Thesis, Master in Family and Community Medicine. Faculty of medicine, Assiut University; 2017.
34. Ahmad AM. Relationship between Hypertension and Lifestyle among Adolescents in Alexandria. In: Darwish A, ElWalili T, ElSharkawy A, editors. Thesis, Master of Nursing Sciences, Pediatric Nursing. Faculty of Nursing, Alexandria University; 2012.
35. Hanrtira NY. Weight Variation among Preparatory School Girls in Alexandria. In: Toama Z, Abdel-Wahed M, editors. Thesis, Master in Community Health Nursing. Faculty of Nursing, Alexandria University; 2008.
36. Abdou FS. A Study of the Prevalence of Obesity among Female Students in Sohag. In: ElNahas AF, Mohammed ER, Mohammed MA, editors. Thesis, Master of Family Medicine. Supervisors. Faculty of Medicine, Sohag University; 2018.
37. Abdel-Aziz SB, Youssef MR, Sedrak A, Labib JR. Nutritional status and dietary habits of school children in Beni Suef governorate, Egypt. *Food Nutr Sci* 2015;06:54-63.
38. Coly A, Millet J, Diallo A, Ndiaye T, Bénéfice E, Simondon F, *et al.* Preschool stunting, adolescent migration, catch-up growth and adult height in young Sengalese men and women of rural origin, *J Nutr* 2006;136:2412-20.
39. Chidumwa G, Said-Mohamed R, Nyati LH. Stunting in infancy, pubertal trajectories and adult body composition: Birth to twenty plus cohort, South Africa. *Eur J Clin Nutr* 2021;75:189.
40. World Health Organization. Population-based Approaches to Childhood Obesity Prevention. Geneva, Switzerland: World Health Organization; 2012.

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