Micronutrients intake among a group of Egyptian children in different demographic areas of Egypt

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ABSTRACT:

There is a growing interest in the role of micronutrients in optimizing health and in the prevention or treatment of diseases. Except for vitamin D, micronutrients are not produced in the body and must be derived from the diet. Micronutrient deficiencies are also referred to as 'Hidden Hunger'. Objectives: First to study specific nutrient intakes among a group of children in different geographical areas representing Egypt. Second use the information on food patterns and consumption to overcome micronutrient malnutrition problems. Subjects and Methods: This cross-section survey was carried out to study the food consumption pattern and specific nutrient intakes of children in different demographic areas of Egypt. Results showed the dietary information revealed micronutrient deficiencies in Egyptian children, as well as less-than-ideal intakes of important nutrients like calcium, iron, and vitamin A. ***Conclusion*** *Future studies, should be followed to a better understanding of the variables and barriers preventing Egyptian children from consuming the recommended amounts of micronutrients.*

Keywords: *Micronutrient_ children _adequacy Egypt*

INTRODUCTION

Interest in the function of micronutrients (vitamins, and minerals) in promoting health and in the prevention or treatment of disease is expanding **(Shenkin, 2006)** except for vitamin D, micronutrients, cannot be synthesized by the body and must obtain through diet **(Kraemer, et al., 2015).** A vicious cycle of malnutrition, underdevelopment, and poverty is caused by micronutrient deficiencies, often known as "Hidden Hunger," which has an impact on health, learning capacity, and productivity **(FAO, IFAD, UNICEF, WFP and WHO, 2019).** Around two billion individuals worldwide are thought to be lacking in one or more micronutrients **(Thompson, 2011).** Micronutrient deficits (such as a lack of iron or vitamin A not only compromise health but are also anticipated to cost between 0.8 and 2.5 percent of the gross domestic product (GDP) **(Stein and Qaim, 2007).** Around the world, at least 50% of kids have vitamin and mineral deficiencies **(UNICEF, 2019).** Development of the nervous system and the brain depends on iron. The effects of iron deficiency are particularly dangerous for children, Improved learning and cognitive development in children are benefits of preventing iron deficiency **(Stevens, et al, 2013).**40% of children under five worldwide suffer from anemia **(WHO, 2021).** The immune system and healthy vision are supported by vitamin A. Vitamin A insufficiency is a public health concern because it puts children at an increased risk of blindness and passing away from illnesses like measles and diarrhea **(WHO, 2021).** By aiding the body's absorption of calcium, vitamin D helps to produce strong bones. In addition, it is playing a crucial role in physical growth and development. Zinc is crucial for the osteoblast enzymes and Zinc consumption promotes the growth of young children **(Wessells and Brown, 2012)**. The operation of nerves, muscles, blood clotting, bones, teeth, and the metabolism of energy all depend on calcium. Rickets can be brought on by a child's calcium deficit. Osteopenia and osteoporosis in adults can result from a calcium deficit **(Ekbote et al., 2011)**. Magnesium is a necessary mineral that is important for many physiological processes, including the preservation of strong bones. Since bones contain around half of the body's magnesium, they serve as a reservoir for the element. Additionally, it has an impact on how much physiologically active vitamin D is produced **(Rude and Gruber, 2004).** Vitamin C functions as a biological redox system involved in several electron transport activities, such as those involved in the manufacture of collagen and carnitine as well as other metabolic processes. Vitamin C readily loses electrons and is reversibly transformed into dehydroascorbic acid **(Padayatty and Levine 2016).** Iron is kept in its ferrous state by vitamin C, which also serves as a reducing agent, allowing hydroxylation enzymes to work, vitamin C has an antioxidative function by interacting with potentially harmful reactive oxygen species, such as the hydroxyl radical or superoxide **(Margie, 2012).** Micronutrient deficiencies have long been a serious health problem in the Middle East. Nevertheless, over the past three decades, the region has undergone substantial changes in the demographic, economic, political, and social contexts, which have affected the challenges with diet, nutrition, and health. In many Middle Eastern countries, which are undergoing a nutrition transition, undernutrition and non-communicable diseases associated with various types of malnutrition coexist. Early nutrition transitional nations (including Egypt, Jordan, Lebanon, Morocco, and Palestine) are frequently characterized by a moderate incidence of overweight and obesity, moderate levels of undernutrition in particular population categories, and wide-spread micronutrient deficiencies **(WHO, 2016).** The bulk of the region's population more than one-third of the total is anemic or iron-deficient. The **FAO, IFAD, UNICEF, WFP, and WHO, (2019) note** notable and low insufficient intakes of calcium, iodine, iron, and zinc. vitamin A, vitamin D, and folate intakes which are frequently reported by several Middle Eastern nations, particularly in youngsters. Diets high in fruits, vegetables, and whole grains and low in added sugar, solid fats, and sodium are protective against micronutrient deficiencies advocated by **GDN (2016); Bin Sunaid et al., (2021).** However, the actual implem-entation of these recomme-ndations varies greatly **(Bailey, et al, 2015; Ward 2014)**. Intrinsic micronutrient deficiencies can lead, to physiological perfor-mance, and/or resilience as well as an elevated chance of chronic illness **w**e'll alert the government and organizations to adopt nutritional measures to address micronutrient deficiencies **(Fenech, 2010)**. This survey was conducted to evaluate children's micronutrient consumption in various demographic areas of Egypt. According to many countries in the world, the study is a necessary prerequisite for monitoring the nutrition situation and for proper planning and execution of nutrition education.

Studying the micronutrient consumption of a significant cohort of Egyptian children is the main objective. The objectives of the study were to: (1) Describe the micronutrient intakes of these children; (2) Assess the sufficiency of those intakes concerning dietary references intake.

Study design: A survey cross-section study

Sample size: 4067 youngsters, whose ages varied from 2 to 18, participated in this study. This study was conducted as a component of a larger investi-gation of Egypt's national survey, which updated data on food consumption patterns among various population groups from 2016 to 2020. Egypt will be divided into four geographic regions as follows: Urban, Lower, Upper, and Frontier Egypt. Multistage sample design for representative simple. From each geographical area, the following governorates were chosen at random: Cairo, Alexandria, Suez, and Port Said, which represented Urban governorates. Egypt was divided into four regions: Lower

Egypt (Ismailia, Minofyia, Kafr El-Shiekh, Damietta, Qalyubia, Sharkia, Dakahlia, Beheira, and Gharbia), Upper Egypt (Giza, Minya, Sohag, Assuit, Qena, Fayoum, Beni Suef, Aswan, and the sample was chosen at random from the governorates that were suggested. Districts were chosen, and villages were chosen at random. The study divided each governorate into urban and rural sampling units (except for Cairo and Alexandria). From each governorate's various socio-economic groups, several residential regions (urban and rural) were chosen.

Exclusion criteria: Children with special dietary guidelines and nutritional issues (such as those with diabetes, chronic kidney or liver illness, or a metabolic disorder caused by an inherited defect), and youngsters with mental and motor disabilities.

Study tools: Structured interviewing questionnaires made up the study's instruments. This was divided into three sections: The first was to gather information about the family's socioeconomic features, such as its members' ages, educational backgrounds, and occupations **(Park and Park, 1979).** The 24-hour recall was used to gather data on daily some micronutrients for the second, and anthropometric measurements were used for the third.

Ethical factors: the ministry of health's research ethics committee's approval.

METHODOLOGY:

- **Dietary nutrient intake:** The youngsters' mothers documented their 24-hour food and beverages for seven separate days. The day before the interview day, the field team recorded oral summaries of the meals and drinks the sample had at each eating opportunity. Decide on the nutritional value of intakes by using food composition tables **(NNI, 2006).** The food nutrient composition intake of each person was compared with reference daily intake (RDI) by **FDA (2020).**
- **Anthropometric measurement:** Following **WHO (2006)** guidelines,

body mass index, height, and weight were calculated

- **Statistical analysis:** The data were analyzed using the SPSS version 20 program. For qualitative nonparametric variables, median percentiles are employed, whereas for quantitative parametric data, the mean and standard deviation (SD) are utilized. The Chi-square test will also Nutritional data analysis Utilizing the food analyzing program in the Statistics Unit at the National Nutrition Institute, data from the 24-hour recall were examined (using Egyptian food composition 2006 as the database). The result was calculated as the sum of the daily micronutrient intake for each sample. After the data from this program were first obtained, the intake of each child was compared to RDI to determine that consumption was adequate. Then the intake of each group was compared to the others using an independent sample t-test or one-way ANOVA test according to **Levesque (2007).**

RESULTS

Table **(1)** showed the 4 main demographic areas including (5344) households studied. The urban household in surveyed samples in the urban areas represented (48.2%) while rural households represented (51.8%).

4645 children in 4 main demographic areas were surveyed, according to **table (2)** data. Children in urban governorates were (1030), in lower Egypt, (1739), in upper Egypt children (1611), and in frontier areas represented children (265). Distribution of children surveyed samples according to geographic region and residence area children in the urban areas represented (92.9%) while lower Egypt 33.7 %in urban areas and (66.3%) in rural areas upper Egypt (30.1 %) in urban and (69.9%) in rural areas frontier areas (71.4%%) in urban areas and (28.6%) in rural areas.

Table (3) observed that the 4 main demographic areas including (**4645**) children were studied by the individuals in surveyed samples. In the total sample, the percentage of main age among children from (6-12 y) was (42%).

Table (4): The distribution of households in the sample showed that most of the families in the study belonged to the middle socioeconomic status while in frontier and Upper Egypt, the poverty level was more**.** The same table shows that the heads of the household by social status in the study governorates represent (29.6%) of that low social class. The medium social class represents (48.9%) of the total sample. A high social class represents (21.5%) of the total sample with more prevalence in Urban (68.8%) than in rural areas (31.2). While low social classes were in the rural areas (76.6%) than in urban areas (23.4%)

Table (5): There was a significant difference regarding social status. The highest percentage of the low social class was found in Upper Egypt (35.6 %) while the lowest percentage of the low social class was reported in Lower Egypt (11.7 %). The highest percentage of the medium social class was found in Lower Egypt (41.6%) while the lowest percentage was in the frontier area. Additionally, the highest percentage of the high social class was found in Lower Egypt while the lowest percentage of the high social class was reported in Upper Egypt.

Table (6) showed that the majority (64.9 %) of the total children got unsafe calcium intake. Only (8.3%) of the total sample got over calcium consumption. Intake of magnesium was found to be acceptable and excessive in all children (31.4%) and unsafe in 13.2%. About (12.5%) of the total children take inadequate iron intake, and (31.4%) of the total sample had got their adequate iron requirement and 15 % of children get unsafe iron consumption despite the high prevalence of anemia among children. About more than half the children (61.9%) of the total specific age group children got over zinc intake. Only 3.2% got an unsafe level of zinc consumption. According to the geographical distribution, urban regions had insufficient intakes of calcium (18.5%), magnesium (23.5%), iron (23.550), and zinc consumed (16.9%) regarding adequacy. Magnesium, calcium, zinc, and iron intake were insufficient in lower Egypt (20.8%, 20.9%, 13.7%, and 18.8% respectively). Inadequate intake of magnesium (17.6%), zinc (10.7%), calcium (22.8%), and iron (16.4%) were all found in Upper Egypt. There were unacceptable intakes of calcium (21.4), magnesium (19.8%), zinc (4.9%), and iron (14%) in the Frontier region.

In Table (7) regarding vitamin intake, the majority (76.1%) of the children got inadequate vitamin A intake. Only 9.2 % of the total sample of children got over vitamin A consumption. 30.4% of the total children got unsafe vitamin C intake. Only 33.9 % of the total sample of children got over vitamin C consumption. In addition, 42.9 % of the children got overconsumption of vitamin B1 intake while only 9% got an unsafe level. About 27% of the sample took unsafe values from vitamin B_{2}.

According to the geographical distribution, lower Egypt's urban areas, Upper Egypt, and the frontier, all had insufficient vitamin A intake (9.4%, 10.8%, 13.0%, and 11.7%, respectively). While in the same regions, poor vitamin C intake was found in (13.9%, 12.1%, 11.5%, and 6.7%).

Table (8): RDA% of mineral consumption according to the children's age groups. There was a significant difference regarding the RDI% of minerals among the different age groups of children. Unsafe levels of calcium, magnesium, and iron consumption were found in the adolescent group (12-18y). Unsafe level of zinc consumption was more among the preschool age (>2-6y). There was 66.8% of unsafe consumption of calcium among age groups 6-12 years and 12-18 y which represent 71.5% and 77.3% respectively. On the other hand, the overconsumption of magnesium and iron especially in age groups less than two years old represented 58.0% for magnesium and 43.1% for iron also among those aged from 2 to 6 years

56.6% for magnesium and 54.3% for iron.

Table (9) observed the RDA% of vitamins for children according to age groups. There was a significant difference regarding vitamin intake as the unsafe level of vitamin A and C intake was observed among children less than 2 years than in other age groups.

DISCUSSION

Dietary sufficiency is necessary for children's healthy growth and development as well as to avoid issues related to inadequate nutrition later in life **(Martins. et al, 2011; Walker, et al, 2007).** However, research from throughout the globe reveals that many kids don't adhere to dietary recommendations for several nutrients (**Fiorentino et al, 2016; Lee and Park 2015).** To pinpoint potential factors influencing children's eating behaviors and food consumption, many studies had been conducted. This study's goal was to evaluate Egyptian children's nutritional intake in light of dietary guidelines. The majority of kids—about (86% and 83%) of all kids get insufficient amounts of calcium and vitamin A. Of all children, about one-third (28.1%) consume too little iron. Only one-third of children got insufficient vitamin C. More adolescents between the ages of 12 and 18 were found to have insufficient calcium and iron. These findings highlight the urgent need to identify barriers to a high-quality diet and to develop research-based interventions that would promote the best possible dietary efficacy. Calcium consumption in children's diets is essential for optimal bone mineralization and rickets prevention **(Abizari, et al., 2014).** Numerous studies have also discovered that a significant portion of school-aged kids consumes insufficient calcium levels **(AL-Musharaf et al., 2012).** If milk, dairy products, meals, and drinks with added calcium are given to children, they can consume the recommended amounts of calcium and phosphorus. To maintain bone health, health professionals should consider recommending calcium supplements when the advised amount of calcium is not achieved. In the Middle East, showed that only about one-third of youngsters were getting enough magnesium, which was consistent with the Saudi Arabian study **(Kutbi, 2021**). Similar findings were supported by **Nasr-Eddine et al., (2018)** who reported that a sizable portion of Saudi Arabian children did not meet the relevant requirements for these nutrients. The present study found that one-third of Egyptian kids consume enough iron from their diets, with this finding being supported by **Kutbi (2021).** However**,** One-fifth of the children were receiving insufficient iron. To improve children's nutritional status, intervention programs may encourage a variety of food choices. 83% of children had insufficient vitamin A intake, which was higher during the first two years of life. Multicenter research by the ICMR including 1.64 preschoolers in 16 districts in India found that vitamin A deficiency is common **(Toteja et al., 2011)**. The prevalence of zinc deficiency among children aged 6 to 60 months (43.8%) and teenagers (49.4%) is considerable, according to available research on zinc levels. Regarding zinc, found adequate intake by the majority of children, which is likely due to enough protein intake is opposite to the current finding of studies which reported zinc deficiency amongst under-five children **(Pathak et al., 2008; Kapil and Jain 2011; Herbst et al., 2014).** According to present findings, more than a third of children consumed too little vitamin C. Adolescent girls living in New Delhi slums were the subjects of a study that revealed the prevalence of vitamin C deficiency **(Bansal et al., 2014).** On the premise of the trend in the children's nutritional adequacy between 1995 and 2000 to 2016 In Egypt. The youngsters consumed an acceptable amount of protein and overall calories over the course of the three surveys. There has been a noticeable rise in the percentage of children who do not receive the required daily amounts of vitamin A and calcium, (40%, 38%54% 73.6%), and (54%, 10%, 60% 66.8%), respectively, over the years **(Hassan et al., 2006;**

Aly et al., 1981). One of the most common nutrient deficits in the world, iron insufficiency affects an estimated two billion individuals. It lowers cognitive growth and is linked to higher morbidity and mortality rates. The iron status needs to be given special consideration **(Hassan et al., 2006).** The iron intake in Egypt's diet appears to be around average, as the hazardous level of iron deficiency is roughly consistent with the numbers from 1995, 2000, and 2016 **(Khorshed et al., 1995)** (13%, 10%, and 13.9%, respectively). However, since bioavailability is not taken into account at this level, anemia risk is significant and even rising in sensitive individuals. The intake of iron has decreased when bioavailability is taken into account. Although the average iron intake has been attained, it is clear that the amount of absorbable iron being consumed is insufficient to meet the needs. Higher dietary fiber, phytate, and other inhibitor levels, as well as a more serious shortage of absorption enhancers, reduce the bioavailability of iron. A lack of micronutrients harms children's cognitive development, so it is crucial to cure it **(Hwalla et al., 2017**). A balanced diet that includes a variety of foods may increase one's chances of attaining a balanced diet made up of a variety of foods may increase the likelihood that a person will consume a variety of nutrients **(Hwalla, et al., 2017).** Children may also benefit from nutrition-based curriculum initiatives that encourage them to consume more fruits and vegetables and improve their diets **(Wambogo et al., 2020).**

CONCLUSION

To sum up, the dietary information revealed micro-nutrient deficiencies in Egyptian children as well as less than ideal intakes of important nutrients like, calcium, iron, magnesium, and vitamin A. Future studies, should follow present findings as a reference to better understand the variables and barriers preventing Egyptian children from consuming the recommended amounts of micronutrients.

RECOMMENDATION

A healthy, balanced diet that contains a variety of food kinds that are sufficient for each vitamin or mineral could prevent nutritional deficiencies. Nutrition education is crucial for countries affected by globalization, urbanization, and a dangerous dietary shift toward low-cost processed foods that are rich in sugar, fat, and salt.

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Table (1): Distribution of household surveyed samples according to geographic region and residence area

Geographical areas	Urban Household		Rural Household	
	No	%	No	%
***Urban (n=1210)**	965	79.8%	245	20.2%
Lower Egypt (n=1944)	716	36.8%	1228	63.2%
Upper Egypt (n=1611)	559	34.7%	1052	65.3%
Frontier (n=579)	335	57.9%	244	42.1%
Total(n=5344)	2575	48.2%	2769	51.8%

**Urban is from (Cairo, Alexandria, Suez, and Port Said)*

Table (2) Distribution of children surveyed samples according to geographic region and residence area

Areas of governorates	Urban		Rural	
	No	%	No	%
*Urban (1030)	957	92.9%	73	7.1%
Lower Egypt (1739)	586	33.7%	1153	66.3%
Upper Egypt (1611)	485	30.1%	1126	69.9%
Frontier (265)	189	71.4%	76	28.6%
Total (4645)	2217	47.7%	2428	52.3%

Urban is from (Cairo, Alexandria, Suez, and Port Said)

Table (3): Distribution of children study according to age

Age		Number	%
Children	<2Y	221	4.9%
	6 - <12Y	1949	42%
	12 - 18Y	1289	27.8%
	2 - <6Y	1186	25.5%
	Total	4645	100%

Table (4): Distribution of the household sample in demographic areas according to social status

Demographic areas		*Urban		Rural		Total		X2	*P*-Value
		No	%	No	%	No	%		
Social status (n=5344)	Low	370	23.4	1213	76.6	1583	29.6	0.352	0.0045
	Medium	1510	57.8	1103	42.2	2613	48.9		
	High	790	68.8	358	31.2	1148	21.5		

**Urban is from (Cairo, Alexandria, Suez, and Port Said)*

Table (5) distribution of the household heads by socioeconomic factors data by geographic area

Household heads		*Urban		Lower Egypt		Upper Egypt		Frontier		P Value
		No	%	No	%	No	%	No	%	
Social status **(n=5344)**	Low	423	26.7	185	11.7	564	35.6	411	26.0	0.000
	Medium	617	23.6	1087	41.6	528	20.2	381	14.6	
	High	238	20.7	548	47.7	127	11.1	235	20.5	

**Urban is from (Cairo, Alexandria, Suez, and Port Said)*

Table (6): The RDI % of minerals for children in the studied governorates

Minerals		Urban (n=1030)		Lower Egypt (n=1739)		Upper Egypt (n=1611)		Frontier (n=265)		Total n=4645
		No	**%**	**No**	**%**	**No**	**%**	**No**	**%**	
Calcium	**Unsafe**	711	69.1%	1099	63.2%	990	61.5%	175	66.1%	64.9%
	Unacceptable	190	18.5%	316	20.8%	397	22.8%	56	21.4%	15.5%
	Acceptable	101	9.9%	210	12.1%	183	11.4%	30	11.5%	11.5%
	Overconsumption	23	2.3%	66	3.8%	66	4.1%	0.2	1%	8.3%
Magnesium	**Unsafe**	166	16.2%	187	10.8%	141	8.8%	54	17.3%	13.2%
	Unacceptable	242	23.5%	504	20.9%	283	17.6%	52	19.8%	24.4%
	Acceptable	394	38.3%	603	34.7%	501	31.1%	83	31.4%	31.4%
	Overconsumption	225	21.9%	594	34.2. %	683	42.4%	83	31.4%	31.4%
Iron	**Unsafe**	151	14.7%	220	12.7.5%	141	8.8%	37	14.0%	15.5%
	Unacceptable	242	23.5%	326	18.8%	264	16.4%	37	14.0%	12.5%
	Acceptable	344	33.4%	596	34.3%	501	31.1%	83	31.4%	31.4%
	Overconsumption	290	28.2%	591	34.0%	700	43.5%	107	40.6%	40.5%
Zinc	**Unsafe**	59	5.8%	106	6.1%	57	3.6%	6.3	2.4%	3.2%
	Unacceptable	103	16.9%	238	13.7%	172	10.7%	12	4.9%	4.4%
	Acceptable	376	36.6%	608	35.5%	438	27.2%	80	30.5%	30.5%
	Overconsumption	417	40.5%	773	44.5%	944	58.6%	164	61.9%	61.9%

%50% of RDI unsafe level of consumption
≥ 50-75% of RDI unacceptable or Inadequate level of consumption
≥ 75-120% of RDI acceptable or Adequate level of consumption
≥ 120% of RDI overconsumption

Table (7) RDA% of vitamins for children in the studied governorates

Vitamins		Urban (n=1030)		Lower Egypt (n=1739)		Upper Egypt (n=1611)		Frontier (n=265)		Total n=4645
		No	%	No	%	No	%	No	%	
Vitamin A	**Unsafe**	747	72.6. %	1299	74.7%	1111	69 %	200	75.6%	76.1.7%
	Unacceptable	96	9.4%	187	10.8%	209	13%	31	11.7%	11.2%
	Acceptable	64	6.3%	132	7.6%	159	9.9%	9	3.3%	3.3. %
	Overconsumption	119	%11.6.	118	6.8%	127	7.9%	15	9.2%	9.2%
Vitamin C	**Unsafe**	320	31.1%	427	24.6.1%	381	23.7%	112	42.3. %	30.4%
	Unacceptable	143	13.9%	210	12.1%	185	11.5%	17	6.7. %	18.8%
	Acceptable	177	17.2%	340	19.6%	283	17.6%	44	16.9%	16.9%
	Overconsumption	387	37.6%	756	43.5. %	765	47.5. %	89	33.9%	33.9%
Vitamin B1	**Unsafe**	114	11.1%	455	26.2%	106	6.6%	23	9.0%	9.0%
	Unacceptable	210	20.4%	443	25.5%	204	12.78%	34	13.2.8%	14.3%
	Acceptable	412	40.0%	470	27.08%	510	31.7%	130	34.7%	34.7%
	Overconsumption	292	28.4%	366	21.1%	786	48.8.4%	113	42.9%	42.9%
Vitamin B2	**Unsafe**	330	32.1%	455	26.2. %	346	21.5%	75	28.5%	27%
	Unacceptable	272	26.5%	443	25.5%	386	24.0%	79	30.2.7%	32.0%
	Acceptable	251	24.4%	470	27.8%	509	31..6%	53	20.1%	20.0%
	Overconsumption	174	16.9.0%	366	21.1. %	446	27.7. %	58	21.09 %	21.30%

%50% of RDI unsafe level of consumption
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≥ 120% of RDI overconsumption

Table (8): the RDA% of minerals for children according to age groups

		<2Y (n=221)		2 - <6Y (n=1186)		6 - <12Y (n=1949)		12 - 18Y (n=1289)		Total n= 4645	P value
		No	**%**	**No**	**%**	**No**	**%**	**No**	**%**		
Calcium	**Unsafe**	117	52.9%	601	50.7%	1393	71.5%	996	77.3%	66.8%	**0.030**
	Unacceptable	43	19.6%	291	24.5%	362	18.6%	233	18.1%	0.2%	
	Acceptable	48	21.6%	216	18.2%	160	8.2%	50	3.9%	10.2%	
	Overconsumption	13	5.9%	78	6.6%	34	1.7%	10	0.6%	22.8%	
Magnesium	**Unsafe**	4	2.0%	38	3.2%	302	15.5%	271	21.0%	13.2%	**0.000**
	Unacceptable	9	4.0%	106	8.9%	567	29.1%	392	30.4%	23.1%	
	Acceptable	80	36.0%	371	31.3%	694	35.6%	485	37.6%	35.1%	
	Overconsumption	128	58.0%	671	56.6%	386	19.9%	141	11.0%	28.6%	
Zinc	**Unsafe**	22	10.0%	66	5.6%	103	5.3%	45	3.5%	5.1%	**0.85**
	Unacceptable	44	20.0%	155	13.1%	300	15.4%	117	9.1%	13.3%	
	Acceptable	47	22.0%	385	32.5%	686	35.2%	406	31.5%	32.8%	
	Overconsumption	108	48.0%	580	48.7%	860	44.1%	721	56.0%	48.8%	
Iron	**Unsafe**	35	15.7%	57	4.8%	261	13.4%	282	21.9%	13.7%	**0.000**
	Unacceptable	35	15.7%	121	10.2%	458	23.5%	369	28.6%	21.2%	
	Acceptable	56	25.5%	364	30.7%	725	37.2%	452	35.1%	34.4%	
	Overconsumption	95	43.1%	644	54.3%	505	25.9%	186	14.4%	30.7%	

%50% of RDI unsafe level of consumption
≥ 50-75% of RDI unacceptable or Inadequate level of consumption
≥ 75-120% of RDI acceptable or Adequate level of consumption
≥ 120% of RDI overconsumption

Table (9): the RDA% of vitamins for children according to age groups

		<2Y (n=221)		2 - <6Y (n=1186)		6 - <12Y (n=1949)		12 - 18Y (n=1289)		Total n= 4645
		No	%	No	%	No	%	No	%	
Vitamin A	**Unsafe**	180	81.6%	843	71.1%	1466	75.2%	928	72.0%	73.6%
	Unacceptable	13	6.1%	145	12.2%	197	10.1%	153	11.9%	10.9%
	Acceptable	13	6.1%	106	8.9%	125	6.4%	98	7.6%	7.3%
	Overconsumption	15	6.1%	92	7.8%	181	8.2%	110	8.4%	8.2%
Vitamin C	**Unsafe**	80	36.2%	308	26.0%	579	29.7%	285	22.1%	27.0%
	Unacceptable	19	8.5%	164	13.8%	203	10.4%	142	11.0%	11.4%
	Acceptable	47	21.3%	211	17.8%	363	18.6%	264	20.5%	19.1%
	Overconsumption	75	34.0%	503	42.5%	804	41.2%	598	46.5%	42.5%
Vitamin B1	**Unsafe**	35	15.7%	71	6.0%	275	14.1%	124	6.9%	10.9%
	Unacceptable	17	7.8%	157	13.2%	435	22.3%	205	15.9%	17.5%
	Acceptable	48	21.6%	407	34.3%	743	38.1%	470	36.5%	35.9%
	Overconsumption	121	54.9%	551	46.5%	496	25.5%	490	40.7%	35.7 %
Vitamin B2	**Unsafe**	35	15.7%	211	17.8%	704	36.1%	356	27.6%	28.1%
	Unacceptable	43	19.6%	269	22.7%	538	27.6%	363	28.2%	26.1%
	Acceptable	78	35.3%	355	29.9%	458	23.5%	380	29.5%	27.4%
	Overconsumption	65	29.4%	351	29.6%	249	12.9%	190	14.7%	18.4%

%50% of RDI unsafe level of consumption
≥ 50-75% of RDI unacceptable or Inadequate level of consumption
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المغذيات الدقيقة التي يتناولها مجموعة من الأطفال المصريين في مناطق ديموغرافية مختلفة من مصر

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الملخص العربي

هناك اهتمام متزايد بدور المغذيات الدقيقة في تحسين الصحة والوقاية من الأمراض أو علاجها. باستثناء فيتامين د ، لا يتم إنتاج المغذيات الدقيقة في الجسم ويجب الحصول عليها من النظام الغذائي. يشار أيضًا إلى نقص المغذيات الدقيقة باسم "الجوع الخفي". الأهداف: دراسة المتناول الغذائي المحدد للأطفال في مناطق جغرافية مختلفة تمثل مصر. لاستخدام المعلومات المتعلقة بأنماط الغذاء والاستهلاك لتصميم موضوعات وأساليب نظام التثقيف التغذوي ، كان هذا المسح المقطعي يهدف إلى دراسة نمط استهلاك الغذاء وتناول المغذيات المحددة للأطفال في مناطق ديموغرافية مختلفة من مصر. النتيجة والاستنتاج: كشفت المعلومات الغذائية عن نقص في المغذيات الدقيقة لدى الأطفال المصريين ، فضلاً عن تناول كميات أقل من المثالية من العناصر الغذائية المهمة مثل الكالسيوم والحديد وفيتامين أ. يجب أن تتبع الدراسات المستقبلية النتائج التي توصلنا إليها كمرجع لفهم أفضل. المتغيرات والحواجز التي تمنع الأطفال المصريين من استهلاك الكميات الموصى بها من المغذيات الدقيقة.

الكلمات الدالة. المغذيات الدقيقة_الأطفال_مصر