CODEN [USA]: IAJPBB ISSN : 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES
SJIF Impact Factor: 7.187

Avalable online at: http://www.iajps.com *Research Article*

OBESITY AS A CAUSE OF MICRONUTRIENT DEFICIENCY AMONG CHILDREN

[1]Dr Ayesha Qamar, [2]Dr Memoona Naeem, [3]Dr Abdullah Jan
[1]Allama Iqbal Medical College, Lahore
[2]Independent Medical College, Faisalabad
[3]Quaid-e-Azam Medical College, Bahawalpur

Article Received: November 2020 **Accepted:** December 2020 **Published:** January 2021

Abstract:
Background: *The prevalence of obesity continues to increase worldwide. Obesity is associated with important complications such as coronary artery disease, hyperlipidemia, diabetes and others. On the other hand, micronutrient deficiency, especially iron deficiency, affects many children around the world.*
Methods: *This study examined the association between obesity and deficiency of micronutrients such as iron, calcium, and phosphorus in children aged 2-16 years. 280 obese and 280 non-obese children from 2 to 16 years of age attending the Department of Endocrinology were assessed. BMI ≥ 85% was defined as overweight and ≥ 95% as obesity. Serum iron, ferritin, TIBC, MCV, hemoglobin, hematocrit, calcium, and phosphorus levels were compared in both groups.*
Place and Duration: *In the Department of Endocrinology and Pediatrics, Jinnah Hospital Lahore for one-year duration from August 2019 to August 2020.*
Results: *The hemoglobin and hematocrit levels were significantly lower in obese children. In addition, serum iron, calcium, and phosphorus levels were significantly lower in obese children compared to their healthy counterparts. Low MCV, MCH, and MCHC were also more common among obese children.*
Conclusion: *The results of our study show a significant impact of healthy eating on the general health of society, as well as the prevention of obesity complications such as anemia, and calcium and phosphorus deficiency.*
Key words: *anemia, calcium, iron, obesity, overweight.*

Corresponding author:
Dr. Ayesha Qamar,
Allama Iqbal Medical College, Lahore

QR code

Please cite this article in press Ayesha Qamar et al, ***Obesity As A Cause Of Micronutrient Deficiency Among Children.,*** *Indo Am. J. P. Sci, 2021; 08(1).*

INTRODUCTION:

Obesity is a global health problem that has increased significantly in recent years. Currently, 16-31% of children and 30% of adults are obese. One of the most important factors in the obesity epidemic is changing people's lifestyle and eating habits. Poor eating habits and decreased physical activity led to such a huge increase in obesity and overweight. Overweight and obese children are at increased risk of high blood pressure, dyslipidemia, and type 2 diabetes. And because of an improper diet containing high-energy foods that do not provide them with adequate micronutrients, they may also be at increased risk of micronutrient deficiencies. Micronutrients are elements that make up less than 0.01% of body weight and contain vitamins and trace elements. They play a vital role in bodily functions. Among micronutrients, iron deficiency is quite common all over the world. Iron deficiency is the most common eating disorder. It is associated with behavioral and learning problems in children and adolescents. It is also an important health problem in Pakistan. According to statistics from the World Health Organization (WHO), 10-39% of women and girls of childbearing age in Pakistan have hemoglobin levels below reference values. Approximately 18-38% of children under the age of 5 have anemia. The aim of the study was to evaluate the level of iron, calcium and phosphorus in obese children aged 2 to 16 years.

MATERIALS AND METHODS:

The study was designed as a retrospective case control study held in the Department of Endocrinology and Pediatrics, Jinnah Hospital Lahore for one-year duration from August 2019 to August 2020. The medical records of 280 overweight and obese children admitted to the Department of Endocrinology and 280 children with normal weight were assessed. BMI ≥ 85% was considered overweight and BMI> 95% was considered obese. The children in this study were between 2 and 16 years of age. People treated for iron deficiency anemia or receiving iron or calcium containing medications or having a medical condition affecting hemoglobin or calcium and phosphorus levels were excluded.

Statistical analysis: We used student's t-test for means and chi-square test for proportions. The independent relationship between iron, calcium, and phosphorus status and obesity was assessed by logistic regression. For all tests, the confidence level was 95%.

RESULTS:

The sample consisted of 560 children and adolescents aged 2-16. 193 (34%) of them are boys and 367 (65%) girls. This predominance of women may be partly due to the fact that families pay more attention to the girl's body weight and image and are therefore more often referred to doctors for obesity. 48.2% of the normal weight group were boys and 51.7% girls, 39.6% compared with 60.3% in the overweight and obese group. In both groups, there was no significant difference between the children's maturation. In the control group, 54.3% were pre-pubertal compared with 41.3% in the obese group, which did not differ significantly (p = 0.823). Table 1.

TABLE 1:- Characteristics of control and case groups in this study

		Cases (%)	Controls (%)	p value
Sex	Male	39.6	48.2	0.009
	Female	60.3	51.7	
Pubertal status	Prepubertal	41.3	54.0	0.823
	Pubertal	58.7	46.0	

In the group with normal weight, 42% had hemoglobin levels in terms of anemia, while in the obese group, 74.3% (p0 / 001). Low MCV and MCH were also significantly greater in obese children. (p = 0.02 and 0.001) Low serum iron concentration and elevated TIBC were observed with a greater frequency in obese children (p <0.001) Table 2.

TABLE 2: Average Values of the studied parameters in case and control groups

	Cases	Controls	p Value
Hb (mg/dl)	9.3±1.6	11.4±1.4	0.001
Hct(%)	28.1±5.2	32.2±4.2	0.001
MCV(fl)	74±7	77±6	0.02
Serum Iron(µg/dl)	62.5±30.1	71±33.6	0.001
TIBC(µg/dL)	465±80	397±69	0.001
Calcium(mg/dl)	7.8±0.9	8.8±0.5	0.001
Phosphorus(mg/dl)	3.9±1.8	4.5±3.6	0.001
Ferritin(ng/ml)	64.1±13	69.9±11	0.49

Ferritin levels showed no significant difference between the two groups (p = 0.49). Serum calcium levels were significantly lower in obese and overweight children (p <0.001). This also applies to the serum phosphorus level in obese children (p <0.001). Table 3.

TABLE 3: Cut off Values for the parameters studied

Age group (yrs)	Hb (gm%)	Hct (%)	Ferritin (ng/ml)	TIBC	MCV(fl)	MCHC	Serum Iron	Calcium (mg/dl)	Phosphorus (mg/dl)
2-6	11.5	34	7-140	250-425	75	31	50-120	8.5	4.5
6-12	11.5	35	7-140	250-425	77	31	50-120	8.5	4.5
12-16	13.0	36	7-140	250-425	78	31	50-120	8.5	4.5

DISCUSSION:

The prevalence of overweight and obesity has increased worldwide in recent years, while iron deficiency remains the most common nutritional deficiency in the world. Children who are obese due to an inappropriate diet may be at an increased risk of micronutrient deficiencies, especially iron. A possible link between iron deficiency and obesity has been noted in some studies. Our findings in this study are also consistent with the results of this study. In 2004, a corresponding study was published in which Karen and colleagues examined a large population of children and found that obese children had the highest incidence of iron deficiency, and that this incidence increased with increasing BMI. Our study also shows that iron deficiency is common among obese children and adolescents. Various factors have been proposed to explain the relationship between iron deficiency and obesity. These include: an improper diet with iron deficiency, genetic factors, limited physical activity, which leads to a reduction in the breakdown of myoglobin in the muscles and thus to a reduction in the amount of iron released into the circulation. Other hypotheses have also been proposed, but additional research is needed to better understand the effects of obesity on iron metabolism. Amota et al. Have shown that hepcidin, which is a major regulator of iron homeostasis, is higher in obese children, leading to reduced iron absorption, and his study also showed that weight loss and decreased BMI will reduce hepcidin and therefore improve iron condition. It therefore appears that the low serum iron levels in obese people are due to a combination of nutritional and functional factors. In this study, we also assessed serum calcium and phosphorus levels in both groups and found that these two micronutrients are also significantly lower in obese children (p <0.001). Many studies have shown hypovitaminosis D in obese people, which may explain the low levels of calcium and phosphorus in obese people. The lack of other micronutrients and vitamins, such as vitamin B12, has also been shown in obese children. However, it seems that more research is needed to better understand these associations.

CONCLUSION:

The link between iron and calcium deficiency and obesity can have a significant impact on the overall health of society given the obesity epidemic. If a true link is established, the inclusion of obese children in screening programs for iron deficiency seems warranted.

REFERENCES:

1. Neufeld, Lynnette M., Ty Beal, Leila M. Larson, and Françoise D. Cattaneo. "Global landscape of malnutrition in infants and young children." In *Global Landscape of Nutrition Challenges in Infants and Children*, vol. 93, pp. 1-14. Karger Publishers, 2020.
2. Wells, Jonathan C., Ana Lydia Sawaya, Rasmus Wibaek, Martha Mwangome, Marios S. Poullas, Chittaranjan S. Yajnik, and Alessandro Demaio. "The double burden of malnutrition: aetiological pathways and consequences for health." *The Lancet* 395, no. 10217 (2020): 75-88.

3. Khademi, Gholamreza, Mohsen Nematy, Golnaz Ranjbar, Mahdieh Pouryazdanpanah, Rahele Rahimi, and Fatemeh Roudi. "Clinical Nutrition Approaches to Medical Management of Children with Obesity and Critical Illnesses." *Journal of Comprehensive Pediatrics* 11, no. 1 (2020).
4. McKay, Jenny, Suleen Ho, Monica Jane, and Sebely Pal. "Overweight & obese Australian adults and micronutrient deficiency." *BMC nutrition* 6 (2020): 1-13.
5. Engle-Stone, Reina, Junjie Guo, Sanober Ismaily, O. Yaw Addo, Tahmeed Ahmed, Brietta Oaks, Parminder S. Suchdev, Rafael Flores-Ayala, and Anne M. Williams. "Intraindividual double burden of overweight and micronutrient deficiencies or anemia among preschool children." *The American journal of clinical nutrition* 112, no. Supplement_1 (2020): 478S-487S.
6. Scrinis, Gyorgy. "Reframing malnutrition in all its forms: a critique of the tripartite classification of malnutrition." *Global Food Security* 26 (2020): 100396.
7. Alberca, Ricardo Wesley, Luana de Mendonca Oliveira, Anna Cláudia Calvielli Castelo Branco, Nátalli Zanete Pereira, and Maria Notomi Sato. "Obesity as a risk factor for COVID-19: an overview." *Critical Reviews in Food Science and Nutrition* (2020): 1-15.
8. Nogueira-de-Almeida, Carlos Alberto, Luiz A. Del Ciampo, Ivan S. Ferraz, Ieda RL Del Ciampo, Andrea A. Contini, and Fábio da V. Ued. "COVID-19 and obesity in childhood and adolescence: a clinical review." *Jornal de Pediatria* (2020).
9. Williams, Anne M., Junjie Guo, O. Yaw Addo, Sanober Ismaily, Sorrel ML Namaste, Brietta M. Oaks, Fabian Rohner et al. "Intraindividual double burden of overweight or obesity and micronutrient deficiencies or anemia among women of reproductive age in 17 population-based surveys." *The American journal of clinical nutrition* 112, no. Supplement_1 (2020): 468S-477S.
10. Biesma, Regien, and Mark Hanson. "Childhood Obesity." *Pediatric Surgery: General Principles and Newborn Surgery* (2020): 529-539.
11. Mantadakis, Elpis, Eleftherios Chatzimichael, and Panagiota Zikidou. "Iron deficiency anemia in children residing in high and low-income countries: risk factors, prevention, diagnosis and therapy." *Mediterranean Journal of Hematology and Infectious Diseases* 12, no. 1 (2020).
12. Nugent, Rachel, Carol Levin, Jessica Hale, and Brian Hutchinson. "Economic effects of the double burden of malnutrition." *The Lancet* 395, no. 10218 (2020): 156-164.
13. Rhodes, Elizabeth C., Parminder S. Suchdev, KM Venkat Narayan, Solveig Cunningham, Mary Beth Weber, Katie Tripp, Carine Mapango, Usha Ramakrishnan, Monique Hennink, and Anne M. Williams. "The Co-Occurrence of Overweight and Micronutrient Deficiencies or Anemia among Women of Reproductive Age in Malawi." *The Journal of Nutrition* 150, no. 6 (2020): 1554-1565.
14. Adaikalakoteswari, Antonysunil, Catherine Wood, Theresia H. Mina, Craig Webster, Ilona Goljan, Yonas Weldeselassie, Rebecca M. Reynolds, and Ponnusamy Saravanan. "Vitamin B12 deficiency and altered one-carbon metabolites in early pregnancy is associated with maternal obesity and dyslipidaemia." *Scientific reports* 10, no. 1 (2020): 1-9.
15. Hawkes, Corinna, Marie T. Ruel, Leah Salm, Bryony Sinclair, and Francesco Branca. "Double-duty actions: seizing programme and policy opportunities to address malnutrition in all its forms." *The Lancet* 395, no. 10218 (2020): 142-155.