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Prevalence of Iron Deficiency and Iron Deficiency Anaemia in Adolescent Girlsin Tobruk, Libya

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ABSTRACT

Anemia is the most common blood disorder, affecting about a third of the global population. Iron deficiency anemia (IDA) is the most advanced stage of iron deficiency.This includes populations of all ages and genders. However, adolescent girls are more prone to this. This study aims to find the prevalence of anemia among adolescent girls in Tobruk, Libya. The data of 200 samples was collected from Ibn Al Heathem privatelaboratory Center in Tobruk, for 7 months (Jun 2023-December 2023). Out of 200 girls,50% of adolescent girls were found to be anemic. Of the total, 43.5% were mild, 4.1%were moderate and 2.5% were severely affected by anaemia. The prevalence of anemiais up to 50%, so it must be prevented and managed.

Keywords: Iron, Anemia, Iron deficiency, IDA, female, Adolescent.

1. Introduction

Iron is a fundamental micronutrient and it is important for several roles in the human body. Iron has essential functions in oxygen binding, cellular growth, and differentiation, transport and storage, immune function, enzymatic reactions, cognitive function, etc. [1]. Consequently, due to physiological and pathological reasons, iron deficiency can impact mental and physical growth resulting in reduced capacity of learning and working [2]. Globally, ID and (IDA) the essential problems of public health and the main nutritional

deficiency [3]. Iron deficiency anemia is distinguished by a hemoglobin synthesis deficiency that results in hypochromic and microcytic red bloodcells [4-6].

The main cause of disability-adjusted years lived in humans is iron deficiency anemia (IDA), which effects females than males [7-8]. Estimation of the burden of iron deficiency anemia in France from iron intake. While premenopausal, pregnant, and growing children have been the primary targets of its attention as a public health issue, it is also becoming more widely acknowledged as a clinical condition that can affect patients who present to a variety of medical and surgical particularly the elderly and those with chronic condition [9-10] .

There are several causes of iron deficiency and IDA in adolescent girls. These include low iron intake or absorption, increasing need during puberty, excessive blood loss during menstruation, parasitic infestation, and so on [11].

Although Iron deficiency anemia affects people of all ages and genders, adolescent females are vulnerable to get it [12-13]. WHO [14] defines adolescence as the population aged 10 to 19 years [15].

Approximately three-fourths of adolescent females do not meet nutritional needs [16]. In 2016, 33% of women of reproductive age suffered from anemia, with Asia and Africa having the highest prevalence.

The frequency of IDA in Middle Eastern countries is equivalent to that of other developing countries (25%-35%), which is significantly greater than that of developed countries (5%-8%) [17-18]. However, there are few statistics on IDA prevalence in the Middle East [19]. The objective of this study is to find the prevalence of anemia in adolescent girls in Tobruk City.

2. Materials and methods

2.1. Principle sample

The 200 samples were taken by Ibn Al Heathem Private Laboratory Center in Tobruk, for 7 months (Jun 2023-December 2023). It was just conducted on femaleadolescents, and then it was categorized into two groups. One group comprised 100 adolescent girls of age group 10-14 years and another group of 100 adolescentgirls of 15-19 years. Serum ferritin, TIBC, blood hemoglobin, and serum iron levels were all estimated in the laboratory.

2.2. Test

All biochemical indicators were assayed in the Ibn Al Heathem private laboratoryCenter. The entire blood count was examined. Using a DxI 600 immunoassay analyzer, serum ferritin levels were determined. The AU5810 Chemistry Analyzers tested the levels of serum iron and UIBC. The value of Fe was added to the UIBC value to calculate TIBC.

2.3. Statistical Analysis

The mean value and standard deviation of all the parameters were calculated using Graph Pad software.

3. Results

Iron deficiency anemia is dominant worldwide. Iron is an essential nutrient for thehuman body and it has a major role in it. Iron is required for several functions. Oxygen transport, DNA synthesis, electron transport, and many other functions.

This study aims to find the prevalence of anemia among adolescent girls in Tobruk, Libya. The data of 200 samples was collected from Ibn Al Heathem private laboratory Center in Tobruk, for 7 months (Jun 2023-

December 2023). The 200 adolescent girls in the study group were categorized into 100 girls of 10-14 years of age and 100 girls of 15-19 years. Table (1) shows below a normal range andmean value of hemoglobin, serum iron, serum ferritin, and TIBC.

The result shows that adolescent girls aged 15-19 have higher levels of hemoglobin, serum iron, and serum ferritin than the 10–14-year age group; in contrast, the 10–14-year group has higher TIBC.

Moreover, Table (2) below shows the Percentage distribution of anemia among adolescent girls, 54% of adolescent girls aged 10 to 14 have anemia, of which 44%have mild, 6.4 have moderate, and 3.6% have severe anemia.

Table 1: Comparison of hemoglobin, serum iron, ferritin, and TIBC in adolescentgirls of 9-14 and 15-20 years of age

Age Group (Years)	Haemoglobin (gm %)Normal Range (>12 gm %)	Serum Iron (µg/dL) NormalRange (35-145 µg/Dl)	Serumn Ferritin(ng/m) Normal Range (15-291ng/ml)	Total iron binding capacity(µg/dL) Normal Range (250-450 µg/ dL)
10-14	**9.4±1.2**	**57.8±5.5**	**48.1±2.3**	**310±10.9**
15-19	**11±2.1**	**71.2±4.7**	**54.3±3.2**	**276±7.8**

Table 2: Percentage of adolescent girls having different degrees of anemia

Age Group (Years)	Percentage of Adolescents with Anaemia (12< (gm/dL)	Mild Anaemia Haemoglobin -10.0((gm/dL) 11.9	Moderate Anaemia Haemoglobin 9.9- 8.0((gm/dL)	Severe Anaemia Haemoglobin (8 < (gm/dL)
10-14	**54%**	**44.0%**	**6.4%**	**3.6%**
15-19	**46%**	**43.0%**	**1.7%**	**1.3%**

4. Discussions

The age group prevalence for those aged 15 to 19 is presented as 46%. A total of 43% have mild, 1.7% have moderate, and 1.3% have severe anemia. This suggeststhat the 10–14 age group has more severe anemia than the 15–19 age group.

According to WHO (2005) reported Iron deficiency anemia is the most prevalent nutritional condition worldwide and nearly two billion people suffer from anemia andapproximately 50% of these cases are due to iron deficiency [20] .

In the United States, 3% of adolescent females were found to have iron deficiency anemia (IDA), which is the most severe stage of the condition, described as a

lowhemoglobin concentration [21]

Vasanthi [22] reported that adolescent girls are more prone to IDA, although it occurs at all ages and involves both females and males. More than 50% of the girls ages between 12 and 15 years have been reported to be anemic.

Tesfaye [23] stated that compared to younger age, the iron requirement isdouble during adolescence.

The result of this study indicates the severity of anemia is more in the 10-14 years agegroup than the 15-19 years age group. Although most of the cases were mild, they should be taken into account due to the possibility of progressing to moderate or severe stages, if left untreated. This finding may be due to the lack of proper nutrition, poor socio-economic status, access to poor health, heredity, more bleeding during the early years of menarche, less awareness about iron-containing diets, poor personal hygiene, worm infestation, etc. Mawani [24] & Ganz, T [25] these studies have proved the validity of the result that has appeared with us.

Other studies also in Tamil Nadu, Nepal, and West Bengal have shown that they have nearly the same prevalence [26-27].

However, other studies in Gujarat revealed that the prevalence is very high compared to our findings [28]. This may be due to different geographical conditions, food habits, lifestyles, and socioeconomic status.

This difference may be due to different, geographical conditions, lifestyle, food habits, etc. Gujarat has shown that prevalence is very high compared to our study. Due to the increased requirement of iron which is caused by sudden increase in lean body mass, menstrual blood loss, and total blood volume, adolescent girls are more vulnerable to iron deficiency and anaemia. WHO and UNICEF started different programs to reduce anaemia in this particular group because if untreated these can affect next-generation children resulting in increased morbidity and mortality and decreased productivity [29].

Abdo, N. [30] reported that iron deficiency anemia is a critical health problem and the most common problem associated with undernutrition that affects many adolescents globally. Healthcare professionals should not only be guided about this health problem among this age group but also supported to enable their intervention.

5. Conclusion

This study was conducted to determine the prevalence of anemia among adolescents aged 10 to 19 years in Tobruk City, Libya. Iron deficiency anemia is an important public health problem. It was found that the prevalence of anemia in adolescent girlsaged 10 to 19 years was 50%. Anemia was more prevalent in the 10-14 age group than in the 15-19 age group. More attention should be paid to combating anemia in girls aged 10-14, increasing productivity, reducing morbidity and mortality, and improving the health status of subsequent generations.

6. References

1. Byrnes, V., Barrett, S., Ryan, E., Kelleher, T., O'keane, C., Coughlan, B., & Crowe, J. (2002). Increased duodenal DMT-1 expression and unchanged HFE mRNA levels in HFE-associated hereditary hemochromatosis and iron deficiency. Blood Cells, Molecules, and Diseases, 29(3), 251-260.

2. Johnson-Wimbley, T. D., & Graham, D. Y. (2011). Diagnosis and management of iron deficiency anemia in the 21st century. Therapeutic advances in Gastroenterology,4(3), 177-184.

3. Jbireal, J. M., Azab, A. E., & Hasan, S. M. (2020). Iron Deficiency Anemia: Insights

into the Prevalence, Causes, Iron Metabolism, Manifestations, Diagnosis, and Treatment. Clin Res Hematol, 3(2), 1-8.

4. Looker, A. C., Dallman, P. R., Carroll, M. D., Gunter, E. W., & Johnson, C. L. (1997). Prevalence of iron deficiency in the United States. Jama, 277(12), 973-976
5. Provan D. (1999). Mechanisms and management of iron deficiency anaemia. *British journal of haematology*, *105 Suppl 1*, 19–26.
6. Stein, J., Hartmann, F., & Dignass, A. U. (2010). Diagnosis and management of iron deficiency anemia in patients with IBD. Nature Review Gastroenterology & hepatology, 7(11), 599-610.
7. MacLean, B., Sholzberg, M., Weyand, A. C., Lim, J., Tang, G., & Richards, T. (2023). Identification of women and girls with iron deficiency in the reproductiveyears. International Journal of Gynecology & Obstetrics, 162, 58-67.
8. De Oliveira Mota, J., Tounian, P., Guillou, S., Pierre, F., & Membré, J. M. (2019). Estimation of the burden of iron deficiency anemia in France from iron intake: Methodological Approach Nutrients, 11(9), 2045
9. Nguyen, P. H., Scott, S., Avula, R., Tran, L. M., & Menon, P. (2018). Trends anddrivers of change in the prevalence of anaemia among 1 million women and childrenin India, 2006 to 2016. BMJ global health, 3(5).
10. Numan, S., & Kaluza, K. (2020). Systematic Review of guidelines for the diagnosis and treatment of iron deficiency anemia using intravenous iron across multiple indications. Current Medical Research and Opinion, 36(11), 1769-1782.
11. Saneela, S., Iqbal, R., Raza, A., & Qamar, M. F. (2019). Hepcidin: A key regulator of iron. *JPMA. The Journal of the Pakistan Medical Association*, *69*(8),1170–1175.
12. Algarín, C., Peirano, P., Garrido, M., Pizarro, F., & Lozoff, B. (2003). Iron deficiency anemia in infancy: long-lasting effects on auditory and visual system functioning. Pediatric Research, 53(2), 217-223.
13. Wintrobe, M. M. (2008). Wintrobe's clinical hematology (Vol. 1). LippincottWilliams & Wilkins.
14. World Health Organization. (1986). Young people's health-a challenge for society: report of a WHO Study Group on Young People and" Health for All by theYear 2000"[meeting held in Geneva from 4 to 8 June 1984]. World Health Organization.
15. Verdon, F., Burnand, B., Stubi, C. F., Bonard, C., Graff, M., Michaud, A. & Favrat, B. (2003). Iron supplementation for unexplained fatigue in non-anaemic women: double blind randomised placebo-controlled trial. Bmj, 326(7399), 1124.
16. Beard, J. L. (2001). Iron biology in immune function, muscle metabolism and neuronal functioning. The Journal of Nutrition 131(2), 568S-580S.
17. De Benoist, B., Cogswell, M., Egli, I., & McLean, E. (2008). Worldwideprevalence of anaemia 1993-2005; WHO Global Database of anaemia.
18. World Health Organization. (2002). The world health report 2002: reducing risks, promoting healthy life. World Health Organization.

19. Abu-Baker, N. N., Eyadat, A. M., & Khamaiseh, A. M. (2021). The impact of nutrition education on knowledge, attitude, and practice regarding iron deficiency anemia among female adolescent students in Jordan. *Heliyon*, *7*(2), e06348.
20. Zhang, Z., Shoff, S. M., & Lai, H. J. (2015). Comparing the use of Centers for Disease Control and Prevention and World Health Organization growth charts in children with cystic fibrosis through 2 years of age. The Journal of Pediatrics, 167(5),1089-1095.
21. Chalke, A., Nevgi, R., Karde, B., & Waghmare, S. (2022). Prevalence of Iron Deficiency and Iron Deficiency Anemia in Adolescent Girls in Tertiary Care Hospital.
22. Vasanthi, G., Fawashe, A. B., Susie, H., Sujatha, T., & Raman, L. (1994). IRON NUTRITIONAL STATUS OF ADOLESCENT GIRLS FROM RURAL AREA AND URBAN SLUM. Hemoglobin (g/dl), 12(2.25), 13-0.
23. Tesfaye, M., Yemane, T., Adisu, W., Asres, Y., & Gedefaw, L. (2015). Anemia and iron deficiency among school adolescents: burden, severity, and determinant factors in southwest Ethiopia. Adolescent health, medicine and therapeutics, 189-196.
24. Mawani, M., Ali, S. A., Bano, G., & Ali, S. A. (2016). Iron deficiency anemiaamong women of reproductive age, an important public health problem: Situation Analysis. Reproductive System & Sexual Disorders: Current Research., 5(3), 1.
25. Ganz, T. (2003). Hepcidin, a key regulator of iron metabolism and mediator ofanemia of inflammation. Blood, 102(3), 783-788.
26. Jolly, R., Rajaratnam, A., Asokan, J. S., & Jonathan, P. (2000). Prevalence of anemia among adolescent girls of rural Tamilnadu. Indian pediatrics, 37(5), 532-536
27. Kanodia, P., Bhatta, M., Singh, R. R., Bhatta, N. K., & Shah, G. S. (2016). A study of anemia among adolescent girls in eastern part of Nepal. Journal of College ofMedical Sciences-Nepal, 12(1), 19-22.
28. Kotecha, P. V., Nirupam, S., & Karkar, P. D. (2009). Adolescent girls' anaemia control programme, Gujarat, India. Indian Journal of Medical Research, 130(5), 584-589.
29. Aguayo, V. M., Paintal, K., & Singh, G. (2013). The Adolescent Girls' Anaemia Control Programme: a decade of programming experience to break the inter-generational cycle of malnutrition in India. Public health nutrition, 16(9), 1667-1676.
30. Abdo, N., Douglas, S., Batieha, A., Khader, Y., Jaddou, H., Al-Khatib, S., ... & Ajlouni, K. (2019). The prevalence and determinants of anaemia in Jordan. Eastern Mediterranean Health Journal, 25(5), 341-349.