SHORT COMMUNICATION article

Analysis of risk factors on hemoglobin level in Libyan women

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HOW TO CITE THIS

Abstract: Anemia is a common health problem among Libyan women. Age, heavy menstruation, and pregnancy are vital risk factors for this problem. In this study, we prospectively examined 60 Libyan women all of which were diagnosed with iron deficiency anemia, their hemoglobin levels were less than 10.0 g/dl. The level of hemoglobin is also analyzed for vegetarian and charcoal-eating women. We found that during pregnancy charcoal-eating women exhibit lower hemoglobin levels than non-eating women. Pregnant young women in the age of 17-27 years have the lowest hemoglobin levels than the other age groups. In addition, vegetarians, heavy coffee and tea drinking, and heavy menstruation in non-pregnant women, as well as breastfeeding, strongly lower hemoglobin levels as measured by their complete blood count.

Introduction

Anemia is a common health problem in which the number of red blood cells (RBCs) in the blood is low, or the blood cells have less than the normal amount of hemoglobin (Hb) [1]. Anemia in pregnancy is commonly due to iron deficiency. It is associated with a variety of adverse outcomes for mothers and infants, including increased risk of maternal mortality, perinatal mortality, and low birth weight [2]. The World Health Organization (WHO) estimates that for two billion cases it occurs at all stages of the lifecycle but is more prevalent in pregnant women and young children [3]. Heavier or longer-than-normal menstrual bleeding can increase the degree of anemia [4]. In addition, bleeding due to digestive system problems such as peptic ulcers or uterine fibroids can cause anemia [5, 6]. For diagnosis of iron-deficiency anemia, in addition to measurement of Hb level and complete blood count (CBC), the measurements of serum iron and total iron binding capacity (TIBC) are more reliable [7-9]. The levels of Hb in Libyans showed the low value and had the lowest mean and the high-value parameter had the highest average [10]. The average values are within the WHO normal ranges and the average Hb values in a low group are less than the WHO normal range. The mean Hb in the medium group is 13.46 within the WHO normal range and the mean Hb in the high group is also within the WHO normal range [10]. With regard to gender, the male has a high value of 55.0% and the female group has a low mean of 45.0% which is in line with WHO ranges. The adult group has a low mean value of 13.66 with 47.88%, the adolescenct group has the highest mean value of 15.08 with 32.0% and the children group has a mean value of 11.64 with 20.4%. This is in line with WHO's normal ranges. In the present study, we examined the Hb levels of Libyan women who attended the hospital due to anemia.

Materials and methods

Patient sampling: This study was performed in the Department of Gynecology and Department of Internal Medicine at the AL-Mokhtar Clinic, Tripoli Medical Center, AL-Jala Hospital, and Sbiea Hospital between December 2017 and February 2018. There were 60 women with iron deficiency anemia. Their ages were between 14 to 80 years. 24 of them were pregnant and 36 were non-pregnant. All of them were anemic as diagnosed by their physician according to their CBC data. Hb of less than 10.1 g/dl was considered an indicator of iron deficiency anemia.

Ethical statement. This study was conducted according to the guidelines in the Declaration of Helsinki [11]. All participants were asked to complete a predesigned face-to-face questionnaire that included most of the information needed for this study such as age, pregnancy age and breastfeeding, charcoal eating behavior, heavy coffee or tea drinking (more than five cups per day), and presence of heavy bleeding. The participant data were collected as yes or no. For this kind of data analysis, formal consent is not required.

Blood collection and analyses. Participants rested in the laboratory for five minutes before the blood sample was obtained. Participants were seated when 5.0 ml of blood was drawn from a vein in the forearm. 1.0 ml - 2.0 ml of the blood collected was used to determine the parameters of the CBC measured by an automatic hematology analyzer (Mindray™ 3030; Orphee Medical SA, Geneva, Switzerland) [12].

Statistical analysis: Data are expressed as the mean and standard deviations (mean±SD) and analyzed statistically by MedCalc Software for Windows, version 22.023. The significance of the difference between the mean of the groups of data has statistically been calculated by a tailed Student t-test. Those with a P value of less than 0.05 have been considered significant.

Results

The findings classified the women into two groups either pregnant or non-pregnant (n=24, 40.0% and n=36, 60.0%, respectively) with no major difference. **Table 1**, the association between the age of the woman and the Hb level is shown. No positive significant difference between the values was observed. In this study, the effect of certain risk factors of anemia on Hb levels was investigated. Thus, **Table 3** shows the prevalence of some risk factors among the investigated patients. Also, **Table 4** shows the mean Hb level in the blood of women with risk factors for anemia.

Table 1: Relationship between age of female and hemoglobin level

Age group years	Mean of Hb (g/dl) in pregnant	Standard deviation	Mean of Hb (g/dl) in non-pregnant	Standard deviation
17-27	8.0	±0.7	7.3	±1.2
28-38	9.0	±0.8	8.7	±0.6
39-49	9.6	±0.6	8.3	±1.1
50-60	Not included	-	5.7	±1.9
61-71	Not included	-	7.7	±1.5
72-82	Not included	-	7.8	±0.6

No significant difference between the Hb in pregnant and non-pregnant women by Student t-test.

Table 2: Prevalence of risk factors of anemia among anemic women

Risk factor of anemia	Pregnant women	Non-pregnant women
Heavy coffee and tea consumption	12	28
Breastfeeding	2	18
Vegetarians	2	1

Table 3: The association between hemoglobin level and risk factors of anemia

Risk factor of anemia	Mean of Hb (g/dl) in pregnant women	Standard deviation	Mean of (Hb g/dl) in non-pregnant women	Standard deviation
Heavy coffee & tea consumption	8.8*	±0.88	7.7*	±1.67
Breastfeeding	8.5	±0.78	8.1	±1.36
Vegetarian	7.3	±1.13	8	-

* Significant difference in the mean of Hb in g/dl of pregnant women who drink coffee and tea
and non-pregnant women who heavily drink coffee and tea by Student t-test.

This study also examined if all women included are pica patients or not and if those with pica have anemia or not. The findings showed that 16.0% of them exhibit pica (charcoal eaters) and have lower Hb levels than the non-pica women. Charcoal strongly reduces Hb levels, from 60 anemic women, four pregnant women are charcoal eaters during pregnancy with a mean of Hb (8.0 g/dl) and six non-pregnant with a mean of Hb (6.0 g/dl). **Table 4** shows the Hb level in charcoal eaters. The difference was found to be statistically significant (P=0.003). In addition, **Table 5** presents the distribution of some causes of bleeding among the patients.

Table 4: Effect of charcoal eating on haemoglobin level in Libyan women

Charcoal	Mean of Hb (g/dl) of pregnant women	Standard deviation	Mean of Hb (g/dl) of non-pregnant women	Standard deviation
Eater	8.0*	0.5	6.0*	±0.8
Non-eater	8.8	0.9	7.0	1.7

* Significant difference between Hb charcoal-eating pregnant women
and Hb charcoal non-eating women by Student t-test

Table 5: Distribution of bleeding in anemic women

Causes of bleeding	Pregnant cases	Non-pregnant cases
Heavy menstruation	0	35
Peptic ulcer	2	5
Ulcerative colitis	0	3
Chronic myeloid leukemia	0	1
Road traffic accident	0	3

Discussion

The present results reveal that younger mothers have lower Hb than the others. Similarly, Haidar and others [13] found that the overall prevalence of anemia in women is increasing at the age of 28 years and that iron deficiency anemia was higher among younger mothers than older mothers. This might be due to malnutrition or heavy menstruation. Moreover, Hb level is affected by other risk factors which can lead to a decrease of iron absorption such as heavy coffee and tea consumption or calcium by the patient. It has been found that an hour time interval between a meal containing iron and the consumption of tea attenuates the inhibitory effect on iron absorption. Tea is a potent inhibitor of non-heme iron absorption [14, 15]. In the study performed by Morck and others [16], a cup of coffee reduced iron absorption from a red meat meal by 39.0% as compared to a 64.0% decrease with tea, which is known to be a potent inhibitor of iron absorption. No decrease in iron absorption occurred when coffee was consumed one hour before a meal, but the same degree of inhibition as with simultaneous ingestion was seen when coffee was taken one hour later. Heme iron from meat is more readily absorbed by the body, mainly because, unlike plant-based sources of iron, it does not depend on the presence of vitamin C for absorption [17]. Pica is an eating disorder, defined by long-term ingestion of non-nutritive substances [18]. The current study showed that pica women have lower Hb levels than non-pica women. Similarly, in U.S. pregnant women, pica was associated with low iron status across gestation. Women of childbearing age develop iron-deficiency anemia because of heavy bleeding during their periods. In this study, we compare the most common causes of bleeding and anemia among the participating patients. Thus, it indicates that heavy menstruation is a strong risk factor for anemia in non-pregnant females. However, bleeding is rarely found in pregnant women with anemia.

Conclusion: Anemia in Libyan women is common among pregnant women and intensifies with increasing the age of females. In pregnant and non-pregnant women, there are risk factors that co-exist with anemia, and the CBC data are affected by factors such as breastfeeding, pica behavior, bleeding, coffee and tea consumption, and vegetarians.

References

1. McPherson RA, Pincus MR (2021) Henry's clinical diagnosis and management by laboratory methods. 24th ed. 1618. Elsevier press. ISBN: 978-0-323-29568-04.
2. Horowitz KM, Ingardia CJ, Borgida AF (2013) Anemia in pregnancy. Clinical in Laboratory Medicine. 33 (2): 281-291. doi: 10.1016/j.cll.2013.03.016
3. McLean E, Cogswell M, Egli I, Wojdyla D, de Benoist B (2009) Worldwide prevalence of anaemia, WHO Vitamin and Mineral Nutrition Information System, 1993-2005. Public Health Nutrition. 12 (4): 444-454. doi: 10.1017/S1368980008002401
4. Munro MG, Mast AE, Powers JM, Kouides PA, O'Brien SH, Richards T, Lavin M, Levy BS (2023) The relationship between heavy menstrual bleeding, iron deficiency, and iron deficiency anemia. The American Journal of Obstetrics and Gynecology. 229 (1): 1-9. doi: 10.1016/j.ajog.2023.01.017
5. Knight K, Wade S, Balducci L (2004) Prevalence and outcomes of anemia in cancer: A systematic review of the literature. The American Journal of Medicine. 116: 7A: 11S-26S. doi: 10.1016/j.amjmed.2003.12.008
6. Sculco D, Bilgrami S (1997) Pernicious anemia and gastric carcinoid tumor: case report and review. The American Journal of Gastroenterology. 92 (8): 1378-1380. PMID: 9260813.
7. Alper BS, Kimber R, Reddy AK (2000) Using ferritin levels to determine iron-deficiency anemia in pregnancy. Journal of Family Practice. 49 (9): 829-832. PMID: 11032208.
8. Howard MR, Hamilton PJ (2013) Haematology: An illustrated colour text. Churchill Livingstone. Elsevier press. ISBN: 978-0-7020-5139-5.
9. Hamilton RJ (2015) Tarascon Pocket Pharmacopoeia 2015 Deluxe Lab-Coat. 2016th Edition. Jones & Bartlett Learning. 217. ISBN: 9781284057560.

10. Ansari SA, Boker RA, Alsaid MS, Sherif RF, Sherif FM (2022) Analysis of the association of vitamin D_3, hemoglobin and ferritin with special respect to Libyan patients. Mediterranean Journal of Pharmacy and Pharmaceutical Sciences. 2 (4): 1-5. doi: 10.5281/zenodo.7479667

11. World Medical Association Declaration of Helsinki (2013) Ethical principles for medical research involving human subjects. Taylor & Francis: Abingdon, UK. Journal of the American Medical Association. 310 (20): 2191-4. doi: 10.1001/jama.2013.281053

12. Shu G, Lu H, Du H, Shi J, Wu G (2013) Evaluation of Mindray BC-3600 hematology analyzer in a university hospital. International Journal of Laboratory Hematology. 35 (1): 61-69. doi: 10.1111/j.1751-553X.2012.01464.x

13. Haidar J, Muroki NM, Omwega AM, Ayana G (2004) Malnutrition and iron deficiency in lactating women in urban slum communities from Addis Ababa, Ethiopia. East African Medical Journal. 80 (4): 191-194. doi: 10.4314/eamj.v80i4.8640

14. Hallberg L, Rossander L (1982) Effect of different drinks on the absorption of non-heme iron from composite meals. Human Nutrition. Applied Nutrition. 36 (2): 116-123. PMID: 6896705.

15. Hallberg L, Rossander-Hulthen L, Brune M, Gleerup A (1993) Inhibition of haem-iron absorption in man by calcium. The British Journal of Nutrition. 69 (2): 533-540. doi: 10.1079/bjn19930053

16. Morck TA, Lynch SR, Cook JD (1983) Inhibition of food iron absorption by coffee. The American Journal of Clinical Nutrition. 37 (3): 416-420. doi: 10.1093/ajcn/37.3.416

17. Siegenberg D, Baynes RD, Bothwell TH, Macfarlane BJ, Lamparelli RD, Car NG, MacPhail P, Schmidt U, Tal A, Mayet F (1991) Ascorbic acid prevents the dose-dependent inhibitory effects of polyphenols and phytates on nonheme-iron absorption. The American Journal of Clinical Nutrition. 53 (2): 537-541. doi: 10.1093/ajcn/53.2.537

18. Lumish RA, Young SL, Lee S, Cooper E, Pressman E, Guillet R, O'Brien KO (2014) Gestational iron deficiency is associated with pica behaviors in adolescents. The Journal of Nutrition. 144 (10): 1533-1539. doi: 10.3945/jn.114.192070