International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Impact Factor (2012): 3.358

Prevalence of Anemia Levels in a Sample of University Female Students

Shadia Mohamed[1], Samia Sweilem[2]

University of Bahri[1]
University of Hail[1, 2]

Abstract: ***Purpose: Anemia is considered a severe public health problem by World Health Organization when anemia prevalence is equal to or greater than 40% in the population. The purpose of this study was to determine the anemia prevalence with the associated factors in female students at University of Hail. Objectives: the aim of this study is to identify the Prevalence of anemia levels and its predisposing factors in female students at University of Hail. Concerning the lack of information available on anemia on Hail/KSA, the present study was designed to identify the prevalence of anemia among female students at university of Hail. Material and Method: (168 female) student were interview to collect information on economic status, age, dietary intake. In addition, self weight and height, Blood hemoglobin was measured. Results: The average age of the students ranged from 18-45 years, Height 146-171, weight 15.2-40.8, Hb 8.8-15.7 mg/dl. There are significant relationship between anemic group and test of Hb. before, family history, awareness about the causes of anemia, fatigue, numbness, coldness in hands & feet (P-value 0,010, 0,003, 0, 016, 0.013, 0.015). Conclusion: There is case of anemia at university of Hail need attention from the decision maker at university and community level.***

Keyword: Anemia, Health, Nutrition Education, Dietary Intake, Blood hemoglobin, Hail.

1. Introduction

Anemia is a condition in which a deficiency in the size or number of erythrocytes or the amount of hemoglobin (composed of heme) limits the exchange of oxygen and carbon dioxide between the blood and the tissue cells. Classification is based on cell size-macrocytic (large), normocytic (normal), and microcytic (small)-and on hemoglobin content-hyprochromic (pale color) and normochromic (normal color) [1].

Most anemia's are caused by a lack of nutrients required for normal erythrocyte synthesis, principally iron, vitamin B12, and folic acid. Others result from a variety of conditions such as hemorrhage, genetic abnormalities, chronic disease states, or drug toxicity. The anemia that result from an inadequate intake of iron, protein, certain vitamins (B12, folic acid, pyridoxine, and ascorbic acid), copper, and other heavy metals are frequently called nutritional anemia.[1] Anemia was defined according to the new WHO cut-off levels for hemoglobin as: blood hemoglobin <11.5 g/dl for the 5-11 years boys and girls; <12.0 g/dl for 12-14 years boys and girls; <12.0 g/dl for 15+ years girls and <13.0 g/dl for 15+ years boys.[2]

1.1 Iron Deficiency Anemia

Iron deficiency anemia is characterized by the production of small (microcytic) erythrocytes and a diminished level of circulating hemoglobin. This microcytic anemia is actually the last stage of iron deficiency, and it represents the end point of a long period of iron deprivation [3].

1.1.1 Pathophysiology

There are many possible causes of iron deficiency anemia. The condition can arise from (a) inadequate iron intake secondary to a poor diet (such as a vegetarian lifestyle with insufficient heme iron); (b) inadequate absorption resulting from diarrhea, intestinal disease such as celiac disease, (c) inadequate use secondary to chronic gastrointestinal disturbances; (d) increased iron requirement for growth of blood volume, which occurs during infancy, adolescence, pregnancy, and lactation; (e) increased excretion because of excessive menstrual blood (in females).

hemorrhage from injury; or chronic blood loss from a bleeding ulcer, bleeding hemorrhoids, ulcerative colitis; or (f) defective release of iron from iron stores into the plasma and defective iron use owing to a chronic inflammation or other chronic disorder.[4] With few exceptions iron deficiency anemia in male adults is the result of blood loss. Large losses of menstrual blood can cause iron deficiency in women, many of whom are unaware that their menses are unusually heavy.[5]

1.1.2 Medical Nutrition Therapy

In addition to iron supplementation, attention should be given to the amount of absorbable dietary iron consumed. A good source of iron contains a substantial amount of iron in relation to its calorie content (high nutrient density) and contributes at least 10% of the U.S. recommended dietary allowance GDA) for iron. Liver; kidney; beef; dried fruits; dried peas and beans; nuts; green leafy vegetables; and fortified whole-grain breads, muf6ns, cereals, and nutrition bars are among the foods that rank highest in iron content . It is estimated that 1.8 mg of iron must be absorbed daily to meet the needs of 80% to 90% of adult women and adolescent males and females. Because typical Western diets generally contain 6 mg/1000 kcal of iron, the bioavailability of iron in the diet is clearly more important in correcting or preventing iron deficiency than the total amount of dietary iron consumed.[6]

1.1.3 Bioavailability of Dietary iron

The form of iron in the diet also influences absorption. Heme iron (about 15% absorbable),present in meat, fish, and poultry (MFP factor), is much better absorbed than non heme iron, which can also be found in MFP, as well as in eggs, grains, vegetables, and fruits. Taken with meals, tea, and coffee can reduce iron absorption by 50% through the formation of insoluble iron compounds with tannin. Iron in egg yolk is poorly absorbed because of the presence of phowitin. In summary to maximize iron absorption and prevent iron deficiency anemia, one should (a) improve food choices to increase total dietary iron intake; (b) include a source of vitamin C at every meal; (c) include heme containing MFP at every meal, if possible; and (d) avoid drinking large amounts of tea or coffee with meals. The Dietary Guidelines for Americans, 2005, recommend that women of childbearing age who may become pregnant eat foods high in heme-iron and consume iron-rich plant foods or iron-fortified foods with an enhancer of iron absorption (i.e., vitamin C-rich foods).[7]

1.2 Pernicious and other Vitamin B1 Deficiency Anemia

1.2.1 Pathophysiology

Pernicious anemia is a megaloblastic macrocytic anemia caused by a deficiency of vitamin B12. Most commonly the vitamin deficiency is secondary to a lack of intrinsic factor (IF), a glycoprotein in the gastric juice that is necessary for the absorption of dietary vitamin B12.[8]

1.2.2 Medical Nutrition Therapy

A high-protein diet (100kg of bodyweight) is desirable both for liver function and for blood regeneration. Because green leafy vegetables contain both iron and folic acid, the diet should contain increased amounts of these foods. Liver should be included frequency because it carries a good supply of iron, vitamin B12, folic acid, and other important nutrients. Meats (especially beef and pork), egg, milk, and milk products are particularly rich in vitamin B12.[9]

For those individuals prescribed metformin for treatment of diabetes, 10% to 30% have reduced vitamin B12 absorption. Metformin negatively affects the calcium dependent membrane and the B12-intrinsic factor complex by decreasing the absorbability by the ileal cell surface receptors. Increased intake of calcium has been shown to reverse vitamin B12 malabsorption. The Dietary Guidelines for Americans, 2005, recommend that people over age 50 consume vitamin B12 in its crystalline form (i.e., fortified cereals or supplements) to overcome the effects of atrophic gastritis. The RDA for adult men and women is 2.4 mcg daily.[8,9]

1.3 Folic Acid Deficiency Anemia

1.3.1 Pathophysiology

Acid deficiency anemia is associated with tropical sprue, can affect pregnant women, and occurs in infants born to mothers with folic acid deficiency. Folic acid deficiency in early pregnancy can also result in an infant with a neural tube defect. Prolonged inadequate diets, faulty absorption and use of folic acid, and increased requirements resulting from growth are believed to be the most frequent causes.[9]

1.3.2 Medical Nutrition Therapy

After the anemia is corrected, the patient should be instructed to eat at least one fresh, uncooked fruit or vegetable or to drink a glass of fruit juice daily. One cup of orange juice supplies about 135 mcg of folic acid. Fresh, uncooked fruits and vegetables are good sources of folate because folate can easily be destroyed by heat. Fortification of grains with folic acid, required by the Food and Drug Administration in January 1998, is an important addition of folate to the American diet. The Dietary Guidelines for Americans, 2005, recommend that women of childbearing age who may become pregnant and those in their first trimester of pregnancy consume adequate synthetic folic acid (from fortified foods and supplements) in addition to consuming a variety of foods containing folate. The RDA for adults is 400 mcg daily. (10)

1.4 Other Nutritional Anemia

1.4.1 Copper – Deficiency Anemia

Copper and other heavy metals are essential for the proper formation of hemoglobin. Ceruloplasmin, a copper containing protein, is required for normal mobilization of iron from its storage sites to the plasma. In a copper deficient state, iron cannot be released, leading to low serum iron and hemoglobin levels, even in the presence of normal iron stores. Other consequences of copper deficiency suggest that copper proteins are needed for use of iron by the developing erythrocyte and for optimal functions of the erythrocyte membrane. The amounts of copper needed for normal hemoglobin synthesis are so minute that they are usually amply supplied by an adequate diet.[11]

1.4.2 Anemia of Protein-Energy Malnutrition

Protein is essential for the proper production of hemoglobin and red blood cells. Because of the reduction in cell mass and thus oxygen requirements in protein-energy malnutrition (PEM), fewer red blood cells are required for oxygenate the tissue. Because blood volume remains the same, this reduced number of red blood cells with a low hemoglobin level (hypochromic, normocytic anemia), which can mimic an iron deficiency anemia, is actually a physiologic (non harmful) rather than harmful anemia. In acute PEM, the loss of active tissue mass may be greater than the reduction in the number of red blood cells, leading to polycythemia. The body responds to this red blood cell production, which is not a reflection of protein and amino acid deficiency but of an oversupply of red blood cells. Iron released from normal red blood cell destruction is not reused in red blood cell production but is stored, so that iron stores are often adequate. Iron deficiency anemia can reappear with rehabilitation when red blood cell mass expands rapidly. The anemia of PEM may be complicated by deficiencies of iron and other nutrients and by associated infections, parasitic infestation, and malabsorption. A diet lacking in protein is usually deficient in iron, folic acid, and, less frequently, vitamin B12. The nutrition counselor plays an important role in assessing recent and typical dietary intake of these nutrients.[12]

1.4.3 Sideroblastic Pyridoxine-Responsive Anemia

Sideroblastic anemia has four primary characteristics: (a) microcytic and hypochromic red blood cells; (b) high serum and tissue iron levels (causing increased transferrin saturation); (c) the presence of an inherited defect in the formation of 8-aminolevulinic acid synthetase, an enzyme involved in heme synthesis(pyridoxal-5-phosphateis necessary in this reaction); and (d) a buildup of iron-containing immature red blood cells (sideroblasts for which the anemia is named). Unlike the familial sideroblastic anemia just mentioned, acquired sideroblastic anemias such as those attributable to drug therapy (isoniazid, chloramphenicol), copper deficiency hypothermia, and alcoholism are not responsive to vitamin B6 (pyridoxine administration).[13]

1.4.4 Vitamin E –Responsive anemia

Hemolytic anemia occurs when defects in red blood cell membranes lead to oxidative damage and eventually to cell hemolysis. Vitamin E, an antioxidant, is involved in protecting the membrane against oxidative damage, and one of the few signs noted in vitamin E deficiency is early hemolysis of red blood cells.[14]

2. Results

Table No. 1: Mean Age, BMI and Hemoglobin of the study population

Variables	*N*	*Minimum*	*Maximum*	*Mean*	*Std. Deviation*
Age	168	18.00	45.00	21.12	**2.68**
Height	168	146.00	171.00	1.58	**5.26**
Weight	168	36.50	115.50	60.69	**14.59**
BMI	168	15.29	40.81	24.20	**5.28**
Hemoglobin	168	8.80	15.70	12.57	**1.36**
Haemtocrit	168	26.00	46.00	36.93	**4.06**

Table No.1 Represents the mean age are 21.12, height 1.58, Weight 60.69, BMI 24.20, Hemoglobin 12.57 and Haemtocrit 36.93, for the respondents with corresponding Standard Deviation, 2.68, 5.26 ,14.59, 5.28, 1.36, and 4.06 respectively. According to these result the BMI is moderately high which indication to overweight between the study populations.

Table No. 2: General Characteristics of the study population

Characteristics	*Variables*	*Frequency*	*%*
Economic Status	Middle Income Group	23	13.7
	Middle-High Income Group	113	67.3
	High Income Group	32	19.0
Marital Status	Single	148	88.1
	Married	20	11.9
Occupational Status	Academic	164	97.6
	Administrative	4	2.4
Exercise	Yes	125	74.9
	No	42	25.1
Presence of other diseases	Yes	27	16.2
	No	140	83.8

Table No. 2 Shows the general characteristics of the corresponding. 67.3% with meddle-High income, 88.1% unmarried, 97.6% are students, 83.8% not complaining from other diseases comparing with anemia.

Table No. 3: Knowledge about anemia causes and consequences

Variables		*Frequency*	*%*
Anemia effect on education performance	Yes	66	41.2
	No	22	13.8
	not know	72	45.0
Balanced diet imp for curing anemia	Yes	114	69.9
	No	13	8.0
	not know	36	22.1
Malnutrition result in anemia	Yes	100	61.7
	No	7	4.3
	not know	55	34.0
Copper, zinc deficiency as cause of anemia	Yes	31	19.1
	No	4	2.5
	I do not know	127	78.4
copper presence imp for iron absorption	Yes	21	13.0
	No	5	3.1
	I do not know	135	83.9

Table No.3 Shows the Knowledge about anemia and consequences of the corresponding. 45.0 % do not know a that Anemia effect on education performance, 69.9 % agree about the important of balanced diet curing anemia, 61.7 % agree about Malnutrition result in anemia , 78.4 % do not know about Copper, zinc deficiency as cause of anemia, 83.9 % do not know about the copper presence important for iron absorption. Poor knowledge about the causes and consequences of anemia indicated.

Table No. 4: Anemia Group Distribution in the study group

Groups	*Variables*	*Frequency*	*%*	*Hb/mg/dl)*
Anemia Groups	Moderate Anemic Group	20	11.9	(≥ 8-10.9
	Mild Anemic Group	29	17.3	(≥ 11-11.9
	Non Anemic Group	119	70.8	(≥ 12

Table No. 4 Presents the Distribution of Anemia Group in the study population which shows that 11.9 % with Moderate Anemia, 17.3 % with Mild Anemia, 70.8 % have No Anemia. Moderate anemia (≥ 8-10.9 mg/dl)(N=18), Mild anemia (≥ 11-11.9mg/dl) (N=29), Non-Anemia (≥ 12 mg/dl)(N=106). Moderate and mild anemia indicate that 29.2% of the respondents considered as anemic cases Anemia was defined according to the new WHO cut-off levels for hemoglobin as: blood hemoglobin <12.0 g/dl for 15+ years girls and <13.0 g/dl for 15+ years boys.[2]

Table No. 5: Anemia Groups and Signs and Symptoms

Signs and Symptoms		*Anemia Groups*				Chi-Square(p value)
		Anemic Group		*Non Anemic Group*		
		Frequency	*%*	*Frequency*	*%*	
Skin Pallor	Yes	12	27.9	22	21.8	0.627
	No	31	72.1	79	78.2	(0.428)
Fatigue	Yes	19	45.2	25	24.3	6.205
	No	23	54.8	78	75.7	(0.013)*
Palpitation	Yes	7	17.1	8	8.0	2.518
	No	34	82.9	92	92.0	(0.113)
Numbness/coldness in hands or feet	Yes	8	19.5	6	6.0	5.936
	No	33	80.5	94	94.0	(0.015)*
Low RBC Count	Yes	4	9.8	7	7.0	0.307
	No	37	90.2	93	93.0	(0.579)
Appetite	Good	36	73.5	100	84.7	2.912
	Poor	13	26.5	18	15.3	(0.088)

*Significant

Table No. 5 Shows the signs and symptoms for the study groups. Which indicates significant relationship between fatigue and sign of anemia and anemic group(P value 0,013). Also there is significant relationship between Numbness/coldness in hand or feet and anemic group(P value 0,015).

Table No. 6: Anemia Groups , Self and Family History

Self/Family History		*Anaemia Groups*				*Chi-Square (p value)*
		Anaemic Group		*Non Anaemic Group*		
		Frequency	*%*	*Frequency*	*%*	
test hemoglobin before	Yes	12	26.1	10	8.6	9.222 (0.010)*
	No	34	73.9	106	91.4	
Usual Menstruation Cycle	≤ 4 days	28	57.1	65	55.6	0.035 (0.851)
	≥ 5 days	21	42.9	52	44.4	
Family history for anemia	Yes	23	50.0	30	25.9	8.718 (0.003)*
	No	23	50.0	86	74.1	
Are you aware of causes of anemia	Yes	17	37.0	22	19.0	5.833 (0.016)*
	No	29	63.0	94	81.0	

*Significant

Table No. 6 Represents the Anemic group and family history. There is significant relationship between testing hemoglobin (P-value 0,010), family history with anemia (P- value 0,003), Knowledge about the causes of anemia(p-value 0,016) and the anemic, non-anemic group. There is no relation between duration of menstruation cycle and anemic, non anemic group.

3. Conclusion

The present study revealed that anemia is a moderate public health problem among students at university of Hail

There are cases of anemia at university of Hail need attention from the decision maker at university and community level.

4. Recommendation

1. Nutrition education programs should be conducted at university of Hail to highlight the risk factors of anemia.
2. Students with family history of anemia should be screened for anemia and treated if indicated.
3. Further investigation about type of anemia between students at university of Hail should be carryout.

References

[1] http://informahealthcare.com/doi/abs/10.1080/09637480220164370
[2] Adams PC et al: Hemochromatosis and iron-overload screening in a racially diverse population, N Eng l J Med 352:17 69, 2005.
[3] Jiang R et al: Body iron stores in relation to risk of Type 2 Diabetes in a pregnancy healthy women, J AMA 291:711,2004.
[4] Fuchs G J et al: Nutritional factors and thalassanemia major, Arch Dis. Child 74:224, 1996.
[5] Herbert V, Loss of recent memory (where in the parking lot is my car? etc) in persons age >50 is often unrecognized subtle B12deficienry,producing inadequate synthesis of new brain cells, but no anemia F, ASEBJ l5(2,Part I):A59,2 001a.
[6] Herbert V, Vitamin B12In Bowman B A, Russell R &[, editors: Present knowledge in nutrition, ed. 8, Washington, D C, 2001b, International Life Sciences Institute Press.
[7] Rimm EB et al: Folate and vitamin 86 from diet and supplements in relation to risk of coronary heart disease among women, J Am Med Assoc, 7 9:359,1998.
[8] Herbert V et al: Low holotranscobalamin is the earliest serum marker for subnormal vitamin B12 (cobalamin) absorption in patient with AIDS, Am J Hematol. 34:132, 1990.
[9] Herbert V et al: Serum ferritin iron, a new test, measures human body iron stores unconfounded by inflammation, Stem Cells 15:291,1997.
[10] Buchowski MS et al: Equation to estimate resting Energy expenditure in adolescent with sickle cell anemia, A m J Clin. Nutr. 76 : 1335 , 2002.
[11] Cook JD, Reddy MB: Effect of ascorbic acid intake on non heme iron absorption from a complete diet, Am J Clin Nutr. 73:93, 200l.
[12] Rimm EB et al: Folate and vitamin 86 from diet and supplements in relation to risk of coronary heart disease among women, J Am Med Assoc, 7 9:359,1998.
[13] Shaheen N J et al: Iron overload gene linked to colon cancer rising. I J Nat1 Cancer Inst 95:154,2 003.

[14] http://www.biomedcentral.com/1471-2458/10/329
[15] R. P. Wildman and coauthors, Appropriate body mass index and waist circumference cutoffs for categorization of overweight and central adiposity among Chinese adults, American Journal of Clinical Nutrition 80 (2004): 1129-1136
[16] http://informahealthcare.com/doi/abs/10.1080/09637480220164370

Author Profile

Shadia Mohamed Idris received the B.Sc., M.Sc. &PhD degrees in Family Science from Ahfad & Khartoum University in 1998, 1997 and 2000, respectively. During 1998-2011, she works at Ministry of health and University of Juba & university of Bahri. Now on secondment at university of Hail/ Saudi Arabia.

Samia Sweilem Alrashidi is working with University of Hail,/KSA, B.Sc.0n clinical nutrition.