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Anemia in North of Iran (South-east of Caspian Sea)

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Abstract: The main purpose of this study was set up to determine iron deficiency and anemia due to iron deficiency among the women in villages around of Gorgan. The comparison of three groups (Fars-native, Turkman and Sistanee) that living in this area and comparison of pregnant and non-pregnant about hematological indexes are other objectives of this study. By random-clustering method were chosen 415 women of 18-35 years old in 20 villages of Gorgan. Gorgan district located in north of Iran and south-east of Caspian sea. In the pregnant women, serum Iron less than 30 μg dL^{-1}, Hemoglobin (Hb) less than 11 g dL^{-1}, transferrin saturation (T.S) less than 16% were be consider as anemia point and in non-pregnant women, this point is the serum iron less than 40 μg dL^{-1}, Hb less than 12 g dL^{-1} and TS less than 16%. The prevalence of Iron Deficiency (ID), Anemia and Iron Deficiency Anemia (IDA) were 35.6% (149), 25.8% (107) and 13.5% (56), respectively. Positive correlation exist between serum Iron and Hb ($p<0.0001$, $r = 0.335$), HCT ($p<0.01$, $r = 0.1581$), MCH ($p<0.01$, $r = 0.1661$) and MCHC ($p<0.001$, $r = 0.262$). The prevalence of ID in Fars-native, Turkman and Sistanee women were 33.6, 47.6 and 26.2%, respectively. The rate of anemia on the same women were 27.7, 18.75 and 22.33% and IAD were 15.6, 11.9 and 11.3%, respectively. χ^2-test showed a meaningful difference in regard to ID and anemia among the three groups of women ($p<0.005$). A statistical significant correlation was seen between Hb and MCHC ($r = 0.467$, $p<0.001$). In pregnant women, the prevalence of the anemia on the basis of serum iron index, T.S and Hb were seen 24.2, 42.4 and 18.2% , respectively, versus non-pregnant women were 21.2, 34.55 and 20.98%. In summary, can be concluded that the prevalence of anemia its characteristic also is one of the women nutritional problems in the villages around the Gorgan and it is different among the three groups of women and in Fars-native is higher than other groups. Too, anemia is a nutritional problem in pregnant women.

Key words: Anemia, iron, ethnicity, pregnancy, women, Iran

INTRODUCTION

Anemia is a human disorder being is facing since long time ago. Some studies predicate that anemia due to iron deficiency is 20% all over the world (Schumann *et al*., 1998). Anemia due to iron deficiency is more common and this is a true especially among the developing world (Stoltzfus, 2003). Anemia is seen predominantly among the women and especially those on fertility age. The main reasons of iron deficiency among young women are inadequate diet-especially protein deficiency- consequent pregnancies or strong bleeding during periodical cycle (Jarrah *et al*., 2007).

Iron deficiency anemia has side effects such as fatigue, general weakness, reduced ability to learn and low working capacity, social economical problems (Yehuda *et al*., 2006; Stoltzfus, 2003). For the women, on the fertility age whom on the same time doing some other works, they need further attention in this regard (Schaaf *et al*., 2000). Various studies indicate that factors such as ethnical, race, cultural, socioeconomic has got a strong correlation with anemia (Elshafei, 1988; Jarrah *et al*., 2007; Gompakis *et al*., 2007).

Epidemiological studies for determining prevalence rate of anemia have seldom performed on pregnant women and some studies show that the rate of anemia in pregnant and non-pregnant women is 51 and 35%, respectively. Childbearing age women generally suffer from anemia (Abdel *et al*., 2000). Women during fertility age are susceptible to anemia and requirement for iron and other nutrients (Almonte *et al*., 1999). With regard to, we carried out this study because of : 1- Iron deficiency as one of the main nutritional problem, 2-lack of any information about anemia and 3-residing various ethnic groups in this aria. Gorgan itself is a capital city of Golestan province located in the north of Iran and south-east of Caspian sea and most people are farmer. The main groups are Fars-native, Turkman and Sistanee, this three groups comprise its main population. The compare of anemia between pregnant and non-pregnant women is another objective in this study.

MATERIALS AND METHODS

This study is a descriptive and cross-sectional study and 415 sample populations were chosen with regard to earlier studies and WHO report (Deamer, 1989) and on the basis of 40% prevalence and accuracy of 0.2% and inaccuracy probability of less than 5%. The women has been in fertility age (18-35 years). The sample size were chosen by random cluster sampling from 20 villages out of 118 villages around of Gorgan. Each woman filled a questionnaire and blood sample collected from each one. The hematological (CBC) and biochemical tests some as Total Iron Binding Capacity (TIBC) and Serum Iron (S.Iron) were determined on the above blood samples. Using Counter 9000 and Spectrophotometer for hematology and biochemical tests, respectively. The terms used in this study are 1-Race or ethnicity is group of people having a special traditional. 2-Fars-native are group of people which originated from town of Gorgan (North-east of Iran) and resided in the villages around Gorgan. 3-Turkaman are a group of people in the this area rarely having family relation with other races other than Turkaman. 4-Sistanee are group of people immigrating from the province of Sistan and Baluchestan to Gorgan. 5-Iron deficiency (ID): when the transferrin saturation is less than 16.6 % Anemia: hemoglobin (Hb) less than 12 g dL^{-1}. When anemia is duo to the ID, it is recognized as iron deficiency anemia (IDA).

In the pregnant women, serum Iron less than 30 μg dL^{-1}, Hemoglobin (Hb) less than 11 g dL^{-1}, Transferrin Saturation (TS) less than 16% were be consider as anemia point and in non-pregnant women, this point is the serum iron less than 40 μg dL^{-1}, Hb less than 12 g dL^{-1} and TS less than 16%. The finding was analyzed using the software SPSS. For the comparison between different groups the t-test and χ^2 test were used. This study has been carried out during year 2000 in villages around of Gorgan. Gorgan itself is a capital city of Golestan province located in the north east of Iran and south of Caspian sea.

RESULTS

This study showed that the prevalence of ID was 35.6% and anemia is 25.8% and IDA was 13.5% in this area. Positive correlation exist between serum Iron and Hb ($p<0.0001$, $r = 0.335$), HCT ($p<0.01$, $r = 0.1581$), MCH ($p<0.01$, $r = 0.1661$) and MCHC ($p<0.001$, $r = 0.262$).

From 415 women under study 7.9% were pregnant and 70.5% were married. The mean age of the women in this study was 24.94. At the time of sampling, 33% of the pregnant and 8.4% of the non-pregnant women were using iron compound. The mean value for serum iron and MCHC index are the lowest among Turkaman. The mean of Hb of the same group was higher than other groups. t-test value between Fars-native and Turkman on base of Hb and between Fars-native and Sistanee on base of Hct and MCV and between Sistanee and Turkman on base of the serum iron and Hct showed a meaningful differences ($p<0.005$). Statistical correlation is significant between Hb and MCHC in Fars-native ($r = 0.475$, $p<0.005$), Turkaman ($r = 0.294$, $p<0.01$) and Sistanee ($r = 0.316$, $p<0.001$). The same correlation in Turkaman race is not strong as the others Table 1.

Among Turkaman the rate of IDA was higher comparing with the other two groups. The prevalence of anemia and IDA in Fars-native was higher than the other two groups χ^2 test shows a meaningful differences in regard to ID and anemia among three groups ($p<0.005$) Table 2.

Table 1: Mean and standard deviation (±SD) of blood indexes among three groups in villages of Gorgan

	Blood index						
Groups	MCHC (%)	MCH (PicG/dL)	MCV* (fl)	Hct** (%)	Hb** (g dL^{-1})	TIBC*** (μg dL^{-1})	S. Iron (μg dL^{-1})
Fars-native	32.32 (2.03)	26.79 (4.59)	84.13 (8.52)	38.47 (3.14)	12.42 (1.2)	333 (69.3)	70.8 (36.6)
Turkman	31.99 (2.2)	28.21 (3.83)	87.26 (7.4)	40.7 (4.04)	13.11 (1.49)	357 (71.99)	57.5 (36.8)
Sistanee	32.23 (1.28)	27.89 (2.91)	85.24 (9.15)	33.99 (4.22)	12.96 (1.3)	339 (66.7)	77.7 (33.8)
Total	32.2 (1.93)	27.42 (4.04)	85.88 (8.48)	39.48 (3.83)	12.76 (1.36)	341 (70.02)	68.5 (36.76)

*t-test is statistical significant between Fars-native and Sistanee group $p<0.05$,** t-test is statistical significant between Fars-native and Turkman group $p<0.05$, *** t-test is statistical significant between Turkman and Sistanee groups $p<0.05$

Table 2: The comparative of Iron Deficiency (ID), Anemia and Anemia+Iron Deficiency (AID) among three groups in villages of Gorgan

		Blood index								
		ID*			Anemia*			AID		
Group	F	F	(%)		F	(%)		F	(%)	
Fars-native	184	61	33.1	$p = 0.001$	60	27.7	$p = 0.01$	29	15.6	$p = 0.48$
Turkman	128	61	47.6		24	18.8		15	11.9	
Sistanee	103	27	26.2		23	22.3		12	11.3	
Total	415	149	35.9		107	25.8		56	13.5	

F = Frequency, * χ^2 test is statistical significant among three groups

Table 3: The prevalence rate of Anemia on base of Serum Iron (S. Iron) , Transferrin Serum (TS) and Hemoglobin (Hb) indexes between pregnant and non-pregnant women in villages of Gorgan

		Blood index								
		TS*			S. Iron*			Hb		
Status	F	F	(%)		F	(%)		F	(%)	
Pregnant	48	20	42.4	p = 0.338	12	24.2	p = 0.531	9	18.2	p = 0.711
Non-pregnant	361	125	34.5		76	21.2		76	20.98	

Miss = 6, F = Frequency,*Although anemia about TS and S. Iron in pregnant women is higher then non-pregnant but there is no significant

Table 4: Values of hematological indexes among pregnant and non-pregnant women in villages of Gorgan

		Blood index								
		MCHC (%)			MCH**(PicG/dL)			MCV**(FL)		
Status	F	Mean	SD		Mean	SD		Mean	SD	
Pregnant (1st Trimester)	21	32.25	1.99	p = 0.356	36.38	6.41	p = 0.005	87.44	5.07	p = 0.006
Pregnant *(2nd Trimester)	15	31.67	1.12		21.8	5.7		70.33	11.08	
Pregnant (3rd Trimester)	12	33.64	1.14		29.4	2.15		87.6	8.35	
Non-pregnant	361	32.24	1.19		27.65	3.18		85.43	8.4	

Miss = 6, F = Frequency , **t-test is statistical significant among four groups, *Values is less than other groups.

Table 5: The prevalence of Anemia on base of Transferrin Serum (TS), Serum Iron(S.Iron), Hemoglobin (Hb) at point of previous delivery number among women in Gorgan

		Blood index								
		TS*			S. Iron			Hb		
Previous No. of deliveries	F	F	(%)		F	(%)		F	(%)	
Non-delivery	151	64	42	p = 0.03	36	23.8	p = 0.11	35	23.2	p = 0.06
1-2 time delivery	135	38	28.1		22	16.3		30	22.2	
3 =< time delivery	125	48	38.4		25	28		42	33.6	

F = Frequency , *χ^2 test is statistical significant among three status

According to serum iron and TIBC, the rate of anemia in pregnant women is more than non-pregnant, but according to Hb value, the rate of anemia in pregnant women is less than non-pregnant women. There is no statistical difference between 2 groups Table 3.

The mean of MCH, MCV and MCHC in 2nd trimester is less than 1st and 3rd trimester in pregnant women. Also these value in non-pregnant women less than pregnant women Table 4.

The rate of the prevalence of anemia according to Trasnferin (TS) serum iron and Hb in pregnant women with three parous or more is higher than women with two parous or less. χ^2 test is statistical significant between two groups ($p<0.02$) Table 5.

DISCUSSION

A large number of women in rural of Gorgan have low hematological indexes same as serum iron, Hb, HCT,MCH and MCHC. Other studies (Stoltzfus, 2003; Kocak *et al*., 1995) showed like results. Prevalence of anemia and ID also were over. These indicators be evidence for a lock of trace elements especial iron in food basket. Others have these results (Kocak *et al*., 1995; Kilinc *et al*., 2002; Ahmed, 2000).

Some nutrients cause the variation in blood indexes: protein deficiency, lowering iron intake, Folic Acid and Vitamin B12 deficiency are some example. In these process ID accompanied with reduction of RBC diameter and folic acid and vitamin B12 related increasing RBC diameter. According to, different studies environmental factors such as improper nutrition the prevalence of parasitical and infectious diseases, ethnical and other racial factors unawareness can pave the way for not taking a proper amount of nutrient and consequently lead to different types of anemia (Hercberg *et al*., 2001; Piammogkal *et al*., 2006).

In present study the blood indexes such as Serum iron/Hb/MCV/MCHC/MCH/between the three race groups do not follow the same pattern. The mean serum iron and MCHC in Turkaman race are lower and the mean Hb and MCV are higher than other groups. Although more studies need to be done to find out the reason for the above, variation in the region but the studies done in other parts of world (Schaaf *et al*., 2000) show different blood index in some race groups. Liebman (1983) has done a research on blood index in 8 states of America (USA) and was found the following results: The mean Hb and Hct and TS were higher in black than white races.The other study (Pan and Habicht, 1991) showed the Hb

concentration in white race is over in spit of receiving adequate iron by the two groups. According to Iscacs study (Isaacs *et al*., 1986) the mean of MCV/MCH in the immigrant' Asian are lower than the European people. With regard to the above studies the variation in the blood indexes are due to the nutritional habit ethnical and racial factors.

The other findings from the present study are the prevalence of anemia, ID and AID among three groups (Fars-native, Turkaman and Sistanee). The χ^2-test show meaningful differences in regard to the prevalence of ID and anemia ($p<0.005$). This difference is not due to IDA. Turkaman women had the highest rate of ID and the lowest rate of anemia on the basis of Hb. Sistanee women from point of view of ID and IDA do not have a ideal status compare to other two groups (Fars-native and Turkaman). Similar studies are shown the different rate and prevalence of anemia among various races and ethnical groups in one region. Jasti study (Jasti *et al*., 2003) indicate the prevalence of anemia in British Asian and Chineas origins whom are immigrating to U.K comparing to European women are 3 and 2 times, respectively. The other study done in south of Turkey by Kocak *et al*. (1995) indicate the anemia rate among Arab are higher than either Turk or Kurd. Adekile and Yaregri (1997) carried out study in south-west of USA which show the rate of ID is lower in black compare to white race. There is not a proper study on the rate of anemia among Iranian ethnic. Sadeghepoor *et al*. (2001) carried out a study on the fertilized age women in North-east of Tehran and the results from this investigation indicated that 36.48% anemia was due to ID. In this present study there was a statistical correlation between Hb and MCHC ($p<0.05$) but there was not such correlation between the other indexes. Hershko *et al*. (1980) founds similar results in her study.

On the basis of this study and similar investigations, we could not determine for sure which one of the factors (either ethnical or environmental) have a definite roll in the blood indexes. The rate effectiveness of each of these factors can not be distinguished easily. It can be concluded from the findings of this study that Turkaman women from villages around Gorgan due to high rate of MCV probably facing more folic acid deficiency. ID is worse for the same group of women.

On base of results, the prevalence of anemia in pregnant women is more than the non-pregnant. Although high demand of iron to be established in pregnancy but high iron supplement intakes to recover this gap between two groups. Sadeghipour *et al*. (2001), Stevens (2000), Nestel *et al*. (1999) and Yasaii and Kimiagar (1989) in their study found similar results. Mean hematological Index such as MCHC, MCH and MCV among pregnant women less than non-pregnant women. These results were similar with Bartels *et al*. (1989).

The prevalence of anemia in women, that have primiparous, is less than multiparous and significant on base of TS index ($p<0.03$). Andert *et al*. (2006) don't have any differences in pair groups. Decrease of iron from tissue in last gestations, malnutrition and not sufficiency iron consumption are preparation factors for above problem.

In this study we observed mean of hematological indexes during 2nd trimester less than other groups in pregnant women. High demand to nutrient without intake iron supplement in 2nd trimester can be one of the important factor for this situation. Milman *et al*. (2000) and Byg *et al*. (2000) reported a positive correlation between hematological indexes during 2nd and 3rd trimester.

This finding suggests that anemia is one of the most nutritional problems in rural women in Gorgan district and this disorder among pregnant women is more than non-pregnant women. Multiparous is preparation factor for anemia. Serum iron status is better among Sistanee women than the other two groups of women. According to iron deficiency disorders in gestational period, we recommend that pregnant women that suffering from anemia, to intake the iron supplement. Future studies are required to determine the effective factors for this heterogeneity.

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