Research Article

Evaluation of anemia during pregnancy at Rusaifah Primary health care center in Makkah Al Mukarramah, Saudi Arabia

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Abstract

Background: Anemia is the most common medical disorder observed among pregnant women, its incidence being particularly high in many underdeveloped tropical countries where it remains a major contributing factor to maternal morbidity, and it is also associated with high perinatal mortality rates.

Objective: To evaluate the prevalence of anemia during pregnancy and its associated factors among pregnant females.

Materials and Methods: This is a cross-sectional primary health-care-based study, which included pregnant females attending antenatal care clinic at Rusaifah primary health care center in Makkah Al-Mukarramah, Saudi Arabia, during 2013–2014 through a checklist especially designed by the investigator.

Results: The prevalence of anemia was 28%, 49.5%, and 37% in the first, second, and third trimesters, respectively. Anemia was mostly of mild type and was significantly associated with age of the last child, age of pregnant women in the first trimester, and birth weight of the outcome child.

Conclusion: Anemia was found to be high in this study population and was associated with several factors. This indicates the necessity to improve the quality and quantity of food rich in iron for pregnant women through health education.

KEY WORDS: Anemia, pregnancy, prevalence, Saudi Arabia

Introduction

Anemia was defined in different studies differently. Hemoglobin of less than 10.5 g/dl was a criterion of anemia during pregnancy by *Quality Assurance in Primary Health Care Manual*,[1] less than 11 g/dl by the World Health Organization (WHO),[2] and less than 10 g/dl by the US Preventive Service Task Forces.[3] Anemia is the most common medical disorder observed among pregnant women, its incidence being particularly high in many underdeveloped tropical countries where it remains a major contributing factor to maternal morbidity, and it is also associated with high perinatal mortality rates.[4]

The lowest normal hemoglobin in the healthy adult nonpregnant woman living at sea level is defined as 12 g/dl. In most published studies, the mean minimum hemoglobin in pregnancy was between 11 and 12 g/dl. The lowest hemoglobin observed in a carefully studied iron-supplement group was 10.44 g/dl.[5] The mean minimum acceptable hemoglobin to the WHO is 11 g/dl.[6]

The prevalence of anemia in childbearing age in Riyadh, Saudi Arabia (Hb <12 g/dL) was found to be 40%.[7]

Anemia is a significant maternal problem during pregnancy. Hemoglobin less than 11 g/dl should be investigated and treated to avoid blood transfusion and its related complications. During pregnancy, the blood volume increases by about 50%

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and the red blood cell mass by about 25%.[8] This physiologic hydremia of pregnancy will lower the hematocrit but does not truly represent anemia.[8]

Iron deficiency is responsible for about 95% anemia during pregnancy, reflecting the increased demand of iron. During the first half of pregnancy, iron requirement may not increase significantly and iron intake of 10–15 mg/day from food is sufficient to cover the basal loss of 1 mg/day. However, in the second half of pregnancy, iron requirements increase owing to an expansion of red blood cell mass and rapid growth of the fetus. Increased number of red blood cells and a higher hemoglobin mass require about 500 mg iron. The iron requirement of the fetus on average is 300 mg. Thus, the total amount of iron necessary over the course of a normal pregnancy is approximately 800 mg. This cannot be supplied in the diet, and iron supplementation is a must.[8]

Data published by the Food and Nutrition Board of the National Academy of Sciences show that pregnancy increases a woman's iron requirement to approximately 3.5 mg/day. This need can be met by iron supplements exceeding 40 mg/day of elemental iron.[9]

Symptoms of anemia during pregnancy may be vague, including pallor, easy fatigability, palpitations, tachycardia, and dyspnea. Angular stomatitis, glossitis, and koilonychias may be present in long-standing severe anemia.[8]

When there is anemia compensatory changes occur in the circulation in an attempt to maintain adequate tissue oxygenation. Severe anemia predisposes to infection, particularly during the puerperium, increases the risk of thromboembolism, and predisposes to decompensation in mothers with cardiac or respiratory diseases.[8]

It is responsible for one-fifth of the relatively high maternal death rate. It is also an important factor in delayed general physical recovery, especially after cesarean delivery and in women of high parity and/or low socioeconomic status.[10]

This study aimed at evaluation of anemia during pregnancy at Rusaifah primary health care center in Makkah Al-Mukarramah, Saudi Arabia.

Materials and Methods

A cross-sectional and analytical primary health-care-based study was implemented. It was conducted at Rusaifah primary health care center in Makkah Al-Mukarramah. Makkah is the most Holy City in Islam situated in the central Hijaz and is the center of annual pilgrimage from all over the world. The Rusaifah Family Medicine Postgraduate Training Center is covering four large catchment areas, Aumaljoud, Alzahraa, and Alqazaz.

All pregnant women attending antenatal care clinic at Al Rusaifah primary health care center during 2013–2014 constituted the study population.

The investigator visited the study area and goes in through the antenatal care cards and met the nurse and the doctor in charge of the antenatal care clinic. The investigator also visited the laboratory of the Rusaifah primary health care center and found that they were using F-820 semi-automated micro cell counter (Sysmex, Kobe, Japan) for hemoglobin assay of pregnant women. The investigator decided to classify anemia into mild, moderate, and severe degree. Dependent variable was anemia during pregnancy. Mild anemia was defined as hemoglobin of 9 to <10.5 g%, moderate anemia as hemoglobin 6.5 to <9 g%, and severe anemia as hemoglobin less than 6.5 g%. Independent variables were age, nationality, parity, husband occupation, birth weight of the outcome child, mode of delivery, body mass index (BMI), number of visits, age of last child, and weight gain during pregnancy. BMI was calculated by measured body weight in kilograms divided by the height in square meters. Normal BMI is 20–25 kg/m^2. Mild obesity was BMI of 27 to <30 kg/m^2 whereas moderate obesity was a BMI of 30–40 kg/m^2 and morbid obesity was a BMI of >40 kg/m^2. Low birth weight was defined as fetal weight of <2,500 g at birth.

Permission from higher authority was obtained to conduct this study at Rusaifah primary health care center. A checklist, especially designed by the investigator to cover all variables under study, was used for collecting data. The antenatal care cards were reviewed by the investigator, pooling the required information from the antenatal care cards (variables) to the checklist, and then made ready for coding and entry to a personal computer. Data were entered and analyzed using SPSS software, version 20. χ^2-Test, Fisher exact test, *t*-test, and analysis of variance were used for statistical analysis. *p*-Value of ≤0.05 was adopted for significance.

Results

Description of the Participants

The study included 308 pregnant women aged between 15 and 45 years with a mean age of 29 ± 6.77 years. Of the study group, 247 (80%) were Saudis, 24 (8%) were Arab, and 37 (12%) were non-Arab. Of 308 pregnant women, 110 (35.7%) were found to be from Bador area, 103 (33.4%) from Alzahraa area, 89 (29%) from Aumaljoud area, and 6 (1.9%) from Alqazaz area. The gravida in the study group was ranging from 1 to 18 with a median of 4, and a mean of 4.73 ± 3.23. Husband occupation was found to be high among 13 (14.2%), moderate among 127 (41.2%), and low among 168 (54.6%) of the studied group. BMI ranged from 15 to 48.5 with a mean of 27.5 ± 6. Low weight was observed in 24 (2.8%), normal weight in 130 (42.2%), mild obesity in 59 (19.2%), moderate obesity in 88 (28.5%), and severe obesity in 7 (2.3%). The birth weight of the delivered child was ranging from 2 to 4.5 kg with a mean of 2.8 ± 0.39 kg. The mode of delivery was reported by 266 (86.6%) to be spontaneous vaginal delivery and by 41 (13.4%) as cesarean delivery. Number of visits ranged between 2 and 13 with a mean visit of 6.73 ± 2.4, mode and median of 6. Total weight gain during pregnancy was ranging from 4 to 15 kg with a mean of 8.6 ± 2.3 kg.

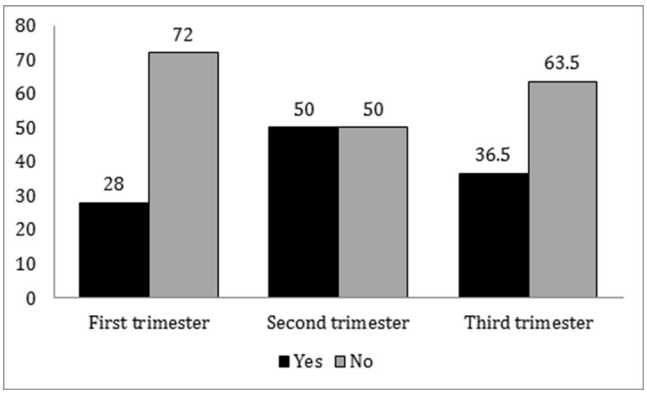

Figure 1: Prevalence of anemia during pregnancy.

Table 1: Degree of anemia in first, second, and third trimesters

	Mild (%)	Moderate (%)	Total (%)
First trimester (*N* = 276)	65 (23.6)	10 (3.6)	75 (27.2)
Second trimester (*N* = 290)	120 (41.4)	24 (8.3)	144 (49.7)
Third trimester (*N* = 263)	85 (32.3)	11 (4.2)	96 (36.5)

Table 2: Distribution of mean age of the last child among pregnant women with and without anemia in the three trimesters

	Mean age of the last child (months)		*p*-Value*
	Pregnant women with anemia	Pregnant women without anemia	
First trimester	14	23	<0.001
Second trimester	17	24	<0.009
Third trimester	18	24	<0.006

*χ^2 test.

Prevalence of Anemia during Pregnancy

Prevalence of anemia during pregnancy was found to be among 75 (28%) pregnant women in the first trimester, 144 (50%) in the second trimester, and 103 (36.5%) in the third trimester [Figure 1].

In the first trimester, mild anemia was seen in 65 (23.6%) and moderate anemia in 10 (3.6%). In the second trimester, mild anemia was seen in 120 (41.4%) and moderate anemia in 24 (8.3%). In the third trimester, mild anemia was seen in 85 (32.3%) and moderate anemia in 11 (4.2%) [Table 1].

Associated Factors

Age of the Last Child

The mean age of the last child among pregnant women with anemia in the first trimester was found to be lower, 14) ± 7.9 months compared to a mean age of 23 ± 12 months among nonpregnant women; this difference was statistically significant ($p < 0.001$). Similarly, in the second trimester, the mean age of the last child among pregnant women with anemia was found to be 17 ± 9.2 months compared to 24 ± 12 months among nonpregnant women ($p = 0.009$). And, in the third trimester, the mean age of the last child among pregnant women with anemia was found to be 18 ± 9.2 months compared to 24 ± 12 months among nonpregnant women ($p < 0.006$) [Table 2].

Table 3: Distribution of mean age of pregnant women with and without anemia in the three trimesters

	Mean age of pregnant women (years)		*p*-Value*
	Pregnant women with anemia	Pregnant women without anemia	
First trimester	29	28	<0.03
Second trimester	28	29	NS**
Third trimester	29	28.7	NS**

*χ^2 test; **Not significant ($p > 0.05$).

Age

The mean age of pregnant women with anemia in the first trimester was found to be 29 ± 7.6 years compared to 28 ± 6.5 years among those without anemia; the difference was statistically significant ($p < 0.03$). However, the mean age of pregnant women with anemia in the second trimester was found to be 28 ± 6.3 years compared to 29 ± 7.4 years among those without anemia. The mean age of pregnant women with anemia in the third trimester was found to be 29 ± 6.6 years compared to 28.7 ± 7 years among those without anemia; however, the difference was not significant [Table 3].

Birth Weight

The mean birth weight of the delivered children among pregnant women with anemia in the first trimester was found to be 2.5 ± 0.34 kg, whereas that of the delivered children among pregnant women without anemia was 2.9 ± 0.32 kg. The mean birth weight of the delivered children among pregnant women with anemia in the second trimester was found to be 2.6 ± 0.42 kg compared to the mean birth weight of the delivered children among those without anemia to be of 2.9 ± 2.8 kg. In the third trimester, the mean birth weight of the delivered children among pregnant women with anemia was 2.5 ± 0.34 kg compared to 3 ± 0.21 kg among those without anemia. These differences were statistically significant with a *p*-value of <0.0001.

Body Mass Index (Obesity)

In the first trimester of pregnancy, anemia was higher (31.3%) among pregnant women having normal weight compared to 24.5%, 26.4%, and 14.3% in those with mild, moderate, and severe obesity, respectively. Similar findings were observed in second and third trimesters; however, these differences were not statistically significant.

Gravidity

The number of pregnant women with anemia in the first trimester was 43 (25%) with a gravidity of 5 or less compared to 22.5% among women with gravidity >5. This difference was not statistically significant.

Mode of Delivery

In the first trimester, 34.3% pregnant women with anemia underwent cesarean delivery whereas 27.3% had spontaneous vaginal delivery.

In the second trimester, 48.7% pregnant women with anemia had cesarean delivery compared to 49.4% who had spontaneous vaginal delivery. In the third trimester, 36.8% pregnant women with anemia had cesarean delivery compared to 39.8% who had spontaneous vaginal delivery. The association of anemia in the first, second, and third trimesters with the mode of delivery was not statistically significant.

Number of Visits

In the first, second, and third trimesters of pregnancy, the number of visits was nearly equal for pregnant women with and without anemia.

Nationality

In the first trimester of pregnancy, the percentage of anemia was found to vary from one nationality to another; it was 27.2% for Saudis, 31.1% for Arab, and 26.7% for non-Arab. However, the difference was not significant. In the second trimester, the percentages of anemia were 38.3% for Saudis, 54.5% for Arab, and 52.8% for non-Arab, and the difference was not significant. In the third trimester, the percentage of anemia among pregnant women was also variable; it was 39.1% for Saudis, 30% for Arab, and 44.4% for non-Arab, and the difference was not significant.

Residency

The residency of pregnant women was not significantly associated with anemia in the first, second, and third trimesters.

Weight Gain

In the first trimester of pregnancy, the mean weight gain among pregnant women with anemia was 8.4 ± 2.5 kg, and the mean weight gain among those without anemia was 9 ± 2.2 kg. However, this difference was not significant. In the second trimester, the mean weight gain among pregnant women with anemia was 8.3 ± 2.5 kg, and the mean weight gain for those without anemia was 9 ± 2 kg. Again, this was not significant. In the third trimester, the mean weight gain among pregnant women with anemia was 8.1 ± 2.5 kg, and the mean weight gain among those without anemia was 9.2 ± 2.1 kg, with the difference being not significant.

Occupation of Husband

Husband's occupation was not significantly associated with anemia during first, second, and third trimesters.

Discussion

The present survey attempted to estimate anemia prevalence and identify its predictors among pregnant women attending training center in Makkah city, Saudi Arabia. Prevalence of anemia during pregnancy was found to be 28% in the first trimester, 50% in the second trimester, and 36.5% in the third trimester, which is in agreement with other similar studies.[11–18] However, it was higher than that reported in other studies.[19–24]

In this study, during the first trimester, mild anemia was seen in 23.6% pregnant women and moderate anemia in 3.6%; in the second trimester, mild anemia was seen in 41.4% and moderate anemia in 8.3%; and in the third trimester, mild anemia was seen in 32.3% and moderate anemia in 4.2% of them. A similar condition was observed in a study carried out in Pakistan, in which majority of the cases had mild anemia (75.0%) followed by moderate anemia (14.8%) and severe anemia (0.7%).[15] Similarly, reports from India in 2010 also showed the majority (50.9%) having moderate anemia followed by mild (30.17%) and severe (18.9%) anemia.[14,25] The high prevalence of anemia in the second trimester can be explained by the expansion of plasma volume compared with red cell volume causing progressive hemodilution up to about 30th–35th week, which may reduce the hemoglobin concentration mainly in the second trimester and in turn increase the prevalence of anemia in the second trimester.

The prevalence of anemia in the first and second trimesters was lower than the third trimester, which was probably due to the good hemoglobin before pregnancy. However, the prevalence was lower in third trimester owing to improvement in appetite, well treated anemia, and decreased physiological hemodilution.

The mean age of the last child of pregnant women was lower than that of nonpregnant women. This can be explained by the pregnancy not being planned and the mothers were not taking food rich in iron. Moreover, it seems that good spacing of nearly 2 years might play a protective role against anemia during pregnancy. This spacing may allow mothers to improve their nutritional status, which in turn will improve their hemoglobin in the next pregnancy. A study conducted in India also reported similar results.[25] The significant association of anemia with the older age in the first trimester in this study is in contrast to the literature. This might be due to certain food habits or lifestyle, which is more prevalent among older pregnant women.

The birth weight of children of mothers with anemia was significantly lower than that of mothers without anemia in all trimesters. This can be because the anemia can affect the birth weight of the delivered child and the weight will be lesser than that of child born to pregnant women without anemia. Thus, a strong correlation exits between anemia and weight of the delivered child, and it is expected that pregnant women without anemia will have a good outcome of birth weight of the delivered child. This finding is very well supported by the literature.[26–28]

Although it is more convincing that obese women will be less anemic because they eat more food that might contain more iron, the result of this study did not support such postulation.

In this study, insignificant association between anemia and gravidity was observed. This finding corroborates previous reports in Eastern Sudan, Nigeria, and Zaire[19,27,28] and is contrary to a report for the highland of Tanzania.[34] It was expected that anemia in pregnancy would tend to increase with rising number of children owing to repeated drain on the iron reserves. In fact, multiparity, especially when the pregnancies have occurred in quick succession, is traditionally regarded as a cause of anemia in pregnancy. However, this study found no consistent relationship between rising number of children and the incidence of anemia. Perhaps, following the experience gained from the first pregnancy and the consequent increased awareness and good diet, as well as increased interaction with other pregnant women at the antenatal clinic, might neutralize its effect. This study also failed to observe any relationship between prevalence of anemia and increasing gestational age, implying that all pregnant women were prone to anemia throughout the gestational period, thus early booking for antenatal care would serve as an important preventive measure in pregnancy. The same result was observed in a study conducted in India.[25] These results of anemia that was greater among gravida 5 or less was unexpected and this could be explained by that pregnant women of gravida 5 or less may have short spacing periods and this may reflect on the anemia they had.

Although not significant, this study showed that pregnant women who had cesarean delivery were found to have anemia more in the first trimester, whereas those who had vaginal deliveries had anemia more in their second and third trimesters. This might indicate that anemia in the second and third trimesters is less likely to end up with cesarean delivery compared to anemia in the first trimester.

In our study group, the number of visits is not significantly associated with presence of anemia and may be explained by the fact that 6.7 visits are ideal number for number of visits during pregnancy. Moreover, anemia might be more related to what happens in those visits rather than the number of visits alone.

The majority of pregnant women with anemia in the first and second trimesters of pregnancy was Arab whereas in the third trimester it was more among non-Arab. This may be because non-Saudi pregnant women are more susceptible to be anemic than Saudi pregnant women. This can also be explained by their low intake of food rich in iron, and probably less regular in their visits to the antenatal care unit.

In comparison to others,[12,24] who reported that anemia is more reported in rural and low social class areas, the women's residency was not significantly associated with their residency in this study. This can be explained by the fact that the number of pregnant women from Alqazaz area was less, and the pregnant women from Alqazaz and Bador area were not well compliance to their iron-containing food and their iron tablets. The two areas are more wealthy, modern, and civilized with a possibility of increased intake of food that is not containing enough iron.

The mean weight gain as expected was more among pregnant women without anemia in their first second and third trimesters. This can be explained by the fact that the pregnant women with anemia were not taking well-balanced diet.

Conclusion

Conclusively, the prevalence of anemia in Makkah was variable from one trimester to another, mainly found in the second trimester with variable degrees. Anemia was predominantly of mild degree and was found in the first and second trimesters.

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