Prevalence of anemia and associated risk factors among pregnant women in Sana'a, Yemen

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ABSTRACT

Objectives: Anemia in pregnancy is a serious public health problem in developing countries. The aim of this study was to determine the prevalence of anemia and associated risk factors among pregnant women in Sana'a, Yemen.

Materials and Methods: This cross-sectional study included 260 pregnant women attended some government and private hospitals in Sana'a from November 2021 to January 2022. Sociodemographic data were collected using structured questionnaires Blood samples were collected and analyzed for hemoglobin (Hb) concentrations using a hematology Sysmex analyzer. The data was analyzed using SPSS version 26 software. Descriptive, bivariate chi-square and logistic regression analyses were done. Results and discussion: The prevalence of anemia among pregnant women was 44.2%. The prevalence of mild, moderate and severe anemias were 18.8%, 25.0%, and 0.4%., respectively. Moderate anemia was the most common anemia. Risk factors associated with anemia were low family monthly income, the presence of health problems, and lack of supplements taken.

Conclusion: The prevalence of anemia was high and represents a severe problem among pregnant women. Identification of risk factors may help in the prevention and control of anemia.

CONTENTS

Introduction:

Anemia is a pathophysiological condition characterized by a lower in blood hemoglobin (Hb) level or the number of erythrocytes (RBCs) or defect in maturation of erythrocytes [1].

Anemia affects all age groups but is more prevailing in pregnant women and children [2]. Anemia in pregnancy defined as Hb less than 11 g/dL or in number of RBCs, which is associated with disabled capacity to transport oxygen. The severity of anemia was categorized into: mild

(Hb 10.0–10.9 g/dL), moderate (Hb 7.0–9.9 g/dL), and severe (Hb <7.0 g/dL) [3].

Globally in 2019, the prevalence of anemia was 36.5% in pregnant women. The prevalence in women of reproductive age was 29.9%, which equates to over half a billion women aged 15-49 years. Prevalence was 29.6% in non-pregnant women of reproductive age [4]. In Yemen, in 2019, the prevalence of anemia in pregnancy was 57.5%, according to the WHO global health observatory. In 2011, the prevalence of anemia in pregnancy was 36% [3]. Anemia is still wide-ranging, particularly in developing countries, despite works to decrease its prevalence [5], and can have serious health effects [6]. The prevalence of anemia among pregnant women aged 15 to 49 years decreased globally between 1995 and 2011 by 12%, from 43% to 38%, according to the WHO in 2014 [7].

The common cause of anemia in pregnancy is iron deficiency [8], particularly in low- and middle-income countries [9]. Approximately 50% of anemia cases among women and girls due to iron deficiency as a consequence of malnutrition, poverty and periodic blood loss during menstruation [10]. Other causes of anemia involve hemoglobinopathy, chronic diseases and infections, hookworm infestation, and deficiencies of nutritional elements such as vitamin B12 and folate [11, 12].

Anemia in pregnancy is companied with adverse effects on both mothers and babes. It includes an increased risk of hemorrhage, sepsis, maternal mortality, perinatal mortality, low birth weight, and decreased work capacity [13]. The risk of death among pregnant women with severe anemia is twice that of mothers without severe anemia [9] due to severe hemorrhage at delivery or postpartum [14] or complications due to anemia, such as heart failure [15]. In terms of fetal outcome, anemia increases the occurrence of perinatal morbidities such as prematurity due to spontaneous preterm birth and low birth weight [16]. In Yemen, which is one of the poorest and least developed countries in the Middle East, anemia represents a major challenge and a serious health problem that faces pregnant women. There were insufficient data

and information on the prevalence of anemia and associated factors among Yemeni pregnant women in Sana'a, Yemen. Therefore, an assessment of the extent of the problem and the factors responsible for it is needed. The aim of this study was to determine the prevalence of anemia and associated risk factors among pregnant women in Sana'a, Yemen.

Materials and methods

This cross-sectional study was done on a total 260 pregnant women aged between 18 and 44 years. They attended the obstetrics and gynecology clinics at Al-Thawrah, Al-Gumhori hospitals and private clinics in Sana'a, Yemen during the period from November 2021 to January 2022. Face-to-face interviews with participant respondents were employed to collect sociodemographic data using structured questionnaires. Two milliliters of venous-EDTA blood were collected from each participant and measured for hemoglobin (Hb) concentration using a hematology Sysmex analyzer.

Statistical analysis

The data were collected, encoded and accessed in SPSS version 26 for analysis. Descriptive, bivariate chi-square and multivariate logistic regression analyses were done. Descriptive analysis summarizes the sociodemographic data as mean, standard deviation, frequency, and percentages. Bivariate chi-square analysis was done to determine the significance of the associations between the variables. Multivariate logistic regression analyses were done, and adjusted odds ratios (AOR) and 95% confidence interval (CI) were calculated, and P-values less than 0.05 were considered statistically significant.

Results

1) **Prevalence and severity of anemia**

As shown in Table 1, we found that for 44.2% (n = 115) of the pregnant women who were anemic (Hb <11.0 g/dL), the mean± SD of Hb was 8.7 ± 1.8 with a range between 6.9 and 10.5 g/dL of blood, while for 55.8% (n = 150) of the pregnant women who were non-anemic (Hb ≥11.0 g/dL), the mean± SD of Hb was 12.8 ± 1.5 with a range between 11.3 and 14.3 g/dL of blood. The severity of anemia was categorized into three levels: mild (Hb 10.0–10.9 g/dL),

moderate (Hb 7.0–9.9 g/dL), and severe (Hb <7.0 g/dL). 18.8% (n = 49) of pregnant women had mild anemia, 25.0% (n = 65) had moderate anemia, and 0.4% (n = 1) had severe anemia.

Table 1: Prevalence and severity of anemia among pregnant women (n=260)

Characteristic	Frequency (n)	%
Anemic status		
Yes	115	44.2
No	145	55.8
Severity of anemia (n=260)		
Mild anemia (Hb 10–10.9 g/dL)	49	18.8
Moderate anemia (Hb 7.0–9.9 g/dL)	65	25.0
Severe anemia (Hb *<7.0* g/dL)	1	0.4

2) Sociodemographic characteristics

As shown in Table 2, about half (47.3%) of the pregnant women with an age range of 27 to 35 years attended the hospital, followed by those with ages ranging from 18 to 26 years at a rate of 33.5%, while the rest of them (19.2%) had ages ranging from 36 to 44 years. The majority of pregnant women (65.4%) came from the capital (Sana'a City), with the remaining 34.6% coming from other areas. Most of the pregnant women (57.7%) were housewives. Also, the majority of family members ranged from 1–5 persons, with a rate of 76.5%, while the rest of them were distributed among the other categories. For the households of the participants, we found that most pregnant women live in their own homes at a rate of 51.9%, while the rest of them (48.1%) rent. In regard to family monthly income, the majority of family respondents (65.0%) had a weak monthly income (less than 50,000 YR), 33.8% had a middle income, and 1.2% had a high income.

Table 2: Sociodemographic characteristics of the study participants (n=260)

Characteristic		Frequency (n)	%
Age	**18-26 years**	87	33.5
	27-35 years	123	47.3
	36-44 years	50	19.2
	Mean ±SD	29.0± 6.37	
Residence	**Sana'a**	170	65.4
	Other areas	90	34.6
Occupation	**Housewife**	150	57.7
	Student	40	15.4
	Government or private employed	70	26.9
Family size	**1-5 persons**	199	76.5
	6-9 persons	52	20.0
	10-15 persons	9	3.5
	Mean ±SD	4.0± 2.40	
Family home	**Own**	135	51.9
	Rent	125	48.1
Fixed income	**Yes**	167	64.2
	No	93	35.8
Income average	**Low (< 50,000 YR)**	169	65.0
	Middle (50,000-200,000 YR)	88	33.8
	High (>200,000 RY)	3	1.2

3) Obstetric and health characteristics

As shown in Table 3, two hundred and seven (79.6%) of the women attendees had previous histories of pregnancy. From those, 37.3% had a history of miscarriage or willful abortion and at least one child. Sixty-eight (26.2%) of the respondents' attendees had a history of bleeding during the current pregnancy. From those who had a history of birth, 58 (22.3%), 74 (28.5%), and 75 (28.8%) had birth spaces of less than a year, a year to two years,

and more than two years between the last and the current pregnancy, respectively. In terms of the age of current pregnant attendees, 94 (36.2%), 81 (31.2%), and 85 (32.7%) ranked their trimesters as

first, second, and third, respectively. Only 15% of the participants had a history of health problems while pregnant.

Table 3: Obstetric and health characteristics of the study participants (n=260)

Characteristic		Frequency (n)	%
Previous history of pregnancy	**Nullipara (0)**	53	20.4
	Primipara (1)	168	64.6
	Multipara (2–4)	33	12.7
	Grand multipara (≥5)	6	2.3
History of abortion	**No**	163	62.7
	Once	4	1.9
	Twice	55	21.2
	Three times	29	11.2
	>three times	8	3.0
Bleeding on current pregnant	**No**	192	73.8
	Yes	68	26.2
Birth space between the last and current	**< 1 year**	58	22.3
	1-2 years	74	28.5
	> 2 year	75	28.8
Current pregnant age (Trimester)	**First trimester**	94	36.2
	Second trimester	81	31.2
	Third trimester	85	32.7
Health problems during the current pregnancy	**No**	221	85.0
	Yes	39	15.0

4) Dietary characteristics

As shown in Table 4, one hundred thirty-nine (53.5%) of the women attendees had not taken iron and folic acid supplementation during pregnancy, whereas 3.5% had taken iron, 11.2%

had taken folic acid, and 31.9% had taken other supplements. One hundred and seventy (65.4%) of the women in attendance had consumed vegetables on an irregular basis during their pregnancy, whereas 19.2% had consumed them daily, 11.6% had consumed them in a couple of days, and 3.8% had consumed them in three days. Furthermore, 178 (68.5%) of the women in attendance had consumed meat on an irregular basis during their pregnancy, whereas 10.4% had consumed it every one to three weeks, 16.9% once a week, 2.3% once every couple of weeks, and 1.9% once a month.

Table 4: Dietary characteristics of the study participants (n=260)

Characteristic		Frequency (n)	%
Iron/folic acid supplementation	No	139	53.5
	Iron	9	3.5
	Folic Acid	29	11.2
	Others	83	31.9
Vegetables	No regular time	170	65.4
	Daily	50	19.2
	In couple days	30	11.6
	In triple days	10	3.8
Meat (red meat; fish; chicken)	No regular time	178	68.5
	1-3 a week	27	10.4
	Once a week	44	16.9
	Once a couple week	6	2.3
	Once a month	5	1.9

5) Risk factors associated with anemia

As shown in Table 5, regarding sociodemographic factors, families with fixed income or low income had a negative association

with anemia in pregnant women; that is, an increase in family income by a unit would likely decrease the risk of being anemic by a factor of 0.490 and 0.190, respectively (*p*-value< 0.05). Family size (1–5 persons) had a significant positive association with anemia. There were no significant associations between age, family home, and anemia in pregnant women in this study. According to the data, it was observed that the majority of the demographic factors of the respondents were considered risk factors.

In terms of obstetrics and health factors, the number of abortions, bleeding, and health problems in pregnant women were all significantly associated with anemia, with the

two previous abortions being high-risk factors. The other factors of obstetrics and pregnancy history were not significantly associated with anemia in pregnant women. According to the data, three factors, namely the respondents' obstetrics and pregnancy histories, were considered risk factors, while the other factors were not. Regarding the dietary factors, a lack of supplements, such as iron and folic acid, was significantly associated with anemia in pregnant women, which is considered a high risk factor. According to the data, it was observed that the majority of the dietary factors of the respondents were not considered risk factors.

Table 5: Factors associated with anemia in pregnant using bivariate chi-square and multivariate logistic regression analyses.

Variables	Chi-Square	P-value	AOR	95% CI
Low income (<50,000 YR)	7.630	0.001	0.094	0.060-0.225
Fixed income	7.411	0.005	0.490	0.292-0.820
Family size (1-5 persons)	4.472	0.033	1.126	1.009--1.258
Number of abortion (twice)	9.147	0.013	0.459	0.2481-0.8452
Bleeding on current pregnant	4.530	0.042	1.127	0.808-1.572
Health problems on current pregnant	4.178	0.002	1.402	0.967-2.034
Lack of supplements taken	8.872	0.003	1.540	1.148-2.066
Iron	4.467	0.034	1.254	0.763-2.063
Folic acid	11.264	0.001	1.702	1.217-2.375

AOR Adjusted Odd Ratio, CI Confidence Interval= 95%, P-value < 0.05 is significant

Discussion

In the present study, we found that the prevalence of anemia among pregnant women was 44.2%. Also, we found that the prevalence of mild anemia was 18.8%, moderate anemia was 25.0%, and severe anemia was 0.4%. Moderate anemia was the most common anemia, followed by mild anemia.

Other studies' findings on the prevalence and severity of anemia in pregnant women were similar, higher, or lower than ours. Similar to Ahmed et al. (2021), who found a 44.4% prevalence of anemia among pregnant women in

Mogadishu, Somalia [17]. Also, he found the prevalence of mild anemia to be 41.2%, moderate anemia to be 47.0%, and severe anemia to be 11.8%. Also, another study done by Hussain et al. (2020) found the prevalence of anemia to be 48.6% among pregnant women in Babylon Governorate, Iraq [18]. He found the prevalence of mild anemia to be 21.8%, moderate anemia to be 26.0%, and severe anemia to be 0.8%. Our prevalence (44.2%) was found to be higher than that found in a previous study done by Al-Aini et al. in 2020 at Sana'a city. She found the prevalence of anemia among pregnant women to be 25.0%. [19]. In contrast, she found that mild anemia was the most common type (70.83%), followed by moderate

anemia (28.13%), and severe anemia (1.04%) [19].

Like in other studies in developing countries, the prevalence of anemia among pregnant women is still high. The overall prevalence of anemia in pregnancy was found to range from 19.3 to 57.4% in Malaysia [20]. Other studies have found that the prevalence of anemia was 62.5% among pregnant women attending antenatal care in Bangladesh [21]. In Yemen, other previous studies have demonstrated that the prevalence of anemia among pregnant women ranged from 25.0% to 81% [19,22-24]. Variations and an increase in anemia incidence among pregnant women in Yemen may be related to the deterioration of medical services and the country's socioeconomic situation due to the civil war that began in 2015 and the siege on Yemen.

In the current study, women with low monthly income (<50,000 YR) were found to be significantly more susceptible to anemia than those from middle-income households (OR = 0.094, 95% CI = 0.060-0.225; P = 0.001). This is consistent with the findings of other studies, which found that women with low monthly income were significantly more susceptible to anemia than those with middle-income monthly income [1,19,21], indicating an inverse relationship between anemia prevalence and socioeconomic status. Other socio-demographic factors like educational level and occupation were found to be insignificant predictors of anemia in this study but were significant in other studies [25,26]. There was agreement with many studies that showed that increasing antenatal care (ANC) attendance during pregnancy is associated with a lower risk of pregnancy anemia [27,28]. There was also agreement with many publications that found the frequency of daily meat and vegetable intake to be positive predictors of anemia, with pregnant women who consumed more meat or more vegetables having a lower risk of anemia (P <0.05).This is because meat and vegetables are sources of iron [29,30].

In the present study, we found a significant association between the presence of health problems and anemia (OR = 1.402, 95% CI = 0.967-2.034; P = 0.002). We found that the highest prevalence of anemia was among pregnant women who had a health problem. Our finding was in line with other previous studies that showed a significant association between the presence of health problems and anemia among pregnant women [19,31].

In the present study, a lack of supplements such as iron and folic acid was significantly associated with anemia in pregnant women (OR = 1.540, 95% CI = 1.148-2.060; P = 0.003). The rate of occurrence was 53.5% (p = 0.003). This is in agreement with other previous studies that found pregnant women who had no iron supplementation during their current pregnancy were at about a two-fold higher risk of developing anemia as compared to those who had iron supplementation [19,21].

Conclusion

The prevalence of anemia was high and represents a severe problem among pregnant women. Identification of risk factors may help in the prevention and control of anemia.

Recommendation

We suggested that additional researches be conducted in several hospitals in Sana'a and throughout Yemen. It might support the prevention and management of anemia in expectant mothers.

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