Al - Saeed University Journal of Applied Sciences
journal@alsaeeduni.edu.ye
Vol (8), No(2), Dec., 2025
ISSN: 3104 - 8978 (Print) ISSN: 3104-8986 (Online)

Prevalence of Anemia and Associated Factors in Women of Child bearing age in Al-Shihr District, Yemen

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Received: 13/9/2025 **Accepted: 6/12/2025**

Journal Website: **https://journal.alsaeeduni.edu.ye**

مدى انتشار فقر الدم والعوامل المرتبطة به بين النساء في سن الإنجاب في مديرية الشحر- اليمن

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الملخص

الخلفية: فقر الدم يؤثر على ربع سكان العالم، ويُعد شائعًا بين النساء في سن الإنجاب. **الهدف من الدراسة:** تحديد معدل انتشار فقر الدم والعوامل المرتبطة به بين النساء في سن الإنجاب في مديرية الشحر – اليمن، **المنهجية:** تم إجراء دراسة مقطعية تحليلية في العيادات الخارجية بالمستشفى العام ومراكز الرعاية الصحية الأولية في مديرية الشحر. شملت الدراسة 400 امرأة غير حامل في سن الإنجاب تم اختيارهن بطريقة العينة الملائمة. جُمعت البيانات عبر مقابلات مباشرة باستخدام استبيان مُختبر مسبقًا. كما أُجريت القياسات الأنثروبومترية وسُحبت عينات دم. تم تحليل صورة الدم الكاملة باستخدام نظام تحليل الخلايا (Coulter)، وتمت معالجة البيانات وتحليلها باستخدام برنامج SPSS. استُخدمت الإحصاءات الوصفية واختبار مربع كاي والتحليل اللوجستي متعدد المتغيرات. **النتائج:** بلغ متوسط مستوى الهيموغلوبين 11.7 ± (1.3) جم/ديسيلتر (فاصل الثقة 95%: 11.5–11.8) وُجد أن 55% (220 امرأة) يعانين من فقر الدم (Hb < 12 جم/ديسيلتر). أظهر التحليل اللوجستي متعدد المتغيرات أن مدة الحيض حتى سبعة أيام (نسبة الأرجحية 2.650، قيمة (P = 0.011)، أو ثمانية أيام فأكثر (نسبة الأرجحية 3.283، قيمة (P = 0.004)، واستخدام اللولب كوسيلة منع حمل (نسبة الأرجحية 3.884، قيمة (P = 0.003)، ووجود تاريخ سابق لفقر الدم) نسبة الأرجحية 1.805، قيمة (P = 0.012)، وانخفاض مؤشر كتلة الجسم) نسبة الأرجحية 2.280، قيمة (P = 0.045) جميعها مرتبطة بزيادة خطر الإصابة بفقر الدم بينما ارتبطت الفئة العمرية (25–35 عامًا) بانخفاض خطر الإصابة (نسبة الأرجحية 0.40، قيمة (p=0.001)).**الاستنتاج:** يُعد فقر الدم بين النساء في سن الإنجاب مشكلة صحية عامة خطيرة وذات انتشار مرتفع .يجب أخذ عوامل الخطورة بعين الاعتبار عند وضع استراتيجيات الوقاية والسيطرة على فقر الدم بين النساء غير الحوامل في سن الإنجاب.

الكلمات المفتاحية: فقر الدم، النساء في سن الإنجاب، مديرية الشحر.

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Abstract

Background: Anemia affects one-quarter of the world´s population, it is common among women of childbearing age. **Objective**: To determine the prevalence and associated factors of anemia in childbearing age women in Al-Shihr district, Yemen. **Methods:** A cross-sectional analytical study design was conducted, at Out Patient Clinics in public hospital and Primary Health Care Centers in Al-Shihr district, 400 non-pregnant women of childbearing age were selected by convenience sampling, the data were collected by interviewing eligible women and reporting the answers in pre-tested structured questionnaire. Anthropometric measurements and blood samples were taken. Complete blood count was measured using coulter cellular analysis system, SPSS used for Data processing and analysis. Descriptive statistics, Chi square test and multivariate logistic regression analysis were measured. **Results.** Mean hemoglobin was11.7± (1.3) g/dl, (95% CI 11.5-11.8). Anemia (Hb <12g/dL) was present in 55% (220) women. Multivariate logistic regression revealed that whether duration of menstruation up to seven days (OR 2.650, P value.011), equal or more than eight days (OR 3.283, P = 0.004), using Intra Uterine Device (IUD) as contraceptive method (OR 3.884, P =.003), having past history of anemia (OR1.805, P =.012) and low body mass index (BMI) (OR 2.280, P =.045) were associated with increased risk of anemia, whereas age group (25-35) (OR .40, P =.001) was associated with reduced risk of anemia. **Conclusion:** Anemia among women of childbearing age is sever public health problem and high prevalence. Identification the risk factors should be consider for prevention and control strategies of anemia among Non-Pregnant Women at childbearing age.

Keywords: Anemia, women of childbearing age, Al-Shihr district

Introduction

Anemia is a global public health problem affecting both developing and developed countries with major consequences for human health as well as social and economic development (Zelalem, 2014). Its adverse health consequences affect people with varied degrees and from all age groups, particularly women of childbearing age (Haidar, 2010).

Anemia is defined as a clinical condition characterized by reduction in haemoglobin concentration of blood below the normal for the age, sex, physiological condition and altitude above sea level of that person. (Bansal A, 2016) The lower than normal of haemoglobin are different for males, pregnant women, non-pregnant women (NPW) and children (13 g/dl for males 11g/dl for children and pregnant women and 12g/dl for non- pregnant women) Nestel; 2002, WHO (2011).

worldwide anemia prevalence affected 29.4% (528.7milion) women at reproductive age. The prevalence of anaemia was highest in south Asia, central and west Africa (47%, 48% respectively). Globally the prevalence of anemia decreased from 33% to 29% in NPW. (WHO, 2014).

Anaemia was considered as largely preventable and easily treatable if detected in time, and strategies for its prevention and control are well documented. Despite these facts, it still has continued to be a common cause of mortality and morbidity. (Asres Y, Yemane T, Gedefaw L. 2014). association of anemia with puerperal sepsis, ante-partum haemorrhage, post-partum haemorrhage and maternal mortality is an established fact beyond doubt (Rakic L, et al., 2013)

The economic and social consequences of iron deficiency anemia (IDA) are thought to be enormous including a significant drain on health care, education resources and labour productivity, and reduced physical and mental capacity of large segments of the population. (Stevens GA, et al., 2013).

Anemia is the result of a wide variety of causes as genetic traits such as sickle-cell anemia and thalassemia, inadequate bioavailability of dietary nutrients in foods such as low iron, folate, vitamin B12, infectious diseases as malaria, schistosomiasis, hookworm infection, HIV infection and some non-communicable diseases. (Beck KL, Conlon CA, et al., 2014).

Iron deficiency is the predominant nutritional deficiency causing anemia and is present even when other causes of anemia are recognized. (WHO,

2001) is resulting from prolonged negative iron balance caused by inadequate dietary iron intake or absorption, increased needs for iron during pregnancy or growth periods, and increased iron losses example as a result of menstruation and Helminthes infestation (WHO, 2014).

Women are at increased risk of becoming anemic due to several physiologic or socio-cultural factors (Zelalem B, 2014). Anemia mostly occurs in women of childbearing age due to menstruation, pregnancy and lactation that experience their life. Women's socioeconomic level and their knowledge of nutritional needs are among important factors that can prevent malnutrition in women. Marriage and pregnancy at an early age, short time periods between multiple pregnancies, poverty, high costs of food, inappropriate dietary habits and patterns and psychological condition especially in adolescent girls are other factors that make women susceptible to anemia. (Jangjoo S, 2016) Specific risk factors for IDA include deficiency of dietary iron, worm infestation, repeated pregnancies, menorrhagia, postpartum hemorrhage, gastric ulcers, hemorrhoids, intake of aspirin/non-steroidal anti-inflammatory drugs and pure vegetarian diet. These modifiable and non-modifiable factors affecting anemia in combination or alone. (AlQuaiz AM, 2013).

The global nutrition target for 2025 calls for a 50% reduction of anemia in women of childbearing age, (WHO, 2014) the five other global nutrition targets include stunting, low birth weight, childhood overweight, exclusive breast feeding and wasting. (WHO, 2014) In low-income countries, the prevalence of anemia remains high and is an area of priority. To make a significant impact, it is likely that a combination of key programs that address the determinants of anemia will be required.

Among the Middle East countries, Yemen included in a category relates to countries experiencing humanitarian crisis with high prevalence of severe child and maternal under nutrition and wide spread micronutrient deficiencies, other countries include (Afghanistan, Djibouti, Iraq, Somalia and Sudan). In these countries, the national development programs have been disrupted, including food safety. (Bagchi K. 2008). Also, Yemen has the highest percentage of people living in poverty where more than half of the country's total population lives below the poverty line. This situation might contribute to the high prevalence of many nutritional disorders including

anemia. (Al-Zabedi EM, 2014) Raja et al., at 2001 stated that diet is a major contributing factor to the high prevalence of iron deficiency anemia in the Republic of Yemen (Bahakim N.A2010). lack of Studies about the anemia in women of childbearing age and its associated factors in Yemen.

The available studies investigate the prevalence of anemia among pregnant women was 83.4%, the most common type of anemia was IDA (Bahakim N-A, 2010).

In study conducted at Mukalla district in Hadhramout governorate at 2004 showed 37.5% of the healthy NPW were anemic, of these 73% had iron deficiency anemia (Al-Shoiab H, 2004).

Identifying the magnitude of anemia and its determinants in high-risk groups, such as women of childbearing age in Yemen would be essential for evidence-based intervention modalities. However, there has been no study on the status of anemia among Yemeni NPW of childbearing age.

The aim of the study: The present study was done to determine the prevalence of anemia and to investigate the association of sociodemographic characteristics, gynecological and obstetric, medical, diet factors and body mass index on prevalence of anemia in NPW of childbearing age in Al-Shihr district in Yemen.

Materials & Methods:

A cross-sectional study design was used for this research. This study was carried out at the OPCs, Al-Shihr public hospital and PHCCs of Al-Shihr district in Hadhramout Governorate, Yemen, Al-Shihr district is an ancient district in Hadhramout Governorate. It is located on the coast of the Arabian Sea, 60 kilometers east to Mukalla District (The capital of Hadhramout Governorate). Its area is 3109 km2 and has 100006 inhabitants. The health services in Al-Shihr district are provided by Al-Shihr Public Hospital and fourteen PHCCs distributed inside the city and in the rural areas which are directed under the office of the Ministry of Public Health and Population in Al-Shihr district. In addition, there are many private clinics with different specialties provide health services. (Department of statistics and information. (Statistics office Al-Shihr district, 2016) Figure 1 describe the site of Al.Shihr district. (National Geospatial-Intelligence Agency, 2017). Target and study population included all women of childbearing age (15-49) who attended the

selected OPCs at Al-Shihr public hospital and PHCCs, as mothers or caregivers who attended with their children for vaccination or follow-up during the study period in 4-months, the exclusion criteria Were (Pregnant women, women Less than two months post-delivery, (WHO, 2016), Chronic debilitating condition, Patient with history of hereditary anemia, History of recent blood transfusion, Currently on Iron supplementation, Women with amenorrhea due to any causes except lactation and Women who had problems that might affect the reliability of the questionnaire e.g. deafness, current psychological disorder. Total (400) required sample size was calculated from the prevalence of anemia in NPW of childbearing age in Yemen at literature. According to WHO report, the prevalence of anemia in NPW at childbearing age in Yemen was 38% (WHO, 2015) was selected by the multistage sampling method, The data collection instrument was interviewing questionnaire, measurement of body mass index and the blood analysis, The questionnaire was included (sociodemographic data income per month, obstetric and gynecological data, medical and dietary conditions.

Anthropometry:

Anthropometric measurements were taken according to international recommendations and followed standard procedures to ensure accuracy. Each woman's weight was measured on using digital weighing scale (Omron, China) and was recorded to the nearest 100 grams. Women wore light clothing, but they removed their shoes before obtaining weight. Height was measured to the nearest 0.1 cm using a single calibrated instrument (ZT 160). Participants stood bare footed on a flat surface with weight distributed evenly on both feet, heels together, and the head positioned so that the line of vision become perpendicular to the body. Arms were hanging freely by the sides. (WHO, 2017) All apparatuses were checked daily. The body mass index was calculated [BMI= weight (kg)/height (m) 2].

Blood Sample for Hemoglobin Estimation:

Blood sample 3 ml of venous blood was taken for complete blood count including hemoglobin, hematocrit, and red cell indices: MCV, MCH, MCHC, RDW. It was sent to the laboratory were blood analysis.

After the data collected were analyzed using the Statistical Package for the Social Sciences (SPSS). The outcome variable was dichotomized as

anemic and non-anemic based on WHO cutoff of <12 g/dl. Descriptive statistic (frequencies and percentages for described categorical variables and means with standard deviation (SD)). The chi-square test was used to identify the association between the anemia and predictor variables, those that had marginal and significant associations (P value <0.05) were fed to the regression models. Binary logistic regressions were used to identify the candidate variables for multiple logistic regression analysis. All predictors variables that have been associated with P value <0.05 in bivariate analyses were considered as candidates to be entered into multiple logistic regression model. Multiple logistic regression was performed using enter method to identify important factors associated with anemia with estimation of the odds ratios (OR) and 95% confidence intervals (CI). All variables with P value < 0.05 were considered as statistically significant. the verbal consent was thought from participant, ensuring them that the information was to be used only for the research and their confidentiality and anonymity would be assured. The participants had got the permission to withdraw from the study at any time without giving any reason**.**

Results

The total number of the women was 400, The age of all women ranged from 15 - 49 years old, with mean ± Stander deviation (28.5± 7.1 years) at 95% confidence interval (CI 27.8-29.2). Mean age of anemic group (28.1±7) years and mean age of non-anemic group (29±7.2) years. Majority in both anemic and non-anemic group had same socio-demographic characteristics. More than half of the participants were within the age group of 25–35 years (52.8%). Also, half of participants had primary education level (50.5%). The majority of them were married (76.5%) and housewife (75.5%). Most of the study women´s family size consists of 5-10 persons (48.5%), although most of them had monthly income less than 50,000 Yemeni Riyal (40%). As reveals, from all socio-demographic characteristics the age groups had statistically significant relationship with anemia with P value = 0.011 (Table 1).

Table 1:

Distribution of socio-demographic characteristics and their associations with anemia among women of childbearing age.

Variable		Anemic N=220 %		Non anemic N =180 %		Total N=400 %		Chi square	P value
Age group	15-24	80	36.3%	43	23.9%	123	30.7%	8.967	.011*
	25-35	102	46.4%	109	60.6%	211	52.8%		
	36-49	38	17.3%	28	15.5%	66	16.5%		
Age (Mean ± SD)		28.5 ±7.1						36.76	.257
		28.1±7		29 ±7.2					
Education	Not educated	22	10%	24	13.3%	46	11.5%		
	primary	119	54.1%	83	46.1%	202	50.5%		
	school							3.013	.390
	Secondary	57	25.9%	50	27.8%	107	26.8%		
	school								
	Diploma & above	22	10%	23	12.8%	45	11.2%		
Marital	Single	44	20%	40	22.2%	84	21%		
	Married	168	76.3%	138	76.7%	306	76.5%		
	Divorced	7	3.2%	2	1.1%	9	2.3%	2.939	.401
	Widow	1	0.5%	0	0.0%	1	0.2%		
Working	Working	39	17.7%	32	17.8%	71	17.8%		
	House-wife	164	74.6%	138	76.7%	302	75.5%		
	Student	17	7.7%	10	5.5%	27	6.7%		
Family size	< 5	59	26.8%	45	25.0%	104	26%	1.985	.371
	5-10	111	50.5%	83	46.1%	194	48.5%		
	> 10	50	22.7%	52	28.9%	102	25.5%		
Monthly family income	< 50000[#]	91	41.4%	69	38.4%	160	40%	2.266	.322
	50000-[#] 100000	81	36.8%	60	33.3%	141	35.3%		
	>100000[#]	48	21.8%	51	28.3%	99	24.7%		
Monthly income (Mean ± SD)=72227±63391									

*Statistically significant, P value <0.05. [#] Monthly family income per month 50000Yemeni Riyal.

The menstrual characteristics, majority of study participants (72%) had menstrual cycle each 21-35 days, and (15.5%) had lactation amenorrhea. Most of the participants (62%) had 1-7 days of menstrual flow. More than half of the participants expressed that they had three or more days of heavy menstrual flow (55.5%), in contrast to the association of menstrual flow with clot that was (29%). (47.7%) of study participants used three or lesser sanitary pads in the heaviest day. Two of menstrual characteristics had statistically significant relationship with anemia, duration of menstruation and number of heavy flow days, using Pearson's Chi square χ^2 test as P value were 0.006, 0.007 respectively. Other menstrual characteristics weren't statistically significant (Table 2).

Table 2:

Distribution of gynecological factors and their associations with anemia among women of childbearing age:

Variable		Anemic (n=220)		Non anemic (n=180)		Total (n=400)		χ^2	P value
		No.	%	No.	%	No.	%		
Frequency Menstrual cycle (days)	<21	13	5.9	16	8.9	29	7.3	7.103	0.069
	21-35	169	76.8	119	66.1	288	72		
	> 35	12	5.5	9	5	21	5.2		
	Non	26	11.8	36	20	62	15.5		
Duration of menstruation (days)	1-7	133	60.5	115	63.9	248	62	10.401	0.006*
	≥8	61	27.7	29	16.1	90	22.5		
	Non	26	11.8	36	20	62	15.5		
Number of Menstrual cycle	<3	57	25.9	59	32.8	116	29	9.927	0.007*
	≥3	137	62.3	85	47.2	222	55.5		
Number of pads used in menstruation	≤3	106	48.2	85	47.2	191	47.7	5.700	0.058
	>3	88	40.0	59	32.8	147	36.8		
	Non	26	11.8	36	20	62	15.5		
Presence of menstrual	Yes	68	30.9	48	26.7	116	29	5.167	0.076
	No	126	57.3	96	53.3	222	55.5		

Considering the parity, (67.3%) of the women had 1- 5 children and hadn't history of abortion (75%). Slightly more than half of the study women were

not lactating (59%), and among the lactating group were less than one year (25.8%). Parity, number of abortions, currently lactation state and its duration weren't statistically significant (P value.756, .898, .513, .259) respectively. More than half of the study women were using a contraception method (53.8%) that was higher in anemic than non-anemic groups (58.2%, 48.3%) respectively. Table 3.

Table (3):

Distribution of obstetric factors and their associations with anemia among women of childbearing age:

Variable		Anemic N=220 %		Non anemic N=180 %		400	Total %	Chi square	P-value
Number of parities	0	52	23.6%	45	25%	97	24.2%	.559	.756
	1-5	151	68.7%	118	65.6%	269	67.3%		
	>5	17	7.7%	17	9.4%	34	8.5%		
Number of abortions	0	163	74.1%	137	76.1%	300	75%	.216	.898
	1-2	49	22.3%	37	20.6%	86	21.5		
	>2	8	3.6%	6	3.3%	14	3.5%		
Currently lactation state	Yes	87	39.5%	77	42.8%	164	41%	.428	.513
	No	133	60.5%	103	57.2%	236	59%		
Duration of lactation	≤1 year	50	22.7%	53	29.4%	103	25.8%	2.698	.259
	>1 year	37	16.8%	24	13.4%	61	15.2%		
	Not lactating	133	60.5%	103	57.2%	236	59%		
Current contraception use	Yes	128	58.2%	87	48.3%	215	53.8%	3.863	.049*
	No	92	41.8%	93	51.7%	185	46.2%		

Table 4 shows that most of the participants had past history of anemia (64%) that showed significant relationship with anemia, Family history of anemia presented only in (29.2%) there is no statistically significant relationship with anemia. History of blood transfusion, peptic ulcer and hemorrhoids presented in (21.8%), (3.8%) and (8.2%) respectively, no statistically significant relationship with anemia. majority of women (94%) were drink tea and coffee with meals that wasn't statistically significant.

Table 4:

Distribution of medical factors and their associations with anemia among women of childbearing age.

Medical factors		Anemic N=220 %		Non anemic N=180 %		400	Total %	Chi square	P value
Past history of anemia	Yes	153	69.5%	103	57.2%	256	64%	6.525	.011*
	No	67	30.5%	77	42.8%	144	36%		
Family history of anemia	Yes	72	32.7%	45	25%	117	29.2%	2.857	.091
	No	148	67.3%	135	75%	283	70.8%		
Historyof blood transfusion	Yes	55	25%	32	17.8%	87	21.8%	3.034	.082
	No	165	75%	148	82.2%	313	78.2%		
History of peptic ulcer	Yes	7	3.2%	8	4.4%	15	3.8%	.437	.508
	No	213	96.8%	172	95.6%	385	96.2%		
Historyof hemorrhoids	Yes	18	8.2%	15	8.3%	33	8.2%	.003	.956
	No	202	91.8%	165	91.7%	367	91.8%		
Drink tea & coffee with meals	Yes	208	94.5%	168	93.3%	376	94%	.258	.612
	No	12	5.5%	12	6.7%	24	6%		

***Statistically significant, P value <0.05.**

Table 5 shows half of the women never ate red meat in last month (51.5%). Chicken, eggs vegetable and beans were eaten mostly 1-6 week (76.2%, 63.5%, 53%, 55.7%) respectively. Fish was daily food in about (87.5%), while fruit was eaten at least once /day in (49%). There was no statistically significant relationship between anemia and eating frequency of food items in last month.

Table 5:

Dietary recalls of food items in the last month and their associations with anemia among women of childbearing age:(n=400)

Frequency / Food Item	Never eat N (%)	1-3/month N (%)	1-6/week N (%)	≥1/day N (%)	Chi square	P.value
Red meat	206(51.5%)	176(44%)	18(4.5%)	0(0%)	2.485	.289
Chicken	15(3.8%)	77(19.2%)	305(76.2%)	3(0.8%)	.613	.893
Fish	5(1.25%)	5(1.25%)	40(10%)	350(87.5%)	1.455	.693
Eggs	35(8.7%)	54(13.5%)	254(63.5%)	57(14.3%)	2.685	.443
Vegetables	8(2%)	26(6.5%)	212(53%)	154(38.5%)	5.265	.153
Fruits	10(2.5%)	23(5.8%)	171(42.7%)	196(49%)	3.782	.286
Beans	19(4.8%)	40(10%)	223(55.7%)	118(29.5%)	6.399	.094

As shown in table 6, mean BMI of the study women was above the normal limit (25.2± 5.96 Kg/m^2). Mean of BMI in non-anemic group was (25.7± 5.8 Kg/m^2) and mean BMI in anemic group (24.9± 6.1 Kg/m^2). Half of anemic group has normal BMI (49.5%) and (39,1%) were overweight, while half of the non-anemic group (50%) was overweight and (43.3%) had normal BMI. Underweight participants represented (11.4%) in anemic and (6.7%) in non-anemic groups. The degrees of BMI hadn't statistically significant relationship with anemia.

Table 6:

Distribution of Body Mass Index (BMI) degrees and their associations with anemia among women of childbearing age.

Degree of BMI Kg/m^2	Anemic N=220 N (%)		Not-anemic N=180 N (%)		Total N=400 N (%)		Chi square	P value
Underweight	25	(11.4%)	12	(6.7%)	37	(9.2%)	5.856	.054
normal	109	(49.5%)	78	(43.3%)	187	(46.8%)		
overweight	86	(39.1%)	90	(50%)	176	(44%)		
BMI (Mean ± SD)	24.9±6.1		25.7±5.8					
	25.2± 5.96						385.85	.550

As shown in table 7, the mean hemoglobin of the study women was (11.7±1.3 g/dl, 95% CI 11.5-11.8). Mean value for Hct, MCV, MCH, MCHC and RDW were (37.7±3.8%), (87.2± 6.2 fl), (26.98±2.95pg), (30.8±1.5g/dl) and (14.9± 2%) respectively.

Table7:

Mean Hemoglobin and Red Blood Cell indices in women of childbearing age.

Variable	Mean± SD	Normal range	Minimum value	Maximum value
Hemoglobin(g/dl)	11.7± (1.3)	12-16	6.90	15.00
Hematocrit(%)	37.7± (3.8)	37% -47%	27.47	68.58
MCV (fl)	87.2 ± (6.2)	80-96	65.24	99.94
MCH (pg)	26.98 ± (2.95)	27-32	15.64	36.43
MCHC(g/dl)	30.8 ± (1.5)	32-36	21.73	36.45
RDW (%)	14.9± (2)	11.5-14.5	11.85	24.07

Figure1 shows the overall prevalence of anemia in this study was 220(55%) were anemic from total 400 participants.

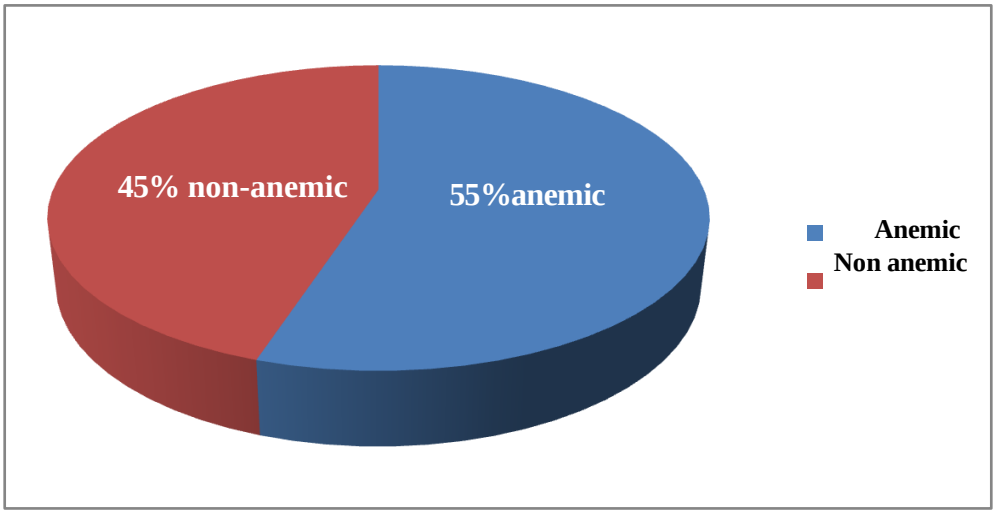

Figure1: Prevalence of anemia among women of childbearing age

Table 8 shows the mean hemoglobin in anemic group was 10.7±(0.99) g/dl, while that of non-anemic group was 12.8 ± (0.7) g/dl. Mean of MCV of anemic group was(84.7±6.7fl). Mean value of MCH in anemic group was (25.7±3.1pg) and mean of RDW was .(%2.3±15.7)

Table 8:

Mean blood hemoglobin and red blood cell indices in anemic and non-anemic groups of women of childbearing age.

RBC parameters	Anemic	Non anemic
Mean hemoglobin(±SD)	10.7±0.99	12.8±0.7
Mean Hematocrit (%) (±SD)	35.4±2.5	40.7±3.1
Mean MCV (flu) (±SD)	84.7±6.7	90.28±3.6
Mean MCH (pg) (±SD)	25.7±3.1	28.5±1.9
Mean MCHC g/dl (±SD)	30.3±1.5	31.5±1.2
Mean RDW % (±SD)	15.7±2.3	14±1

Figure 2 reveals the degrees of anemia, majority of the anemic women in the study had mild anemia 50.9%. Severe anemia represented1.8% and moderate anemia was 47.3%

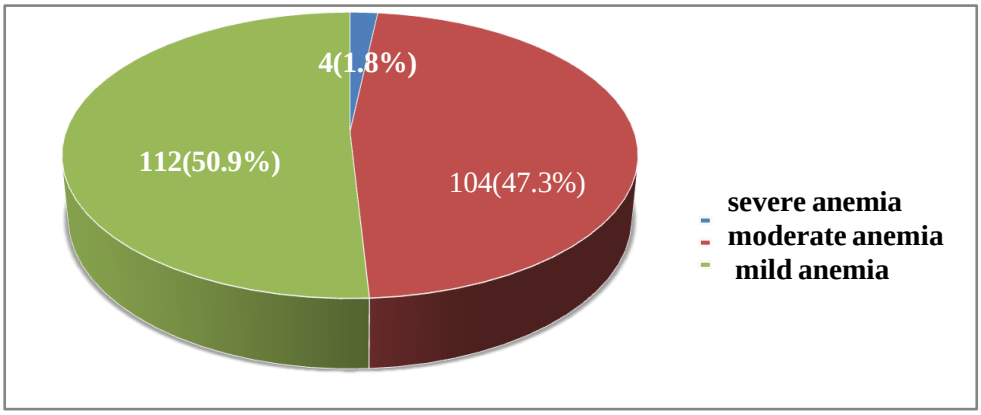

Figure 2: Severity of anemia among women of childbearing age

Table 9 shows that most of anemic cases had normal MCV (normocytic RBCs) 78.2%, low MCH (hypochromic RBCs) 63.2% and high RDW 67.3%. microcytic hypochromic anemia was 21.8% that at same time had high RDW.

Table9:

Distribution of MCV, MCH and RDW in anemic women of childbearing age:

RDW		MCV<80 N %		MCV≥80 N %		Total RDW N=220 100%	
<14.5	MCH<27	0	0%	3	1.4%	72	32.7%
	MCH≥27	0	0%	69	31.4%		
≥14.5	MCH<27	48	21.8%	88	40%	148	67.3%
	MCH≥27	0	0%	12	5.4%		
Total MCV N=220 (100%)		48	21.8%	172	78.2%		
Total MCH N=220 100%	MCH<27					139	63.2%
	MCH≥27					81	36.8%

To control the effect and predict the most important predictors of anemia, logistic regression analysis was performed. In the model, those predictor variables that had marginal and significant associations in the chi-square tests were fed to the regression models. Although BMI showed statistically insignificant relationship with anemia using Pearson's Chi square test, it was studied in regression model because of its importance. From all studied variables, the univariate analysis in table10 reveals six predictor variables that were significantly associated with anemia among women of childbearing age.

Using IUCD as contraceptive method was the most significantly associated with increasing risk of anemia (OR =4.043, 95% CI 1.769-9.242, P=.001). The age group (25-35) was significantly associated with reduced risk of anemia(P=.003, OR=.503, 95%, CI .318-.796), as OR was less than 1, so this age group was a protective factor against anemia. Other factors that found associated with increased risk of anemia were duration of menses more than 8 days (OR=2.912, 95%CI 1.489-5.696, P value =.002), increasing the days of heavy flow more than 3(OR CI1.259-3.956, Pvalue.006), presence of past history of anemia (OR=1.707, 95%CI1.131-2.577, Pvalue.011) and underweight (OR=2.180, 95%CI 1.031-4.611, P value .041) 2.232, 95%.

Table 10:

Univariate Logistic regression analysis factors affecting anemia among women of childbearing age

Variable		Anemic N=220 (%)		Non anemic N=180(%)		odds ratio (95% CI)	P-value
	15-24	80	65%	43	35%	1	
Age groups	25-35	102	48.3%	109	51.7%	.503(0.318-0.796)	.003*
	36-49	38	57.6%	28	42.%	.729(.395-1.346)	.313
Age (Mean ± SD)		28.5±7.10				.983(.965-1.011)	.229
Duration of	1-7 days	133	53.6%	115	46.4%	1.601(.912-2.811)	.101
	≥8	61	67.8%	29	32.2%	2.912(1.489-5.696)	.002*
	Not menstruating	26	41.9%	36	58.1%	1	
Days of heavy	<3	57	49.1%	59	50.9%	1.338(.718-2.492)	.359
	≥3	137	61.7%	85	38.3%	2.232(1.259-3.956)	.006*
	Not menstruating	26	41.9%	36	58.1%	1	
Currently contraception	Yes	128	59.5%	87	40.5%	1.487(1.000-2.211)	.050
	No	92	49.7%	93	50.3%	1	
	COCP	20 47.6%		22 52.4%		.919(.470-1.797)	.805
	IUD	32 80%		8 20%		4.043(1.769-9.242)	.001*
	Injection-implant	6 60%		4 40%		1.516(.414-5.55)	.529
	Other methods	42 59.2%		29 40.8%		1.464(.841-2.548)	.178
	Not use contraception	92 49.7%		93 50.3%		1	
Past history of anemia	Yes	153 59.8%		103 40.2%		1.707(1.131-2.577)	.011*
	No	67 46.5%		77 53.5%		1	
Degree of BMI	Underweight	25 67.6%		12 32.4%		2.180(1.031-4.611)	.041*
	normal	109 58.3%		78 41.7%		1.462(.966-2.214)	.072
	overweight	8648.9%		90 51.1%		1	

Statistically significant, P value <0.05.

As shown in table11, multivariable logistic regression analysis reveals five potential factors remained significant predictors of anemia in women of childbearing age. The strongest risk factor of anemia was using of IUCD, recording OR 3.932 (95%CI 1.623-9.523, P =.002). This indicated that women who had used IUCD as contraception method were more than 3 times more likely to have risk of anemia than women who didn't use any contraception method. Using IUCD was the strongest risk factor of anemia in women of childbearing age with the same marked dose-response relation seen in univariate analysis. Age group (25-35) had OR.407(95% CI.243-.681, P =.001) which was less than 1, indicating that women age group (25-35) were 0.407 less likely to have anemia (protective factor) than women age group (15-25). Duration of menstruation whether normal (1-7) or abnormal (≥8) were significant risk factors of anemia. Menstrual duration ≥ 8 days had OR (3.283) that was higher than OR of menstrual duration 1-7days (2.650). Duration of menstruation ≥ 8 days was recording OR 3.283, (95%CI1.465-7.357, P = .004), indicating that women who had abnormal long duration of menses were more than 3 times more likely to have risk of anemia than women who didn't menstruating. Duration of menstruation of 1-7 days had OR 2.650 (95%CI1.246-5.635, P value.011), indicating that women who had 1-7 days were more than 2 times more likely to have risk of anemia than women who didn't menstruating. Presence of past history of anemia had OR 1.805 (95%CI 1.135- 2.865, P =.013), indicating that women who had past history of anemia were 1.8 more likely to have risk of anemia.

For women who were underweight (OR = 2.302, 95%CI1.031-5.139, P=.042), they were more than 2 times more likely to have risk of anemia than women who were overweight.

Table11:

Multivariate logistic regression analysis of factors affecting anemia among women of childbearing age:

Variable		Odds ration	(95% CI)	P value
Age groups	15-24	1		
	25-35	.407	.243-.681	.001*
	36-49	.695	.350-1.378	.297
Duration of menstruation	1-7 days	2.650	1.246-5.635	.011*
	≥8	3.283	1.465-7.357	.004*

Variable		Odds ration	(95% CI)	P value
Type of contraception	POP	2.079	(.943-4.586)	.070
	COCP	.806	(.393-1.664)	.565
	IUD	3.932	(1.623-9.523)	.002*
	Injection-Implant	1.697	(.422-6.816)	.456
	Other methods	1.720	.933.-3.170	.082
Past history of anemia	Yes	1.803	1.135-2.865	.013*
	No	1		
BMI	Underweight	2.302	1.031-5.139	.042*
	Normal	1.561	.984-2.478	.059
	Overweight	1		

***Statistically significant factor, P value <0.05.**

Discussion

Anemia remains a very common health problem among the women of reproductive age group and leads to high morbidity and mortality rates among females. (Mamta, 2014) Investing in women's reproductive health not only advance the human rights and improve the health and wellbeing of individual women and their families but it also benefits societies and national economics. (Roudi-Fahimi F, 2003). Slightly more than half of NPW of childbearing age were anemic. Further, duration of menstruation, use IUCD, past history of anemia and underweight were found to be significant risk factors of anemia in women of childbearing age in Al-Shihr district, while age group 25-35 was a protective factor. the high prevalence of anemia among childbearing age women. In other words, in every two women one had anemia. Relating to the WHO classification of anemia as the public health significance, our data clearly confirms that anemia is sever public health problem among NPW of childbearing age in Al-Shihr district. In fact, is higher than the previous WHO estimates of anemia in NPW in Yemen (38%), and was moderate public health problem (WHO, 2015). Mean hemoglobin in this study was 11.7±1.3 mg /dl, this finding consisting with that found in India (Rao S, et al., 2011), (Dey S, 2010) and it is lower than global mean hemoglobin in NPW12.6 mg/dl and lower than that of NPW in Yemen 12.3mg/dl (WHO, 2015). Reflect to experiencing humanitarian crisis and

widespread micronutrient deficiencies(Bagchi K).Also among the Middle East countries, Yemen has the highest percentage of people living in poverty where more than half of the country's total population lives below the poverty line, this situation might contribute to the high prevalence of anemia (Al-Zabedi EM.). This high prevalence may reflect further deterioration of health status of Yemeni population since ongoing conflict (Burki T, 2015), (Muftah S).

In NPW, the global anemia prevalence is 29%; these translate to 496.3 million(Stevens GA et al., 2013). Higher prevalence of anemia in NPW reported in India 96.5%, (Shrinivasa B, et al., 2014) Pakistan 68.5% (Rasool A, 2015). Other studies reported the prevalence of anemia in NPW 40% as inTanzania(Gunaratna NS, et al., 2015).

Vietnam (Nguyen PH, 2006), Bangladesh (KamruzzamanM, 2011) and Cambodia (Wieringa F. et al., 2016), in contrast to lower prevalence 20-39% reported in Ethiopia(Haidar J, 2010), Turkey(Pala K, 2008), Serbia(Rakic L, 2013), China (Qin Y, 2013) and (Borges MC, et al., 2015) Anemia was mild health public problem <20% in Chili10% (Ríos-Castillo I, 2013), Australia, Canada Brazil., (Germany, France, USA. (WHO, 2015) Anemia remains one of the glaring health disparities separating less developed and industrialized counties. With advances in management and prevention programs, industrialized nations have outpaced less developed countries. (Tolentino K, 2017) Also, variation in prevalence could be attributed to the differences in the determinant factors of anemia in different countries.

To compare our findings with other studies conducting in other Arab countries, in UAE, Sultan conducted a study aimed to estimate the prevalence of anemia among Sharjah University female students, he found prevalence of anemia was 29% (Sultan AH, 2007). AlQuaiz el al conducted a cross-sectional survey in Riyadh, Saudi Arabia, they found the prevalence of anemia was 40%. (AlQuaiz AM, et al., 2013) Similar result was in a study in Iraq (Al-Fathy A, 2012). (Khatib el al, 2006) conducted a cross-sectional study to identify the determinants of anemia in Lebanese women of childbearing age attending health centers in Lebanon, they found that the prevalence of anemia was 16%. In Kuwait the prevalence of anemia in women aged (20-49) was 17%(Al Zenki S *et al.*, 2015). Other studies found prevalence ranged from 11% in Egypt to over 40% in the Syrian Arab Republic and Oman among women of childbearing age. (Bagchi K, 2004).

Although the anemia in women was studied extensively in most parts of world, there is a dearth in information about its prevalence and associated factors in Yemen especially among NPW of childbearing age. In a cross sectional study conducted at Mukalla district to determine the prevalence of IDA in pregnant women who attend the maternal –child-health center 2004, prevalence of anemia in pregnant women was 82% while in non-pregnant control group was 37.5%. IDA was 77% and 73% in both group respectively. (Al-Shoiab.H, 2004) Al.Saqaaf, in 2002 studied anemia among Yemeni females, he found that IDA was the most common cause of anemia in pregnant Yemeni females, accounting for about 84.5%. Fadhel, 2003 studied maternal anemia in relation to neonatal birth weight in Aden city; she found that 83.4% of the pregnant women included in her study were anemic; and the percentage of low birth weight among the anemic mothers was 13.4%. (Bahakim N-A, 2010). WHO suggests12 g/dl of hemoglobin to be taken as cut off for diagnosis of anemia. Lower limits of normal hemoglobin concentration have been debatable for many years and also in different books and research works (Beutler E, 2006). WHO corrected lower limit to define anemia for different factors like altitude, sex, age, smokers, ethnicity. (Sullivan KM, 2008) From that, WHO indicates hemoglobin concentrations should be adjusted downward by 1mg/dL in people of African extraction, though ethnic differences in hemoglobin concentrations that exist in populations outside the USA remains unknown (Nestel P, 2002). So, whether the WHO cut off can be applied to Yemeni population group needs to be studied. In relating to degrees of anemia, mild anemia (Hb 11.9-11mg/dl) was the most prevalent Manifestations of anemia among women in childbearing age may not be noticeable easily. In severe cases, there will be shortness of breath and chest pain that can worsen the health conditions of women and lead to various secondary health problems such as cardiovascular diseases, ultimately death (Mamta DL, 2014). A agreement with Ethiopian study showing that mild anemia is the most prevalent type of anemia. (Asres Y, 2014) other study in Haiti showed that moderate anemia was most prevalent 47.2% (Heidkamp RA, et al., 2013) Fortunately in this study the prevalence of severe anemia is lower than that estimated in Yemen by WHO 2.3%. (WHO.2015) Whereas severe anemia is closely related to risk of high mortality, even mild anemia carries health risks and reduces capacity to work. (Mamta DL, 2014), so prevention in the early mild stages can help in reducing future burden of moderate and severe anemia.

As IDA is the most common type of anemia and usually associated with low MCV and low MCH. Normocytic, normochromic anemia could be attributed to presence of iron deficiency (decreased MCV) accompanied by B12 and folate deficiency (increased MCV). early stage of mild IDA could be present with normocytic normochromic anemia. (Greer J, 2013) In this study mean RDW was above the normal range. In addition, in this study all cases that had microcytic hypochromic anemia had high RDW. Although we did not measure the gold standard serum ferritin levels, these abnormality in indices point towards IDA. Study conducted by Al-Quaiz et al found MCV, MCH, and RDW as reliable, cost effective, and useful parameters to detect IDA in child bearing age women in absence of serum ferritin level. (Al.quaiz JM, 2012).

Multiple logistic regression analysis for risk of anemia for the various factors, the age group 25-35 was protective factor and had less risk of developing anemia disagreement with study conducted in Ethiopia the age group 25-35 years old were more likely to anemia. (Asres Y, 2014) but the age group 15-24 years most of them were anemic may be attribute to a continuing of anemia at childhood and also relating to diet problems with adolescent that all resolving with increasing age. Other study in Ethiopia revealed 30-39 age group was a predictor of anemia. (Gebremedhin S, 2011) A study done in India the age group 20-24years were anemic, (Dey S, 2010) while other study in India that age group wasn't statistically significant factors in anemia. (Mishra P, 2012).

Education level, working status, marital status, family size and monthly income of family weren't significant risk factors for anemia in this study, this agreement with a study conducted in Saudi Arabia(AlQuaiz AM, 2013) and Turkey. (Pala K, 2008) Regarding the education, it is believed that lack of knowledge of the causes and consequences of anemia may influence food choices even in resource poor populations. (Rao S, 2014)Therefore, education that reflects knowledge, attitudes and household dietary practices must be studied instead of formal education. study the lower family monthly income wasn't significant risk factors for anemia. This consists with a study conducted Yemeni Pregnant Women (WHO, 2014). Socioeconomic status has been well documented role in incidence of anemia, as people with better socioeconomic status and thus having approach to better resources are less

likely to develop anemia. (Rasool A, 2015) A study conducted in Kuwait found that prevalence of anemia was not affected by socioeconomic status in Kuwait (Al Zenki S, et al., 2015).

Though the role of sociodemographic characteristics documented in many studies with variations. Kamruzzaman el al conducted a cross-sectional study in Bangladesh, they found women with no education were more likely to be anemic than those with educated.(Kamruzzaman M, 2015) similar in study conducted in Timor-Les. (Lover AA, 2014) A cross-sectional study conducted by Balarajan el al in India, the anemia was socially patterned, being positively associated with lower wealth status, lower education. (Balarajan YS, 2013) Other study conducted by Sanku el al India, they found that lower education levels and working increase the risk of anemia while high wealth index reduces it. (Dey S, 2010) Zelalem conducted a study focused on factors related to anemia on women of childbearing age in Ethiopia, he found that age, occupation and wealth index weren't significant predictor of anemia, while illiteracy and widow increase the risk of anemia. (Zelalem B.2014) Disagreement between studies regarding the significance of socio-demographic characteristics could be explained by the sample differences e.g. studies in which samples were selected from large areas with population of different characteristics.

The duration of menstruation was one of the risk factors of anemia and the risk increases when duration more than eight days due to dietary decrease iron consumption in food. This is consisting with finding in a case control study conducted by Al-Quaiz at the primary health care clinics in Saudi Arabia, (Al-Quaiz MJ.2001) and a cross-sectional study conducted in Turkey (Pala K, 2008) revealed that menstrual duration of more than 5-8 days was a risk of having anemia.

No relationship between anemia and family planning usage was found, but there was a statistically significant relationship of anemia with IUCD used was the strongest predictors factors of anemia in this study associated with increased risk of anemia due the heavy menstrual blood loss. (Rakic L, 2013) consisting with a hospital-based study among clients in Egypt found high prevalence of anemia among IUCD users (64.9%) compared to nonusers or users of other method. (Hassan EO, 1999) Sharmanov el al conducted

comparative analysis of the national nutrition surveys in Kazakhstan they found use of IUCD increases the prevalence of anemia among women used IUCD. (Sharmanov T, et al.2015).

In this study, past history of anemia was associated with increasing risk of anemia, this consisting with that studies conducted in Turkey (Pala K, 2008), Saudi Arabia(Al-Sayes F, 2011) and Serbia(Rakic L, 2013).

low BMI (<18.5kg/m2) increased the risk of anemia, similar to study conducted in Bangladesh, undernourished women were more likely to have anemia.(60). Qin et al conducted cross sectional survey in China found that women with overweight were less likely to be anemic. (Qin Y, 2013) Same finding in a study conducted in Saudi Arabia (AlQuaiz AM, et al., 2013). Good diet intake improves the energy supply and provides the body with nutrients making it strong and resistant against acquiring diseases. (AlQuaiz AM, et al., 2013).

Dietary factors hadn't significant relationship with anemia. This is disagreement with many studies that documented the role of dietary factors as a risk factors of anemia (Nguyen PH, 2006), (Al-Sayes F, 2011), (Beck K, 2014), (Bhargava A, 2001). This disagreement may be attributed to common characteristics of dietary patterns and habits in both anemia and non-anemic groups. the dietary data were based on qualitative information and, thus couldn't estimate the precise assessment of the nutrient intake.

There were several limitations with the present study, inability to capture representative data of whole the community, because difficult transport to all PHCCs to take blood samples, Information bias may be present as family income, family history of anemia and dietary factors were based on patient's recalls. Finaly micronutrient (serum iron, folate, and vitb12) levels, which might be root causes of anemia, weren't assessed.

Conclusion

Anemia among women of childbearing age is sever public health problem in Al-Shihr district. The prevalence of anemia is higher than that estimated by WHO in Yemen in 2011.Duration of menstruation, using IUD as contraceptive device, past history of anemia and underweight were risk factors of anemia. Age group 25-35 was protective factor of anemia. Most women had mild degree anemia, that was of normocytic hypochromic type.

Recommendation

Mass interventions through large-scale community and primary care health programs focusing on awareness of proper and healthy diet and reproductive health to reduce the burden of anemia.in addition to large scale studies should be done to identify specific etiologies and root causes of anemia among this group by assessing serum micronutrients (serum iron, folate, and vit-b12 levels).early Identification of the risk factors should be considered in prevention and control strategies of anemia among NPW of childbearing age.

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