Medical and Research Publications
International Open Access

Research Article **Journal of MAR Gynecology (Volume 3 Issue 2)**

Anemia and Associated Factors Among Pregnancy Women

Dr. Sally Yaseen Kdair *.

Corresponding Author: Dr. Sally Yaseen Kdair, MBCHB. Higher Diploma in Obstetrics and Gynecology. Iraqi Ministry of Health, Al- Rusafa Health Directorate / Al- Numan General Hospital. Baghdad –Iraq.

Received Date: May 24, 2022

Published Date: June 01, 2022

Abstract

Anemia in pregnancy is a major public health problem in both low- and middle-income countries. This study aimed to assess the risk factors of anemia among pregnant women in Baghdad. A community based cross-sectional study was conducted among pregnancy women who attended the outpatient clinic in Baghdad city by convenience sampling. General questions regarding age, occupation, socioeconomic status, education, number of pregnancies, history of abortion, degree of anemia, contraceptive use, BMI and blood pressure were included. Frequencies and percentages used for descriptive variables. The findings revealed that the mean age of pregnant women was 24.8 with SD 6.9 and the highest percentage 63.7% of them were in the age groups 20 to 34 years old; 37.4% had primary education; 77.4% were housewives; 60.6% were living in middle SES and only 0.9% of them were smoker. Half of them had mild anemia and only 3.1% had severe anemic disease. In conclusion, majority of them had normal BMI; multipara, parous, one or more times of abortion. Few had a history of parasite infection. Need to enhances of pregnant women's knowledge about effects of anemia during pregnancy especially among those with low education, adolescent mothers and women of reproductive age in general.

Keyword: Anemia, Pregnancy, Risk, BMI, SES

Introduction

Anemia in considered a major public health problem and still has an important role in both mortality and morbidity among pregnant women, mainly in developing countries [1]. The World Health Organization (WHO) defines anemia as a condition in which the hemoglobin concentration of a woman during pregnancy is <11 g/dl [2-3]. The World Bank Group (WBG) estimates that the prevalence of Anemia among pregnant women in Iraq is nearly 38%, while the World Health Organization (WHO) estimates it approximately 31% in 2019[4]. In Africa, the prevalence of anemia was 57.1% among pregnant women, when the prevalence of anemia among pregnant women is 40.0% or more, it is considered as a severe public health problem [5]. During pregnancy, anemia increased more than fourfold from the first to third trimester [6]. It is a well-established fact that there is a physiological drop in hemoglobin Hb in the mid trimester, this physiological drop is attributed to increase of plasma volume and hence decrease of blood viscosity lead to better circulation in placenta [6].

The causes of anemia during pregnancy is multidimensional, however, in developing countries, it is predominantly nutritional deficiencies in iron, folate and vitamin B12. Other causes of anemia are loss of blood due to bleeding, failure of bone marrow to produce sufficient number of Red Blood Cells (RBCs) causing a plastic anemia, and parasitic diseases [7-8]. Different factors other than their awareness, behaviors and practices may also influence pregnant women's hemoglobin status, including socio-demographic variables such as employment , wages, parity, access to anemia therapy and even home toilet facilities associated with hook worm infestation [9]. Besides, inadequate intake of iron and folic acid during pregnancy has adverse neonatal outcomes such as; miscarriage, stillbirth, prematurity, low birth weight, congenital anomalies and perinatal morbidity and mortality [10-11]. Anemia in Pregnancy considered a significant public health problem; it has an essential role in disabled life and death of pregnant women and their future children, mainly in developing countries [12]. Emphasis should focus on pregnant women since they are especially at risk and health care providers must emphasis on teaching of pregnant women good long-term dietary habits as a part of an approach to health promotion [13]. Education and anemia attitude in pregnant women is considerably weak, which can be a major cause of problems related to pregnancy [14]. Therefore, proper awareness and educational programs about diet and lifestyle habits during pregnancy will reduce anemia prevalence rate [15-16]. This study aimed to assess the risk factors of anemia among pregnant women in Baghdad during the study period.

Methodology

A community based cross-sectional study was conducted between February and April 2022 among anemic women of reproductive age (14-49 years), who attended the outpatient clinic in Baghdad city. The sample consisted of 350 participants. The study protocol was approved by the ethical committee of the Iraqi Ministry of health. Women with malignancy or chemotherapy taken were excluded from this study. Convenience sampling was applied to recruit study participants. The data of the participants were collected through a self-constructed interview and each patient was asked to answer the questionnaire after explanation by the researchers in native language. General questions regarding age, occupation, socioeconomic status, education, number of pregnancies (including abortions and stillbirths), family history of anemia, contraceptive use, BMI and blood pressure were included. Questions related to the causes of anemia: Dietary habits (eating of fresh fruit, vegetables and meat), and supplement intake. Blood sample was taken for complete blood count include (hemoglobin level, Mean corpuscular hemoglobin (MCV), Mean corpuscular hemoglobin concentration (MCHC), and red cell distribution width (RDW), serum ferritin and ESR which measured by using Abbott 1000 hematological analyzer. According to World Health Organization definitions of anemia as hemoglobin less than 12.0 g/dL, and further categorized as mild (10.1–11.9 g/dL), moderate (7.9.0–9.0 g/dL) and severe <7.0 (SPSS statistics version 20) was used for data entry and analysis.

The continuous variables were visually inspected for normality using histograms and described using mean and standard deviation. Frequencies and percentages used for descriptive variables. Ethical approval a verbal informed consent was taken from participants before starting the interview and the name of each participant was registered.

Results

Out of 350 of pregnant women with anemic disease, the mean age was 24.8 with SD 6.9 and the highest percentage 63.7% of them were in the age groups 20 to 34 years old; 37.4% of them had primary education; 77.4% were housewives; 60.6% were living in middle SES and only 0.9% of them were smoker as shown in Table 1. Regard to degree of anemia, 54% of them had mild anemia; 42.9% had moderate of anemia and 3.1% of them had severe anemic disease [Table2]. In Table 3 we show the highest percentage 66.3% of them had multipara and 63.1% had parous of parity. 49.2% of them were in the 3rd stage of pregnancy and 48% had one or more times of abortion. While in table 4 we show the dietary characteristic of studied sample , 65.1% of them were rarely eating the fresh fruit and meat and 59.7% were take the supplement food. For BMI, 63.1% of them had normal weight; 22.9% had overweight and 8.9% had underweight. 80.6% of them had 90/60 to 140/90 Bp and 59.4% had normal conjunctiva color as shown in Table 5. In figure 1 show that 55.7% of them had history of using the contraceptive while 44.3% were not used. 5.7% of pregnant women had a history of parasite infection as shown in figure2.

Variables		Frequency (350)	Percent
Age	<20	82	23.4
	20-34	223	63.7
	≥35	45	12.9
	Mean age	24.8±6.9	
Education	Illiterate	25	7.1
	Read & write	28	8.0
	Primary	131	37.4
	Secondary	73	20.9
	Collage	93	26.6
Occupation	Housewives	271	77.4
	Employed	49	14.0
	Student	30	8.6
SES	Low	53	15.1
	Middle	212	60.6
Smoking	Yes	3	0.9
	Sometimes	4	1.1
	No	343	98.0

Table 1: Characteristics of studied sample

Degree of anemia	Frequency	Percent
Mild (10-11.4g/dl)	189	54.0
Moderate(7-9.9g/dl)	150	42.9
Severe (<7.0g/dl)	11	3.1
Total	350	100

Table 2: Degree of anemia among pregnant women

Variables		Frequency (350)	Percent
Gravid	Primipara	118	33.7
	Multipara	232	66.3
Parity	Nulliparous	129	36.9
	Parous	221	63.1
Gestational age	1st trimester	78	22.2
	2nd trimester	100	28.6
	3rd trimester	172	49.2
History of abortion	Zero	182	52.0
	>one	168	48.0

Table 3: Obstetric and maternal characteristics of the studied sample

Variables		Frequency (350)	Percent
Eating of fresh fruit, vegetable and meat	Regularly	122	34.9
	Rarely	228	65.1
Supplement intake	Yes	141	40.3
	No	209	59.7

Table 4: Dietary characteristics among pregnant women

Variables		Frequency (350)	Percent
BMI	Underweight (<18.5)	31	8.9
	Normal (18.5-24.9)	221	63.1
	Overweight (25-29.9)	80	22.9
	Obese (≥30)	18	5.1
Blood pressure mmHg	<90/60	21	6.0
	90/60 to 140/90	282	80.6
	>140/90	47	13.4
Conjunctiva color	Pallor	142	40.6
	Normal	208	59.4

Table 5: Medical and physical findings of the study

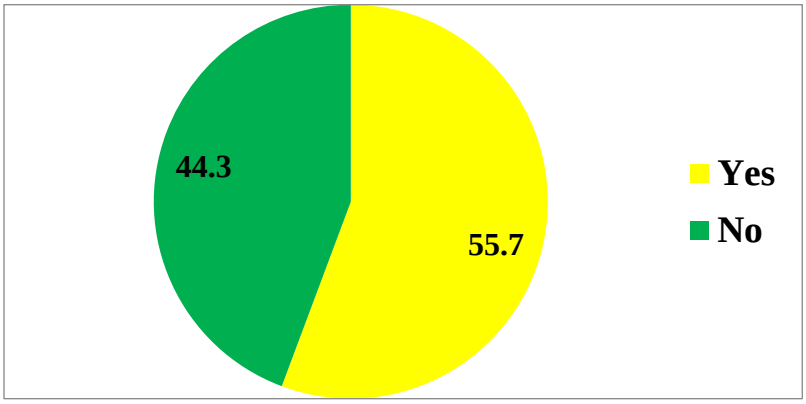

Figure 1: Bicart of contraceptive use among pregnant women

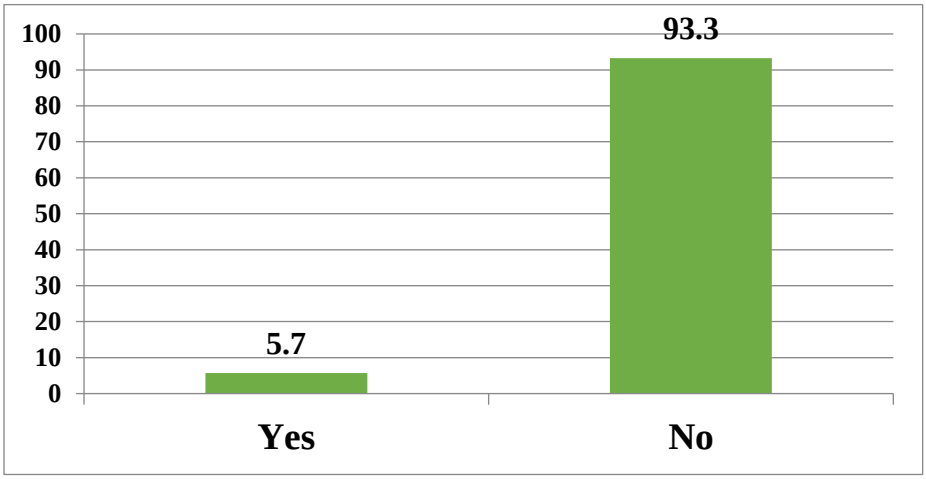

Figure 2: History of parasite infection among pregnant women

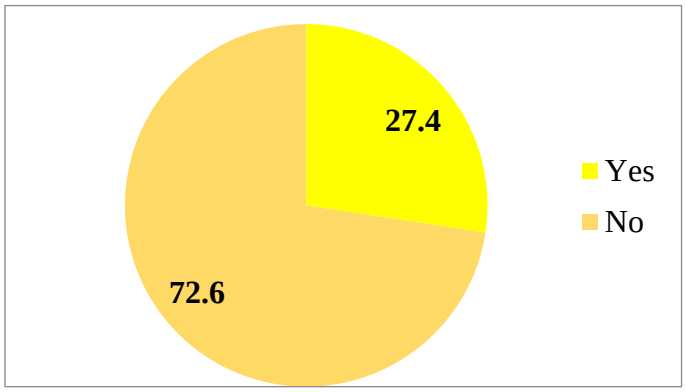

Figure 3: Bichart of previous operation among pregnant women

Discussion

In this study, we discovered that the proportion of pregnant women who were anemic and had a hemoglobin level less than 11gm/dl were about 46% which is considerably higher than the estimated rate of the WHO[17] and are nearly compatible with several local studies[18-19]. The prevalence of Anemia and level of Hemoglobin of pregnant women seem to be within similar values reflects the universal distribution of the problem and the similarity of the living conditions across the governorate. This high level of anemia prevalence is considered a severe public health problem according to the classification of the WHO [20], due to its associated impact on the general health of the community. In the present study ,the highest percentage 63.7% of pregnant women were in the age groups 20 to 34 years old; In comparison with other studies done it by Somali Region, East Ethiopia, were (49.1 %) of participant were in the age group (20 -24) years old [21], and a study done in Baquba Governorate / Iraq , the authors found the 30% in the age (25-29) years old[22]. Nguyen et al. report that, of the total change in Hb levels observed among pregnant women in India, 2% was attributable to an increase in average maternal age, which increased from 23.5 years to 29.4 years between 2006 and 2016 [23]. Similarly, Chakarbati et al. [24] observed that one additional year of age at pregnancy was associated with a 3.2% decrease in anemia prevalence, over a 10-year period. In Guinea, anemia prevalence among women of reproductive age was decreased significantly between 2005 and 2012, but only among women aged 20–29 years (2005: 54.9%; 2012: 49.1%) [25]. Similarly, in Bangladesh, Ara et al. [26] found that women aged 35 years and older had higher odds of being anemic compared to their younger counterparts between 2014 and 2017 (35–45 vs. 15–25: aOR = 1.72, CI: 1.00 to 2.97; >45 vs. 15–25: 2.18, 95% CI 1.15 to 4.12). However, in Zimbabwe, age was significantly and independently associated with anemia among WRA only in 2005, but not in 2010 or 2015 (40–44 vs. 20–24 aOR = 1.66, 95% CI 1.28 to 2.16; 45–49 vs. 20–24 aOR = 1.80, 95% CI 1.35 to 2.41)[27]. In this study, the highest percentage 37.4% of them had primary education; 77.4% were housewives; 60.6% were living in middle SES and only 0.9%

of them were smoker. Across sectional study in Ethiopia to assessing women's risk factors of iron deficiency anemia. Findings depicts that (30.5%) of mothers aged 23-27 years, (39.1%) were primary school educated, (46.1%) were housewives, (60.9%) were lives in small family, (46.1%) at middle level of economic status and lives in urban areas[26]. The same result was documented in retrospective case control study done in, it was observed that pregnant housewives were two times more likely to develop anemia than who have job, the possible reason may be that housewives may have financial constraint, work load and may not have early access to health care services. Nguyen et al. report that, of the total change in Hb levels observed among pregnant women in India, 24% was attributable to improvements in maternal education [23]. In Tanzania, Heckert et al. observed that 36% of the change in anemia prevalence among WRA was attributable to improvements in maternal education [28]. Over a ten-year period in India, one additional year of increase in maternal educational attainment was associated with a 1.8% decrease in anemia [24]. In Cambodia, improvement in maternal education between 2000 and 2014 was also associated with a decrease in the prevalence of anemia (adjusted β −0.08, 95% CI −0.13 to −0.03) [29]. Similarly in Ethiopia, the odds of anemia among lactating women who were employed outside the home decreased significantly between 2005 and 2011, compared to women who were not employed (aOR 0.71; 95% CI 0.63 to 0.80) [30]. The level of income and wealth determine a household's ability to access elements pivotal to the health and well-being of its members, including food and healthcare. Using regression-decomposition analysis, Nguyen et al. report that of the total change in Hb levels observed among pregnant women in India, 17% was attributable to a household's socioeconomic status [23]. In Tanzania, Heckert et al. observed that 36% of the change in anemia prevalence among WRA was attributable to an increase in household wealth (results were combined for household wealth and maternal education) [28]. Similarly, in Rwanda, Iruhiriye et al. reported that 7% of the observed change in anemia among women was accounted for by the increase in the number of assets owned by the household [31]. In addition, three additional studies observed a statistically significant trend in WRA anemia reduction and an increase in household wealth. In Cambodia, the increasing wealth index was significantly associated with the observed decrease in anemia prevalence between 2000 and 2014 (adjusted β −0.13, 95% CI −0.16 to −0.11) [29]. In Ethiopia, the odds of anemia among lactating women from the middle and rich wealth tertiles decreased significantly between 2005 and 2011, compared to women from the poorest tertile (aOR 0.83; 95% CI 0.70 to 0.98) [30]. In Guinea, between 2005 and 2012, the decrease in anemia prevalence was statistically significant for WRA from the highest household wealth quintile (2005: 50.4%; 2012: 42.8%) [25]. On the other hand, in India, states with lower per capita income and education among ≥15 years old in 201, experienced a greater and statistically significant reduction in anemia prevalence between 2010 and 2017 (annualized change: low SDI states = −0.98%; middle SDI states = −0.61%) [32].

The highest percentage 66.3% of them had multipara .The results of this study is different with other study found in Waist governorate, were (46.7 %) of study group had three and more pregnancies [33]. Also disagree with other studies done in Babylon teaching hospital, were the majority of the

study sample (59.0%) were gravidity numbers (3-4)[34]. And agree with study which reported regarding to Parity, the highest percentage (63.1%) for study group have (1-2) [22]. In India, between 2005 and 2015, the odds of anemia among nulliparous pregnant adolescent women (15–19 years) remained consistently higher compared to older women (20–49 years), even when an overall decrease in anemia prevalence among adolescent women was observed (2005: aOR = 1.19, 95% CI 1.05 to 1.37; 2015: aOR = 1.16, 95% CI 1.03 to 1.31) [35]. In addition to age, the number of children a woman has, as well as the interval between two consecutive pregnancies, is also directly associated with her nutritional status. Nguyen et al. report that, of the total change in Hb levels observed among pregnant women in India, 6% was attributable to the number of children under the age of five years that a woman had [23]. Having more than two children was also associated with higher odds of being anemic among pregnant women in Brazil, between 2002 and 2008 (>2 children vs. ≤2 aOR 1.61, 95% CI 1.36 to 1.91) [36]. Higher parity and short birth intervals are also known risk factors for anemia among WRA. In India, the authors found that, among pregnant women, a decrease in the number of children < 5 years accounted for 6% of the increase in measured Hb, observed between 2006 and 2016 [23]. Higher parity (>4 children) was also associated with the increased odds of anemia among women in Nepal in 2016, where anemia prevalence actually increased between 2006 and 2016 [37]. On the other hand, having more than one child was associated with a decrease in the odds of anemia in rural Western China in 2001 and 2005 [38]. One possible explanation for this contradictory finding could be China's family planning program during this time, which allowed for more than one child based on sub-population characteristics, such as socioeconomic conditions [39]. Therefore, it is possible that those families who chose to have more than one child belonged to a higher socioeconomic stratum. Parity had a mean of 1.0 birth (95% CI 0.9, 1.1). At the final Hb reading parous women were more likely to have anemia than nulliparous women. At both Hb readings, the grade of anemia increased with parity. An anemic woman with at least one previous birth was more likely to have Grades II to III anemia, than a nulliparous anemic woman at first and final Hb readings. Gravidity had a mean of 1.4 (95% CI 1.3, 1.5). At the final Hb reading the presence of anemia increased with gravidity such that a multigravid or grand multigravid woman was more likely to be anemic than a primigravid or secundigravid woman[40]. Whereas a history of single or recurrent abortion of case study group (48%) .Also the result is similar to what had been reported in West Ethiopia, were (85.3 %) & (91 %) of participant didn't have abortion [41]. Uche-Nwachi, 2010 found that, Of the 618 abortions studied, 55% were spontaneous and 45% induced [40]. The presence of anemia at the first Hb reading was not associated with spontaneous (p = 0.119) or induced abortions (p = 0.312). No association existed between the presence of anaemia at final Hb and induced abortions (p = 0.400). However, at final Hb reading persons with 2–3 spontaneous abortions were more likely to have anaemia than those who had one [40].

49.2% of them were in the 3rd stage of pregnancy and a study in India by Uche[40], the authors found the gestational age at first visit was inversely related to the presence of anemia at the first Hb reading.

Women whose first visit was during the second trimester (60.8%) were more likely to be anaemic at the first Hb reading than those who had their first visit during the first trimester (39.2%). In this study, 65.1% of them were rarely eating the fresh fruit and meat and 59.7% were taking the supplement food. Improved dietary intake, especially an increase in consumption of iron-rich foods, also predicted improvements in WRA anemia prevalence. The most significant improvements were observed in countries and regions that instituted large-scale food fortification initiatives, where the average annualized rate of reduction in WRA anemia was 4.4%. Overall, improvements in dietary diversity, especially increased consumption of animal-source foods, were associated with more modest decreases in anemia among WRA. This is not surprising, since the proportion of anemia attributable to iron deficiency varies across countries and regions. The relationship between the consumption of iron-rich foods and the prevalence of anemia is also observed in settings where the burden of disease increased between two time points. In India, anemia prevalence among WRA increased between 1998 and 1999 (52%) and 2005–06 (56%) [42]. However, the higher consumption of coarse cereals, which are high in iron, was significantly associated with lower anemia prevalence [42].

For BMI, in this study, 63.1% of them had normal weight; 22.9% had overweight and 8.9% had underweight. In Brazil, between 2002 and 2008, pregnant women who were of normal weight, or overweight/obese, had significantly lower odds of being anemic, compared to women who were underweight (normal vs. underweight aOR 0.79, 95% CI 0.66 to 0.94; overweight/obese vs. underweight aOR 0.42 95% CI 0.42 to 0.66) [36]. Similarly in Ethiopia, between 2005 and 2011, lactating women with a normal weight had lower odds of suffering from anemia, compared to women who were underweight (aOR 0.78; 95% CI 0.68 to 0.89) [30]. In Guinea, between 2005 and 2012, the decrease in anemia prevalence was also statistically significant for WRA compared with normal weight (2005: 53.2%; 2012: 49.5%), and those who were overweight/obese (2005: 50.9%; 2012: 42.7%), but not for underweight WRA [25]. And in Zimbabwe, women whose BMI was > 30 had consistently lower odds of being anemic between 2005 and 2015, compared to women with normal weight (2005: aOR = 0.68, 95% CI 0.54 to 0.86; 2010: aOR = 0.61, 95% CI 0.52 to 0.72; 2015: aOR = 0.75, 95% CI 0.65 to 0.88) [27]. In the present study, 55.7% of them had history of using the contraceptive while 44.3% were not used. The relationship between contraceptive use and the reduction in anemia among WRA was also observed in countries where the burden of disease increased. In Nepal, for example, even though anemia prevalence increased from 35% in 2006 to 40% in 2016, the use of hormonal contraceptives was associated with a decrease in the odds of anemia compared to not using any contraception [37]. In the present study, 5.7 % of cases had history of parasite infection and compared with a study done it in Ethiopia, the authors reported (99% &41.4%) have a parasitic infection [43]. In this study, 27.4% of them had a history of operation and compared with a study done in Al-Hilla city in Babel[44] , they reported the association between the previous health and current health history and risk factor of anemia during pregnancy, women with history of previous operations (mainly Caesarean

Section) were at risk of 2.4 times to have anemia during pregnancy (OR=2.38) and also risk if 21 times if she had a history of parasitic infections (intestinal worm and malaria) (OR=21.15) .

The finding of this study is in agreement with a study which state excessive blood loss from previous caesarean sections leads to iron storage depletion and causes iron deficiency anemia which commonly occurs in pregnant women with women who give birth by caesarean section [44-45]Also, the finding is in agreement with a which found the mothers who were infested by parasitic infection were 3.7 times more likely to develop anemia than those who were not infested by parasitic infection during the current pregnancy. This could be due to blood loss caused by parasitic infestations that might put mothers at high risk of iron deficiency anemia [46].

Conclusion and Recommendation

The present study concluded that there was a association between risk factor of anemia during pregnancy and socio-demographic characteristics of housewives occupation, reproductive history characteristics (primipara , having one or more abortion and short birth interval of less than 2 years), and finally previous and current health history, women with history of previous operations and also risk if she had a history of parasitic infections. Future research should aim to capture more comprehensive information on the country-specific etiology of anemia among WRA. More comprehensive and harmonized data collection would enable a comparison of the disease burden across countries and geographies, as well as providing targeted recommendations for each country and region where the prevalence of anemia among WRA remains high.

References

1. WHO. “WHO EMRO | Hepatitis | Health Topics.” N.p., (2020)11. Mar. Web.

2. Jufar, H. and Zewde, T. Prevalence of Anemia among pregnant women attending antenatal care at Tikur Anbessa Specialized Hospital. Journal of Hematology and Thrombotic Diseases.2014; 2(1): 1–6. 3.

3. Gedefaw, J., Ayele, A., Asres, Y., and Mossie, A. Anaemia and associated factors among pregnant women attending antenatal care clinic in Walayita Sodo town, Southern Ethiopia, Ethiopian Journal of Health Sciences. 2015; 25(2):155–162.

4. World Bank. (2019). Prevalence of Anemia among pregnant women (%), Iraq. Available at: https://data.worldbank.org/indicator/SH.PR5.

5. Okube, O., Mirie, W., Odhiambo, E., Sabina, W. and Habtu, M. (2016) Prevalence and Factors Associated with Anaemia among Pregnant Women Attending Antenatal Clinic in the Second and Third Trimesters at Pumwani Maternity Hospital, Kenya. Open Journal of Obstetrics and Gynecology, 6, 16-27

6. Tan, F., Xia, Y., Zhang, W., & Jin, X. (2013). Cascading failures of loads in interconnected networks under intentional attack. EPL (Europhysics Letters), 102(2), 28009.

7. Salhan, S., Tripathi, V., Singh, R., &Gaikwad, H. S. (2012). Evaluation of hematological parameters in partial exchange and packed cell transfusion in treatment of severe anemia in pregnancy. Anemia, 2012.

8. Chaparro, C. M., &Suchdev, P. S. (2019). Anemia epidemiology, pathophysiology, and etiology in low- and middle-income countries. Annals of the New York Academy of Sciences, 1450(1), 15.

9. Nivedita K., Shanthini N. (2016). Knowledge, attitude and practisces of pregnant women regarding anemia, iron rich diet and iron supplement, RJRCOG, 5(2):120404.

10. Iuga AOMM. Adherence and health care costs. Risk Manag Healthcare Pol. 2014;4(7):35

11. Sendeku, F. W., Azeze, G. G., & Fenta, S. L. (2020). Adherence to iron-folic acid supplementation among pregnant women in Ethiopia: a systematic review and meta-analysis. BMC pregnancy and childbirth, 20(1), 138.

12. Yadav, U. K., Ghimire, P., Amatya, A., & Lamichhane, A. (2021). Factors Associated with Anemia among Pregnant Women of Underprivileged Ethnic Groups Attending Antenatal Care at Provincial Level Hospital of Province 2, Nepal. Anemia, 2021.

13. Hussain, A. M., Kadhem, Q. I., & Hussain, N. A. (2020). Prevalence of anaemia in a sample of pregnant women in Babylon Governorate, Iraq. Revista Latinoamericana de Hipertension, 15(4), 275-279.

14. Girma, S., Teshome, T., Worku, M., Solomon, T., Kehulu, S., Aman, R., ... & Gezahegn, H. (2020). Anemia and Associated Factors Among Pregnant Women Attending Antenatal Care at Madda Walabu University Goba Referral Hospital, Bale Zone, Southeast Ethiopia. Journal of Blood Medicine, 11, 479.

15. Chacko, R., Premkumar, U., Josephet, M. et al ., (2016) . Knowledge, attitude, and practice of anemia among pregnant women in government hospital, Indo American Journal of Pharmaceutical Research. 6(11):6988-6992.

16. Suryanarayana, R., Chandrappa, M., Santhuram, A. N., Prathima, S., & Sheela, S. R. (2017). Prospective study on prevalence of anemia of pregnant women and its outcome: A community based study. Journal of family medicine and primary care, 6(4), 739–743.

17. Geneva. “WHO. The Global Prevalence of Anaemia in 2011.” World Health Organization 9.ISBN 978 92 4 156496 0 (2015):43.

18. Haidar J. Prevalence of anaemia, deficiencies of iron and folic acid and their determinants in ethiopian women. J Health Popul Nutr.2010;28(4):359, 68.

19. Khalaf M, Khider D, Kama B. (2018). Anemia in Pregnant Women in Kirkuk Governorate. SAS J. Med; 4(8): 108-115.

20. Challa S, Amirapu P. Surveillance of Anaemia: Mapping and Grading the High-Risk Territories and Populations. J Clin Diagn Res. 2016;10(6):LC01–LC6.

21. Osman, M. O., Nour, T. Y., Bashir, H. M., Roble, A. K., Nur, A. M., &Abdilahi, A. O. (2020). Risk Factors for Anemia Among Pregnant Women Attending the Antenatal Care Unit in Selected Jigjiga Public Health Facilities, Somali Region, East Ethiopia 2019: Unmatched Case–Control Study.Journal of Multidisciplinary Healthcare,13, 769.10.

22. Qadessia.D&Rabea.M, (2019). Effectiveness of Instruction Program on Pregnant Women’s Knowledge regarding Anemia at Primary Health Care Centers in Baquba City.Iraqi National Journal of Nursing Specialties,32(2), 19-29

23. Nguyen P.H., Scott S., Avula R., Tran L.M., Menon P. Trends and drivers of change in the prevalence of anaemia among 1 million women and children in India, 2006 to 2016. BMJ Glob. Health. 2018;3:e001010.

24. Chakrabarti S., George N., Majumder M., Raykar N., Scott S. Identifying sociodemographic, programmatic and dietary drivers of anaemia reduction in pregnant Indian women over 10 years. Public Health Nutr. 2018;21:2424–2433.

25. Wirth J., Woodruff B.A., Mamady D., Beauliere J.M., Ayoya M., Rohner F., Teta I. Nutrition trends in the past fifteen years in Guinea: Secondary analysis of cross-sectional data on children, adolescent girls and women. Afr. J. Food Agric. Nutr. Dev. 2019;19:14889–14915.

26. Ara G., Khanam M., Rahman A.S., Islam Z., Farhad S., Sanin K.I., Khan S.S., Rahman M.M., Majoor H., Ahmed T. Effectiveness of micronutrient-fortified rice consumption on anaemia and zinc status among vulnerable women in Bangladesh. PLoS ONE. 2019;14:e0210501.

27. Gona P.N., Gona C.M., Chikwasha V., Haruzivishe C., Mapoma C.C., Rao S.R. Intersection of HIV and Anemia in women of reproductive age: A 10-year analysis of three Zimbabwe demographic health surveys, 2005–2015. BMC Public Health. 2021;21:41.

28. Heckert J., Headey D.D., Ndiaye B., Brero M., Assey V. Analysis of the Drivers of Change in Women's Anemia in Tanzania 2005–2015. International Food Policy Research Institute (IFPRI); Washington, DC, USA: 2019.

29. Greffeuille V., Sophonneary P., Laillou A., Gauthier L., Hong R., Hong R., Poirot E., Dijkhuizen M., Wieringa F., Berger J. Inequalities in Nutrition between Cambodian Women over the Last 15 Years (2000–2014) Nutrients. 2016;8:224.

30. Lakew Y., Biadgilign S., Haile D. Anaemia prevalence and associated factors among lactating mothers in Ethiopia: Evidence from the 2005 and 2011 demographic and health surveys. BMJ Open. 2015;5:e006001.

31. Iruhiriye E., Olney D.K., Ramani G.V., Heckert J., Niyongira E., Frongillo E.A. Stories of Change—Rwanda, Final Report. International Food Policy Research Institute (IFPRI); Washington, DC, USA: 2019.

32. India State-Level Disease Burden Initiative Malnutrition Collaborators The burden of child and maternal malnutrition and trends in its indicators in the states of India: The Global Burden of Disease Study 1990–2017. Lancet Child Adolesc. Health. 2019; 3:855–870.

33. Zaman, A, H. (2020). Knowledge, attitude and practices among pregnant women about antenatal care, danger sign during pregnancy and adopting family planning method.Journal of Preventive Medicine and Holistic Health,4(1), 10-15.

34. Ameen, W. A. (2019). Safety Measurement among Pregnant Women with Anemia at Babylon Teaching Hospital.Indian Journal of Public Health,10(6), 383.

35. Bellizzi S., Pichierri G., Panu Napodano C.M., Salaris P., Fiamma M., Fozza C., Cegolon L. Iron deficiency anaemia and low BMI among adolescent girls in India: The transition from 2005 to 2015. Public Health Nutr. 2020;24:1577–1582.

36. Fujimori E., Sato A.P., Szarfarc S.C., Veiga G.V., Oliveira V.A., Colli C., Moreira-Araújo R.S., Arruda I.K., Uchimura T.T., Brunken G.S., et al. Anemia in Brazilian pregnant women before and after flour fortification with iron. Rev. Saúde Pública. 2011;45:1027–1035.

37. Rai A., Khan M.N., Thapa S. Trends and determinants of anaemia in women of Nepal: A multilevel analysis. Matern. Child Nutr. 2020;16:e13044.

38. Pei L., Ren L., Wang D., Yan H. Assessment of maternal anemia in rural Western China between 2001 and 2005: A two-level logistic regression approach. BMC Public Health. 2013;13:366.

39. Qin M., Falkingham J., Padmadas S.S. Unpacking the Differential Impact of Family Planning Policies in China: Analysis of Parity Progression Ratios from Retrospective Birth History Data, 1971-2005. J. Biosoc. Sci. 2018;50:800–822.

40. Uche-Nwachi, E. O., Odekunle, A., Jacinto, S., Burnett, M., Clapperton, M., David, Y., Durga, S., Greene, K., Jarvis, J., Nixon, C., Seereeram, R., Poon-King, C., & Singh, R. (2010). Anaemia in pregnancy: associations with parity, abortions and child spacing in primary healthcare clinic attendees in Trinidad and Tobago. African health sciences, 10(1), 66–70.

41. Birhanu, D.T, Atomssa, E.M., &Mengist, H. M. (2019). Determinants of anemia among pregnant women attending antenatal care in HoroGuduruWollega Zone, West Ethiopia: Unmatched case-control study.PloS one,14(10), e0224514

42. DeFries R., Chhatre A., Davis K.F., Dutta A., Fanzo J., Ghosh-Jerath S., Myers S., Rao N.D., Smith M.R. Impact of Historical Changes in Coarse Cereals Consumption in India on Micronutrient Intake and Anemia Prevalence. Food Nutr. Bull. 2018; 39:377–392.

43. Berhe, K., Fseha, B., GebrehiwotGebremariam, H. T., Etsay, N., Welu,G., &Tsegay, T. (2019). Risk factors of anemia among pregnant women attending antenatal care in health facilities of Eastern Zone of Tigray, Ethiopia, case-control study, 2017/18.The Pan African Medical Journal,34.

44. Ishraq Ahmed chiad, A. J. D. R. S. G. (2021). Factors Associated with Anemia in Pregnant Women Attending Primary HealthCare Centers in Al – Hilla City. Annals of the Romanian Society for Cell Biology, 25(6).

45. Ojukwu et al. (2018). Determinants and Patterns of Anemia in Pregnancy at Booking in Federal Medical Center Owemi, South East Nigeria, 33(2):1–1329.

46. Argaw B, Argaw-Denboba A, Taye B, Worku A, Worku A. (2015). Major risk factors predicting anemia development during pregnancy: unmatched-case control study. J Community Med Health Educ.2015;5(353):2161–0711.