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مدى انتشار فقر الدم وعوامل الخطر المرتبطة به بين النساء الحوامل في مدينة العزيزية، العراق

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المستخلص:

فقر الدم أثناء الحمل يُعدّ مشكلة صحية عامة رئيسة، اذ يؤثر على ٣١٪ من النساء الحوامل في العراق، ونحو نصف مليار امرأة حول العالم، مما يؤدي إلى نتائج سلبية على الأمهات والمواليد. هدفت هذه الدراسة إلى تحديد معدل انتشار فقر الدم بين النساء الحوامل وتحديد العوامل الديموغرافية المحتملة التي تسهم في هذه الحالة. **المواد وطرائق العمل:** شملت هذه الدراسة ٢١٣ امرأة حامل تتراوح أعمارهن بين ١٦ و٤٣ عامًا من مدينة العزيزية في العراق، وأُجري لهن تحليل عدّ دموي كامل خلال الفترة من يوليو إلى أكتوبر ٢٠٢٤. **النتائج:** أظهرت النتائج أن متوسط مستويات الهيموغلوبين وقيم حجم الخلايا المعبأة لدى النساء الحوامل كان ١٠.٧٢٩ ± ٠.٨١٧٦ غرام/ديسيلتر و٣٣.٢٩٥ ± ٢.٤٤٦على التوالي. من بين المشاركات، كانت ٧٤ امرأة في حملهن الأول، اذ بلغ متوسط مستوى الهيموغلوبين وقيمة حجم الخلايا المعبأة لديهن ١١.٢١٧ ± ٠.٧٧١ غرام /ديسيلتر و٣٤.٩٥٩ ± ٢.٤٢٤% على التوالي. ومن اللافت أن ١٣٩ امرأة لديهن تاريخ حمل سابق كنّ يعانين من مستويات هيموغلوبين وقيم حجم خلايا معبأة أقل. بلغ معدل انتشار فقر الدم ٣٠٪ بين

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النساء تحت سن العشرين، وكان أعلى بكثير بين النساء فوق سن العشرين. كما كان فقر الدم أكثر شيوعًا بين النساء اللاتي لديهن تاريخ حمل سابق (٦٩.٣٤%، ٩٥ من ١٣٩) مقارنة بالحوامل لأول مرة (٢٧٪، ٢٠ من ٧٤). **الاستنتاجات:** النساء الحوامل فوق سن العشرين واللائي لديهن تاريخ سابق من الحمل معرضات بشكل أكبر لخطر الإصابة بفقر الدم مقارنة بالنساء الأصغر سنًا اللائي لا يملكن مثل هذا التاريخ.

الكلمات المفتاحية: فقر الدم؛ الحمل؛ النساء الحوامل؛ مستويات الهيموغلوبين؛ حجم الخلايا المضغط.

Prevalence of Anemia and Associated Risk Factors Among Pregnant Women in Al-Aziziyah City, Iraq

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Abstract

Anemia during pregnancy is a major public health concern, affecting 31% of pregnant women in Iraq and nearly half a billion women worldwide, which leads to adverse maternal and neonatal outcomes. This study aimed to quantify the frequency of anemia in pregnant women and identify potential demographic factors contributing to this condition. Materials and Methods: This study involved 213 pregnant women aged 16-43 in Al-Aziziyah City, Iraq, who underwent a complete blood count test from July to October 2024. Results revealed that pregnant women had average hemoglobin levels and packed cell volume values of (10.729 ± 0.8176 g/dL and 33.295 ± 2.446), respectively, among the participants, 74 were first-time mothers, with mean

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Hb levels and PCV values of (11.217 ± 0.771) g/dL and (34.959 ± 2.424), respectively. Interestingly, 139 women with a history of previous pregnancies had lower mean Hb levels and PCV values. Anemia prevalence was 30% among women under 20 and significantly higher among those over 20. Anemia was also more common among women with previous pregnancies (69.34%, 95/139) compared to first-time pregnancies (27%, 20/74). Conclusions: Pregnant women over 20 years with a history of previous pregnancies have a higher risk of anemia compared to younger women without such history.

Keywords: Anemia; Pregnancy; Pregnant women; Hemoglobin levels; Packed Cell Volume.

Introduction

Anemia during pregnancy is a significant public health concern, particularly in developing countries, due to its association with adverse maternal and neonatal outcomes. The World Health Organization (WHO) defines anemia in pregnancy as a hemoglobin level below 11 g/dL (Adam et al., 2018). Globally, around half a billion women of reproductive age were affected, with 31% of pregnant women in Iraq experiencing anemia(Kadhim, 2023). In India, prevalence increases from 51.1% in the first trimester to 70.7% in the third(Locks et al., 2024), while in China, 30.7% of pregnant women were anemic, with iron deficiency anemia (IDA) accounting for 17.3% of cases (Zhou et al., 2024). Iron deficiency is the leading cause, responsible for about 50% of cases, though vitamin deficiencies (A, B12, C, D, E, folate, zinc, riboflavin, and copper), infections like HIV, schistosomiasis, and hookworm, and *Helicobacter* infection also contribute(Rashid et al., 2023). Risk factors include maternal age, birth spacing, nutritional status, prenatal care, iron supplement adherence, education, parasitic infections, and chronic diseases (Sari et al., 2024). Anemia increases risks of preterm birth, low birth weight, perinatal mortality, cardiovascular issues, fatigue, immune suppression, preeclampsia, and placental abruption(Rizwan & Memon, 2010). Additionally, affected women may suffer from respiratory difficulties, irregular heartbeats, infections, postpartum cognitive impairment, and depression (Kadhim,

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2023). Prevention and management strategies include improving iron intake through diet, supplementation, and food fortification, alongside public health measures such as birth spacing education, improved nutrition, sanitation, immunization, and diarrheal disease control (Nagar & Rachel, 2018). Addressing these factors is essential to reducing maternal and neonatal complications. In Iraq, a study by Al-Badri et al. (2022) demonstrated that the anemia in patients with diabetes mellitus associted with fungal infection . Additionally . The decrease in blood levels in pregnant women leads to the occurrence of various diseases, as immunity is affected by this decrease (Abdullah *et al* ., 2021).

However, anemia during pregnancy remains a significant concern in both American and European populations. A French observational study by Harvey et al. (2016) involving 1,506 pregnant women found an anemia prevalence of 15.8%, increasing as pregnancy progressed, with nearly 60% at moderate or high risk of iron deficiency. Similarly, a multicenter Austrian study by Zeisler et al. (2021) reported iron deficiency rising from 12.2% in early pregnancy to 65.7% in later stages, emphasizing the need for routine screening. In the Netherlands, van den Broek et al. (2008) discovered that pregnant women of non-Northern European descent had a significantly higher anemia prevalence, with a relative risk of 5.9 at booking and 22 at 30 weeks gestation compared to Northern European women. In the United States, a study by Zhang et al. (2023) found an overall anemia prevalence of 26.7% among pregnant women, with Black women showing a higher risk across all trimesters compared to White women, while Asian women had the lowest risk in the third trimester. These studies highlight both the widespread nature of anemia in pregnancy and the influence of demographic factors, underscoring the importance of early detection and tailored interventions.

Finally, this study aimed to determine the prevalence of anemia among pregnant women and to ascertain some demographic characteristics that may be associated with anemia.

Materials and Methods

Study Design

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The study was conducted on 213 pregnant women aged 16-43 who attended the gynecology consultation at Al-Aziziyah General Hospital from July to October 2024 in Al-Aziziyah City, Wasit Governorate, Iraq. Blood samples were collected from the patients to perform a complete blood count (CBC) test.

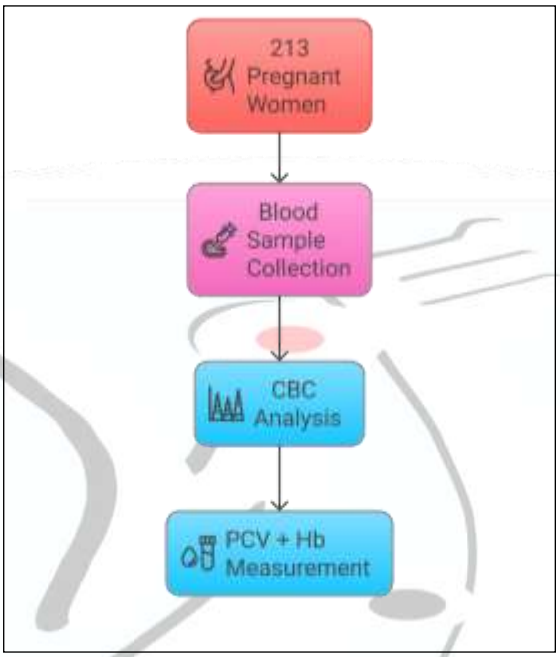

Figure1: Blood Analysis Process for Pregnant Women

Data Collection

Information was collected directly from the pregnant women, and the participants' consent was obtained to complete the study. The questionnaire criteria included socio-demographic characteristics and age. Pregnant women were divided based on pregnancy into first-time pregnant women and multiparous (multiple-time pregnant) women.

Laboratory Evaluation

The participants in this study had their venous blood drawn and then transferred to an EDTA tube with a volume of three milliliters. A complete blood count (CBC) test was conducted in the laboratory by placing it directly on the shaker equipment for three to five minutes. A Sysmex XN-350, a fully automated blood analyzer, was used to perform the complete blood count

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test, Packed cell volume (PCV) and hemoglobin concentration (Hb) were the parameters that were examined.

Statistical Analysis

The SPSS 21.0 program, developed by SPSS Inc. and located in Chicago, Illinois, USA, was used for that purpose. S = significant difference ($P < 0.05$), HS = highly significant difference ($P < 0.01$), and NS = non-significant difference were the significant (P-value) comparisons in any test. The analysis of variance (ANOVA) test was employed to ascertain any differences between the groups that were under investigation.

Results and Discussion

The mean Hb levels and PCV values of pregnant women were (10.73±0.8176 g/dL), (33.3±2.446%) respectively, and among the 213 pregnant women, 74 women who experienced pregnancy for the first time, their mean Hb levels and PCV values were (11.22±0.771 g/dL), (34.96±2.424%) respectively, while the number of women with previous pregnancy was 139 women, their mean Hb levels and PCV values were (10.46±0.711 g/dL), (32.32±2.803%) respectively (Figure-1).

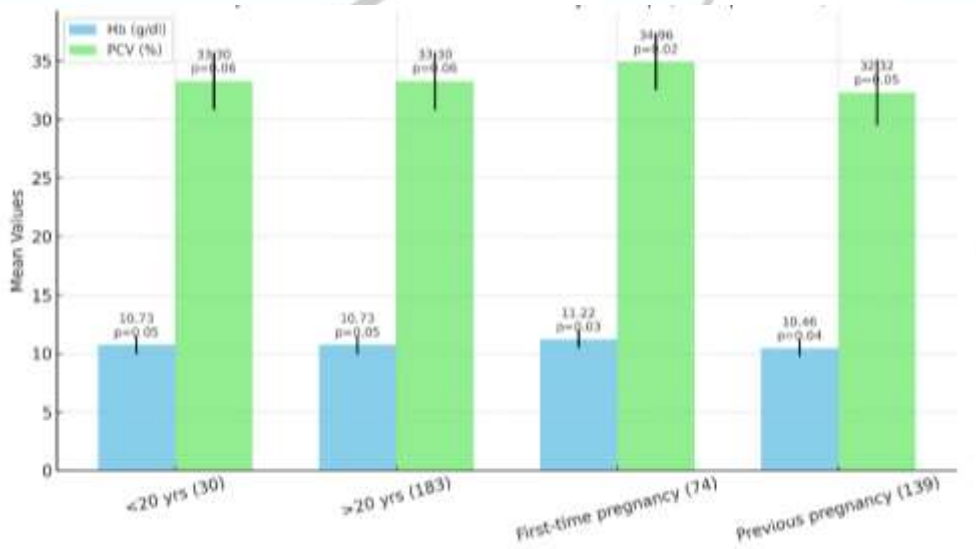

Figure 1: Comparison of Hb and PCV levels in the women pregnant

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Anemia is a significant public health issue worldwide(Sharma et al., 2020). In this study of 213 pregnant women aged 16–43 years, the mean total hemoglobin level was 10.729 g/dL, which is below the normal range and suggests the presence of anemia. Thapa and Dowerah (2024) tested 310 pregnant women ranging in age from 15 to 45 and found similar things. Anemia affected 89.68% of the women in the study. The average hemoglobin level was highest in the first trimester (9.14 g/dL) and lowest in the third trimester (8.90 g/dL)(G. Thapa & Dowerah, 2024). Other studies show that hemoglobin levels fall during pregnancy. In Sudanese women, mean hemoglobin levels were 11.3 g/dL in the first trimester, 11.4 in the second, and 10.3 in the third, demonstrating hemodilution causes a considerable decline(Elmadih et al., 2022). In a Nigerian study, hemoglobin levels dropped from 11.20 g/dL in the first trimester to 10.47 in the third (Osoagbaka et al., 2000).

Interestingly, Eltayeb*et al*. (2023) discovered that obese pregnant women had higher hemoglobin levels and reduced anemia rates than non-obese women (Eltayeb et al., 2023). In pregnancy, iron deficiency from increased dietary needs for fetal development and maternal blood volume expansion causes anemia (Benson & Smid, 2022 ;Leke & Kremp, 1989). Low and high hemoglobin levels during pregnancy were health risks, thus food and medication must be maintained to maintain optimum levels (Haram et al., 1997; Jung et al., 2019).

In this study, the mean packed cell volume (PCV) was 33.295%, which is below the normal range, supporting anemia. Studies found that 86.6% of anemic pregnant women had low PCV values (H. Hameed et al., 2018). Other investigations found mean PCV levels of 33.35% in Sudanese women and 32.54% to 30.30% in Nigerian women in the third trimester (Elmadih et al., 2022 ;Osoagbaka et al., 2000). In addition to iron, foliate and vitamin B12 deficits can lower PCV. Red blood cell formation requires certain nutrients, and shortage can cause anemia (Wahed et al., 2008). A more thorough physiological and pathological approach is needed, as nutritional and viral problems were associated to decreased PCV in pregnant women. Anemia can be treated with iron supplementation, but not fully.

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Long-term health difficulties and infections can contribute. Identifying pathogenic reasons of low PCV and spontaneous hemodilution during pregnancy is crucial. These issues must be addressed and comprehensive treatment solutions created to treat anemia in pregnant women.

Based on Hb levels, the number of anemic women under 20 years of age was 9 (30%) out of 30 women, while the number of anemic women over 20 years of age was 106 (57.92%) out of 183 women, while the number of anemic women who were experiencing pregnancy for the first time was 20 (27%) out of 74 women, while the number of women with previous pregnancy was 95 (69.34%) out of 139 women. The results were statistically significant (P-value = 0.01), as shown in Table-1

Table-1: Distribution of anemia (Hb> 11 g/dl) by characteristics of pregnant women.

Characteristics	Prevalence of anemia (n, %)	P-value
Age <20 Yrs (30)	**9 (30%)**	**0.01****
Age >20 Yrs (183)	**106 (57.92%)**	
First-time pregnancy (74)	**20 (27%)**	**0.01****
Previous pregnancy (139)	**95 (69.34%)**	

According to Table 1, both age and the number of pregnancies was significant factors associated with an increased risk of anemia in pregnant women. The study showed women under 20 years of age had a lower prevalence of anemia (30%) compared to women over 20 years old (57.92%), which suggests that older pregnant women in this sample were at a higher risk of anemia. Additionally, to confirms what previous research has shown: that anemia was more common in mothers who were older, especially in the 20–40 age bracket. Decreases in erythropoiesis and metabolism with age may be responsible for this rise, which in turn can impact overall blood health (H. Hameed et al., 2018). The age range of 21–30 years comprised the bulk of the anemic women in Sagar, India (Biswas et al., 2023). Conversely, It was discovered that older women in Turkey had greater hemoglobin levels, suggesting a lower occurrence of anemia (Yalçın et al., 2024).

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Interestingly, according to other research, anemia is more common among pregnant women who were younger. For example, in Nepal, the frequency of anemia was higher among women aged 16–19 than among older age groups(B. Thapa et al., 2022), and similarly, there was an increased prevalence of anemia among women under the age of 20 in Bali (Wati & Aristasari, 2024). Anemia was more common in areas with poor socioeconomic position and high rates of illiteracy, especially among younger women who may lack the resources to combat the disease(Kumar, 2019 ;Dogra, 2020). Therefore, as a means of dealing with anemia Regular prenatal care and dietary education were crucial for the management of anemia in all age groups. Prenatal care and nutrition instruction should be provided often to all age groups(Bansal et al., 2020). A number of factors, including age, intersect to determine the prevalence of anemia; these include dietary status, parity, and access to healthcare. Regardless of age, factors such as grand multiparity and short interpregnancy intervals significantly increase the incidence of anemia (Khan Galzie & Imtiaz Rasool, 2022).

The current study found that multiparous women were more prone to acquire anemia than primiparous women; the prevalence of anemia was 27% in women experiencing their first pregnancy, compared to a much higher incidence of 69.34% in women with previous pregnancies. This confirms what previous research has shown: a robust association between anemia and increased parity. As an example, more than 63% of women in Bangladesh who suffered from anemia were mothers of multiples (Alam et al., 2021), whereas in Turkey, the risk of anemia during a subsequent pregnancy was higher for women who had experienced it during a prior pregnancy (Yalçın et al., 2024). Another study conducted in Dhaka found that compared to primigravida women (47.14%), multigravida women (62.28%) had a higher prevalence of anemia.(Rahman et al., 2017). Due to the cumulative nutritional depletion that happens with recurrent pregnancies, particularly in environments with inadequate nutritional assistance, the increased incidence in multiparous women can be explained by this.(Biswas et al., 2023 ;Devi et al., 2020). Moreover, Women whose pregnancies were spaced less than a year apart were at a higher risk of anemia because their bodies do not have

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enough time to store iron and folic acid, two nutrients that were critical for keeping hemoglobin levels healthy(Vanamala et al., 2018).

In a study included 74 women who were pregnant for the first time, the average hemoglobin (Hb) levels were 11.217 ± 0.771 g/dL and the PCV values were 34.959 ± 2.424. These numbers were determined to have a substantial statistical impact (P-value = 0.0001). Similarly, for women with a previous pregnancy (n = 139), the mean Hb levels and PCV values were 10.455 ± 0.711 g/dL and 32.317 ± 2.803, respectively, with statistically significant results (P-value = 0.0001), as shown in Table 2.

Table2: Hemoglobin and Packed Cell Volume Levels Among Pregnant Women in the Study Groups

Group	Hb level (g/dl)	PCV %	P-value
First-time pregnancy (74)	11.217 ± 0.771	34.959 ± 2.424	0.0001***
Multi (139)	10.455 ± 0.711	32.317 ± 2.803	0.0001***

In the current study, higher Hb and PCV levels in first-time pregnant women may reflect cumulative undernutrition compared to those with prior pregnancies. The Hb and PCV values suggest mild to moderate anemia, particularly among women with previous pregnancies, consistent with findings that hemoglobin levels tend to be higher in first pregnancies due to the increased nutritional demands and physiological changes associated with multiple pregnancies (Imia, 2020) .Hemoglobin levels typically decrease as pregnancy progresses, reaching their lowest point before rising in the final two months, and tend to decline further in subsequent pregnancies(A. H. Hameed & Abbas, 2018).

The current study found lower hemoglobin concentrations in multigravida women (10.455± 0.711 g/dL) compared to primigravida women (11.217 ± 0.771 g/dL), in line with a study from Ethiopia, which attributed the decrease to repeated pregnancies affecting red blood cell formation and the increased blood volume causing hemodilution(Feleke & Feleke, 2020). However, a study by Yoon et al. (2014) found lower

hemoglobin levels in first-time mothers (12.1 ± 0.821g/dL) compared to those with multiple pregnancies (13.2 g/dL), suggesting increased nutritional stress in first pregnancies(Yoon et al., 2014). Despite this, multiple pregnancies pose higher risks of anemia and complications(Lazarov et al., 2016).

Similarly, PCV values were lower in multigravida women (32.317%) than in primigravida women (34.959%), with anemia more prevalent in multigravida women due to cumulative nutritional demands and physiological stresses(Nidhi & Jha, 2023). Parity influences hematological responses to supplementation, as women with lower parity show a greater response to hematinics, while higher parity women show a diminished response due to factors like increased plasma volume expansion(Foo & Somsiah, 1991). Studies have also shown that PCV levels significantly decrease during the second and third trimesters, mainly due to dietary iron deficiency, which is more pronounced in women with higher parity(Wahed et al., 2008).

There was a statistically significant difference between the groups in terms of both Hb and PCV (P 0.0001). These results were consistent with research by(Nirmala et al., 2015),and this is corroborated by research out of Nigeria that found multigravida women to have much lower hemoglobin levels and a higher prevalence of anemia (Eze et al., 2024). Additionally, a study conducted by Nija and Kuril (2024) established a strong correlation between multiple pregnancies and an increased frequency of anemia. The researchers identified a significant association between the two, with a p-value less than 0.001 (Nija & Kuril, 2024). This lends credence to the idea that complications during subsequent pregnancies are more common than during the first (Vanamala et al., 2018).

Among the women analyzed, 4 (13% of 30) were under the age of 20, while 76 (41% of 183) were over the age of 20 and showing anemia, according to the PCV levels. Plus, 76 (55%) out of 139 women who had previous pregnancies were anemic, whereas 9 (12%) out of 74 women who were pregnant for the first time were. These findings were found to be statistically significant (P-value = 0.01), as shown in Table 3.

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Table3: Prevalence of Anemia (PCV > 32%) According to Women's Demographic Factors.

Characteristics	Prevalence of anemia (n, %)	P-value
Age <30 Yrs (30)	4 (13%)	0.01**
Age >30 Yrs (183)	76 (41.0%)	
First-time pregnancy (74)	9 (12%)	0.01**
Previous pregnancy (139)	76 (55%)	

As shown in Table 3, age and number of pregnancies were significant factors associated with an increased risk of anemia in pregnant women. Our study found that women under 20 years old had a lower prevalence of anemia (13%) compared to women over 20 years old (41%), suggesting that older women were more susceptible to anemia. This aligns with findings from Oluwafemi et al. (2019), who observed the highest prevalence of anemia in the 25-34 age group(Oluwafemi et al., 2019). Similarly, Najam et al. (2022) reported higher anemia rates in women aged 31-39 years compared to those under 30(Najam et al., 2022). Anemia severity increases with age, as seen in the 20-24 age group, where many women were mildly, moderately, or severely anemic(Lakshmi & Rani, 2023). In Indonesia, Research has shown that anemia is more common in women over the age of 35, affecting 92.5% of this demographic(Jasa & Listiana, 2023). A number of factors exacerbate anemia in this age group, including older mothers, lower socioeconomic level, and an absence of iron supplementation (Fareed et al., 2024 ;Balcha et al., 2023). Anemia is more common in adolescent pregnancies; in fact, Maryum et al. (2023) found that 36.2% of pregnant teens were anemic, which increases the risk of complications such postpartum hemorrhage and low birth weight.(MARYUM et al., 2023). In China, Individuals in the 18–20 age group were more prone to anemia, with a modified odds ratio of 1.28 (Wu et al., 2020). Higher anemia rates in this group were associated with lower levels of education and irregular prenatal care (MARYUM et al., 2023).

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Concerning parity, our research indicated that 55% of women who had previously given birth also suffered from anemia, while 12% of first-time mothers did. Anemia is more common among women who have given birth more than once, according to this finding. Researchers have found that up to 60% of pregnant women suffer from anemia (Babatunde et al., 2017). Anemia is more common in first-time mothers, according to research in Nigeria (Okunade & Adegbesan-Omilabu, 2014). The correlation between parity and anemia is dose-response, since the incidence of anemia rises as the number of pregnancies rises (Al-Farsi et al., 2011 ;Shah et al., 2020). Anemia affects 46.2% of grand multiparous women (those who have had five or more pregnancies), whereas only 18.7% of nulliparous women experience this condition (Kavak & Kavak, 2017). Similarly, PCV values fall as parity rises, and studies reveal that primigravida women have greater hematocrit levels than multigravida women, indicating that PCV drops and anemia rates rise with multiple pregnancies (Shah et al., 2020 ; Kavak & Kavak, 2017). Low PCV and increased anemia rates were associated with nutritional inadequacies, particularly iron insufficiency, which was prevalent in high-parity women. Nutritional supplements and health education were two interventions that can help reduce the risk of anemia in women who were pregnant or breastfeeding (Babatunde et al., 2017). Improved maternal and fetal outcomes can be achieved by healthcare and diet that ensures optimal PCV and hemoglobin levels (Manjulatha et al., 2015).

This study has some limitations. Its conclusions may be limited by its single hospital, Al-Aziziyah General Hospital in Wasit Governorate, Iraq. Limiting the study to Al-Aziziyah might not fully show how the prevalence of anemia varies in other areas because of differences in diet, socioeconomic status, and access to health care. The sample size (213 participants) supports preliminary analysis; however, it may not represent the variety of Iraqi pregnant women. Despite these limitations, the study provides useful insights and a framework for anemia research in bigger, more diverse populations.

Conclusions

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The current found that pregnant women over 20 with prior pregnancy history had a higher risk of anemia than younger women without such histories. Due to cumulative dietary deficits and increased physiological demands in older women, iron and nutrient reserves from previous pregnancies may be depleted.

Acknowledgments

We are sincerely grateful to the University of Wasit and the College of Basic Education and College of Education for Pure Sciences for their utmost scientific support.

Ethics Approval and Consent to Participate

Ethics Committee of the College of Basic Education granted the necessary ethical approvals and permissions. Additionally, the nurses who agreed to participate in the current study provided their informed consent.

Consent for Publication

Not relevant (no personal information about an individual is presented).

Availability of Data and Material

The corresponding author can provide the data produced during this investigation upon reasonable request.

Competing Interests

The authors affirm that they have no competing interests.

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Authors' Contributions

Every author on the list made a substantial, direct, and intellectual contribution to the work. The final draft of the work was read and approved by the writers.

Recommendations

We advocate for comprehensive nutritional counseling emphasizing the significance of iron-rich diets for pregnant women, alongside routine iron supplementation targeting the most at-risk populations, while also endorsing the integration of anemia screening and management into standard care

practices, prioritizing hemoglobin testing for its superior diagnostic accuracy compared to the PCV method.

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