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Original article

ANEMIA IN PREGNANCY, STUDY IN BITOLA, NORTH MACEDONIA

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ABSTRACT

Purpose: Anemia in pregnancy is a national problem because it reflects the value of people's socioeconomic well-being, and its influence is very large on the quality of human resources. Anemia during pregnancy has been a significant health problem worldwide for many years. Our study was designed to assess the prevalence of anemia at the time of diagnosis of pregnancy during the third trimester in the city hospital of Bitola.

Material/Methods: This pilot study was performed in a Clinical hospital in Bitola (R. Macedonia). The total number of participants was 173 pregnant women. Complete blood count (CBC) - CBC was determined in ethylenediaminetetraacetic acid (K-EDTA) blood samples -using Sysmex XN 550 (Sysmex Co, Kobe, Japan).

Results: We established that the prevalence of anemia among pregnant women was 14.0% (n = 25). Seventeen women had mild and eight moderate anemia. When we analyzed the distribution of anemia in different age groups, we noticed that anemia was most common in the age group 35-39 years. Mild anemia was present in the age groups 17-24 and 35-39, and moderate anemia was mainly present in the age group 25-29.

Conclusions: Anemia in pregnancy is a mild public health problem in Bitola. The diet of pregnant women, which does not reflect a varied and balanced diet, causes an iron deficiency. The main risk factors were age of the pregnant woman. Further, we recommend ongoing education about effects of anemia, especially among women with low education and the population of adolescent women and women of reproductive age in general.

Keywords: anemia, pregnancy, iron deficiency anemia,

INTRODUCTION

Anemia in pregnancy is a national health problem in many countries around the world, as it reflects the value of people's socioeconomic well-being, and its impact is very large on the quality of human life. Anemia during pregnancy has been a significant health problem worldwide for many years [1]. The prevalence of anemia in pregnancy varies to varying degrees in different parts of the world. The World Health Organization (WHO) defines anemia in pregnancy as a hemoglobin concentration in the blood of less than 11 g/dl [2]. The WHO classifies anemia into different levels of severity based on hemoglobin levels: mild (10–10.9 g/dl), moderate (7–9.9 g/dl), and severe (<7.0 g/dl) [3]. The WHO tolerates a prevalence of anemia of up to 4%, but a prevalence of anemia of 5% or higher is considered a public health problem by the WHO. Anemia in pregnancy is present in more than 40% of women, which translates to approximately 56 million women worldwide [4]. The causes of anemia during pregnancy in developing countries are multifactorial. It is due to nutritional deficiencies (folic acid and vitamins A, B and C), parasitic infections such as malaria and hookworm, or chronic infections such as tuberculosis and HIV [5], but the most common cause of anemia in pregnancy is iron deficiency, while other causes are less common [6]. Anemia during pregnancy has a negative impact on the health of the mother and child and increases the risk of maternal mortality and perinatal death [7, 8]. Anemia in pregnancy is associated with adverse pregnancy outcomes, low birth weight, small for gestational age, preterm birth, postpartum hemorrhage and eclampsia [9]. While the negative health effects for the mother associated with anemia in pregnancy are fatigue, poor work capacity, increased risk of heart disease and mortality, impaired immune function, etc. [6,10] Anemia remains a significant health problem globally, accounting for 60,534 deaths and 3.4% of global disability-adjusted life years in 2010 in women aged 15–49 y [11]. WHO currently recommends daily iron and folic acid supplementation during pregnancy to prevent maternal anemia, preterm birth, and small for gestational age [12]. Our study

was designed to assess the prevalence of anemia at the time of diagnosis of pregnancy during the third trimester in the city hospital of Bitola.

MATERIALS AND METHODS

The study was conducted between January 2023 and December 2024 in PHO Clinical hospital Bitola, the second-largest hospital in the Republic of North Macedonia. Our study included women in the third trimester of pregnancy. Bitola Municipality has a population of 80,000 citizens. The study population included 173 pregnant women who were in their third trimester and attending for routine care. Women were informed about the study aims and follow-up schedule, and those agreeing to participate gave a signed consent. Complete blood count (CBC) - CBC was determined in ethylenediaminetetraacetic acid (K-EDTA) blood samples -using Sysmex XN 550 (Sysmex Co, Kobe, Japan) according to the manufacturer's instructions. The obtained indicators were as follows: white blood cell count (WBC x109/L), neutrophil percentage (NEUT%), neutrophil count (NEUT(x109/L), lymphocyte percentage (LYMPH%), lymphocyte count (LYMPH(x109/L)), red blood cell count (RBC x10^{12}/L), hemoglobin (HGB (g/l)), platelets (PLT(x109/L)). The data was entered, cleaned, and analyzed using SPSS version 20. Descriptive statistics were used to summarize data. The p-value of less than 0.05 was considered a statistically significant result. A pregnant woman was considered anemic if hemoglobin was <11 g/dl [2]. The age of participants, which was collected as variables were categorized as (17–24, 25–29, 30–34, 35–39 and 40–43).

RESULTS

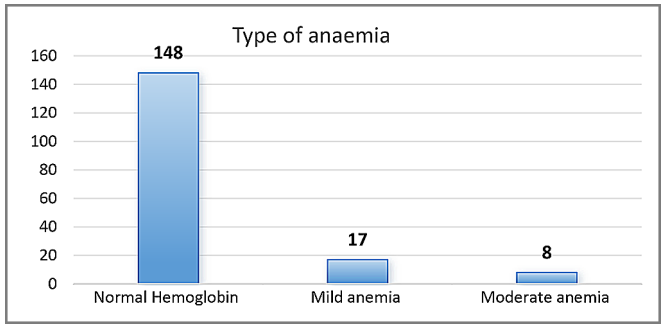
The study population included 173 pregnant women who were in their third trimester and attending for routine care. Among 173 pregnant women, 25 have anemic status. The age of the participants ranged from 17 to 43 years with a mean age of 31 (SD 6.95) years, Table 1.

Table 1. Sociodemographic characteristics of the pregnant women (N = 173).

Variable name	Number (%)
Mothers characteristics	
Age (years)	
17–24	39 (23%)
25–29	39(23%)
30–34	39(23%)
35–39	39(23%)
40–43	17(10%)
Level of education	
Primary	23 (13%)
Secondary or higher	150 (87%)
Ethnicity	
Christians	126 (73%)
Muslims	46 (27%)

The prevalence of anemia among pregnant women was 14.0% (n = 25). Seventeen women had mild and eight moderate anemia, Figure 1.

Fig. 1. Severity of anemia in pregnancy among women in Bitola Manicipality.

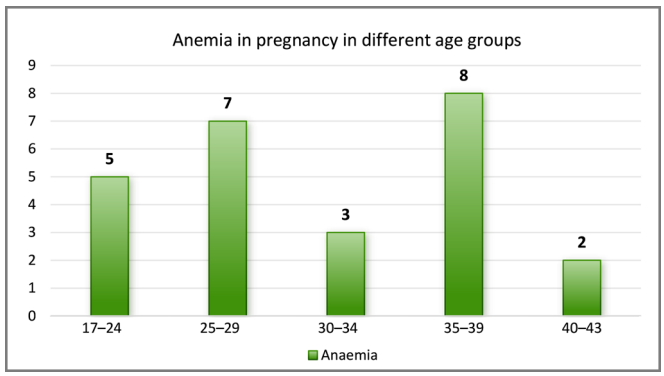


The distribution of anemia in different age groups is shown in Table 2 and Figure 2. Among 173 pregnant women, 25 have anemic status. Anemia is most common in the age group 35–39 years. Mild anemia was present at the same rate in the age groups 17–24 years and 35–39 years. Moderate anemia was mainly present in the age group 25–29 years

Table 2. Anemia in pregnancy in different age groups (N = 173).

Variable Age (years)	N	Anaemia (Hb < 11 g/dl) N (%)	Normal (Hb >11 g/dl) n (%)
17–24	39	5 (13)	34 (87)
25–29	39	7 (18)	32(82)
30–34	39	3 (8)	36(92)
35–39	39	8(21)	31(79)
40–43	17	2(12)	15(88)

Fig. 2. Anemia in pregnancy in different age groups (N = 25).



The distribution of anemia in different age groups is shown in Table 3.

Table 3. Age wise distribution of degree of anemia

Age (years)	Normal Hemoglobin (No./%)	Mild anemia (No./%)	Moderate anemia (No./%)	Total
17–24	34 (23%)	5 (29%)	0	39
25–29	32 (22%)	3 (18%)	4 (50%)	39
30–34	36 (24%)	2 (12%)	1 (12%)	39
35–39	31 (21%)	5 (29%)	3 (38%)	39
40–43	15 (10%)	2 (12%)	0	17
Total	148	17	8	173

In Table 4, we see that in anemic patients, the lowest MCH and MCHC concentrations were in the age group 17-24, the lowest MCV concentration was in age group 30-34, and the lowest hemoglobin concentration was in the age group 25-29. In normal pregnancies, we see that the lowest MCH and MCV concentrations were at age group 17-24, the lowest MCHC concentration is at age group 30-34, and the lowest hemoglobin concentration is at age group 35-39. Table 4 shows that mean hemoglobin in normal pregnant women in all age groups is 124 g/l and that mean hemoglobin in anemic pregnancies is 102 g/l

Table 4. Hemoglobin levels, MCV, MCH, MCHC, in different age groups (N = 173) in normal pregnant women and pregnant women with anemia.

Variable	MCH (pg) Mean ±SD		MCHC (g/L) Mean ±SD		MCV (fL) Mean ±SD		Hemoglobin (g/l) Mean ±SD	
Age group years	Normal	Anemia	Normal	Anemia	Normal	Anemia	Normal	Anemia
17–24	29.20±12.5	26.7±12.25	335.85±161.3	313.4±144.4	86.76±39.06	84.28±40.58	124.61±52.6	104±51
25–29	29.51±12.9	28.34±11.6	334.5±155	326.42±158.4	88.38±38.7	87.12±36.3	124.21±54.7	97.28±45.7
30–34	30.23±12.9	26.93±9.4	331.30±152.8	332.66±152.1	91.29±38.8	79.76±31.7	123.83±52.3	104.66±50.6
35–39	30.33±11.0	27.7±11.05	333.19±158.19	327.37±158.37	89.87±35.22	84.62±35.27	123.41±48.9	99.25±44.75
40–43	30.50±13.4	29.05±13.85	339.93±161.4	328.5±163	89.81±40.16	89.1±42.4	125.53±51.5	109±54.5

When we performed a blood smear, we noticed that in 23 patients the erythrocytes were microcytic and hypo chromic, indicating iron deficiency anemia, and in only one patient did we notice macrocytic, hyper chromic erythrocytes, indicating megaloblastic anemia, which is a consequence of a deficiency of Vitamin B12 and folic acid.

DISCUSSION

During pregnancy, the need for iron increases twofold, and as pregnancy progresses, iron needs increase, since a large part of the maternal iron is used by the fetus, therefore, the possibility of anemia in pregnancy increases. A pregnant woman loses approximately 800 mg of iron, and her body needs to replenish the lost amount by consuming 2.8-6 mg of iron per day. During the first trimester, iron reserves in the body are low, while in the second trimester of pregnancy, these reserves are further reduced, and in the third trimester, a decrease in other iron-containing proteins is also observed. The prevalence of anemia among pregnant women (%) in Macedonia was reported at 25.7% in 2019, according to the World Bank's Development Indicators Collection, compiled from officially recognized sources. The findings of our study showed that the prevalence of anemia during pregnancy in the municipality of Bitola is 14.0%. In the Republic of Macedonia, there has been a trend of decreasing rates of anemia during pregnancy in the last ten years, due to improvements in maternal nutrition during pregnancy, as well as general health and care during pregnancy, and the country has strengthened antenatal care services for all pregnant women and iron supplementation is recommended to combat anemia. Globally, the burden of iron deficiency anemia in pregnant women ranges from 2.4% to 66% [13].

In our study, we did not find an association between anemia in pregnant women and educational level. Several previous studies have shown that education reduces the risk of anemia. Women who had secondary or tertiary education were less likely to be anemic compared to pregnant women with primary education. Educated pregnant women are less likely to develop nutritional anemia due to the fact that they have better income and eat nutritious food [14]. A study in Ethiopia also reported a higher preva-

lence of anemia in pregnant women who had no education [15].

Pregnant women with secondary and higher education usually have good outcomes for the mother and the newborn, because they have an increased frequency of exclusive breastfeeding, proper nutrition, the use of qualified attendance during childbirth and frequent check-ups in a newborn clinic [16]. In our study, anemia was most common in the age group 35-39 years. Global statistics have shown that the ideal age of the mother during pregnancy is in the age group of 20-35 years, and at that age, there is a lower risk of pregnancy complications and healthy reproduction. All this is due to the biological and psychological conditions of pregnant women.

It has been proven that pregnant women under the age of 20 are at a higher risk of anemia because, in that age group, biological development, namely reproduction, is not optimal, and pregnant women over the age of 35 are also more prone to anemia. This causes the body's strength to start to decrease, and it is easy to get various infections during pregnancy [17].

In the study, we found that iron deficiency anemia is the most common anemia in our patients. Iron deficiency is the most common cause of anemia worldwide, affecting approximately 1 billion people. Iron deficiency anemia is the most common global nutritional deficiency [17]. Iron deficiency anemia is the most common pathological cause of anemia, affecting almost 1 in every 5 pregnant women in the United States [18].

This study has several limitations that need to be considered when interpreting the findings. Although nutrition is recognized as a major determinant of anemia in pregnancy, detailed information on the nutritional status and dietary habits of the participants was not collected. The absence of such data restricts the ability to assess the extent to which dietary factors contributed to the observed prevalence of anemia. Future studies should incorporate comprehensive nutritional assessments, including dietary surveys and biochemical markers, to provide a more complete understanding of this relationship.

Furthermore, other potential etiological factors such as chronic diseases, parasitic or infectious conditions, and genetic hemoglobinopathies were not evaluated. The lack of these data may have introduced residual confounding, potentially influencing the observed results. Addressing these aspects in future research would strengthen the evidence base and contribute to a more accurate understanding of anemia in pregnancy within this population.

CONCLUSION

Anemia in pregnancy is a mild public health problem in Bitola. The most common cause of anemia is the diet of pregnant women, which does not reflect a varied and balanced diet. The age of the pregnant woman is reflected in the incidence of anemia. Targeting anemia during pregnancy is a priority in our work. Furthermore, continued education about the effects of anemia is needed, especially in women with low education and the adolescent and reproductive age population. There is considerable evidence that maternal iron deficiency anemia increases the risk of preterm birth and subsequent low birth weight, and accumulating information suggests a link between maternal iron status during pregnancy and the iron status of infants after delivery. Iron supplementation certainly improves maternal iron status during pregnancy and during the postpartum period, even in women who enter pregnancy with reasonable iron stores.

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