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Prevalence of Iron Deficiency Anemia among Moroccan Pregnant Women

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Abstract

Background: Iron deficiency anemia in pregnant women is a serious public health problem, especially in developing countries. **Aim:** The objective of this study is to determine the prevalence of iron deficiency anemia and its associated factors during pregnancy in the south of Morocco. **Methods:** A cross-sectional study was carried in the regional Hospital Center Hassan II (RHC) from April to august 2021 in all the pregnant women coming for consultation in the maternity service. 500 pregnant women were randomly recruited for the study. A complete blood count and serum ferritin was performed in every case. They have been the subjects of a questionnaire containing their background and health data. The analysis of our data was done by the IBM SPSS Statistics 25 software. **Results**: The prevalence of iron deficiency anemia was 20% with a CI of (44.7% - 53.5%). The most affected age group was 25 to 35 years with a rate of 42.86%. The majority of women had mild anemia (84.61%) followed by moderate anemia (11.54%) and severe anemia (3.85%). 57.14% of the anemic pregnant women were primigravida. The results of serum ferritin made it possible to identify 70% of women deficient, with a dominance of normocytic normochromic anemia. The influence of geographic origin and place of birth was not significant. **Conclusion:** The prevalence of iron deficiency anemia is more or less low in our study. However, there is a high prevalence of iron deficiency and anemia during pregnancy. Statistically, there was no significant association between iron deficiency anemia and the various parameters studied, such as age, parity, origin and place of birth.

Keywords

Iron Deficiency, Anemia, Pregnancy, Prevalence

1. Introduction

Anemia in pregnant women is frequent and partly depends on the nutritional status of the population. Iron deficiency is the leading cause of anemia in pregnant women [1].

According to the WHO, anemia is defined during pregnancy by a hemoglobin level below 11 g/dL in the first and third trimesters of pregnancy and below 10.5 g/dL in the second trimester [2].

The main cause of anemia in obstetrics is iron deficiency, which has a worldwide prevalence between estimated 20% - 80% of female population. Stages of iron deficiency are depletion of iron stores, iron deficient erythropoiesis without anemia and iron deficiency anemia, the most pronounced form of iron deficiency.

Iron deficiency anemia in pregnant women is mainly caused by increased iron requirements, a low iron diet or iron malabsorption. Iron deficiency anemia has major consequences for the health of the mother as well as the newborns. It appears to increase the risk of maternal and infant mortality. It also contributes to the increased risk of prematurity and intrauterine growth retardation [3].

The prevalence of iron deficiency anemia during pregnancy varies according to the population studied, the gestational age and whether or not systematic supplementation is carried out. Other studies have shown that there is also a relationship between age, socioeconomic class, number of pregnancies, women's level of education and the onset of iron deficiency anemia [4].

In Morocco, the prevalence of iron deficiency anemia in pregnant women remains a major health problem. It is, therefore, necessary to determine the prevalence of anemia in pregnant women, particularly in our population, and to recommend a prevention strategy. Giving the scarcity of studies on iron deficiency anemia in pregnant women in Morocco, we conducted this study through which we will try to determine the prevalence of iron deficiency anemia in the Souss Massa region and to study the influence of anthropometric and socio-demographic parameters on its prevalence.

2. Methods

Type of study: cross-sectional study.

It was conducted in the Hassan II Regional Hospital Center (RHC) in Agadir, the hospital serves more than about 2 million people both from the zone and other nearby zones.

Time of study: From April to August 2021.

We included all pregnant women attending at Regional Hospital Center, with a singleton pregnancy. No sampling method was used.

Exclusion criteria: Pregnant women with an infection or severe medical disorders.

A convenience sample of 500 pregnant women was recruited from RHC.

In order to study all the aspects related to this subject, we associated two methods of data collection, in particular, the questionnaire and the biological assessment.

2.1. Data Collection

2.1.1. The Questionnaire

The study was conducted through a questionnaire designed by obstetricians and biologists on clinical data containing 8 items: age, weight, height, parity and gravidity to establish an average and calculate the body mass index (BMI), geographical origin, place of birth and marital status.

The questionnaire was tested on 10 patients by 5 medical students; all questions were understood by the patients with no missing data.

A training of the midwives and students on how to ask the question and avoid information bias.

Ethical conditions:

The questionnaire was anonymous as long as a prospective follow-up was not planned.

Free and informed consent.

2.1.2. Biological Analyzes

Blood collected from fasting subjects by venous route was divided into dry tubes and tubes with Ethylenediaminetetraacetic acid (EDTA). The samples obtained from the EDTA tube were immediately sent to the hematology laboratory for the performance of the hematological analyses. Those collected in the dry tubes were sent to the biochemistry laboratory for the determination of the biochemical parameters.

2.1.3. Hematological Parameters

Hematological parameters were based on complete blood count (Hemogram). This examination was carried out using a device (Sysmex XN 1000®) that counts the different cellular elements of the blood: red cells, white blood cells, hemoglobin, hematocrit, Pads and hematological indices (MCV, MCH, MCHC).

2.1.4. Biochemical Parameters

The samples from the dry tubes underwent centrifugation in order to collect the serum used to carry out biochemical analyzes using a device (Biosystems BA 400®) allowing the assay of: Ferritin, Serum iron.

2.2. Data Analysis

All the data collected are entered on an Excel 2010 support, after which they are transferred and statistically analyzed by the SPSS. Two types of studies were carried out: a descriptive study whose variables retained are represented in the form of percentages to describe qualitative variables and in the form of means and standard deviations to describe quantitative variables. An analytical study to find the existence of an association between the prevalence of iron deficiency anemia and the various factors studied, using the Pearson χ^2 (chi-square) test. The association was considered significant for a p value less than or equal to 0.05.

2.3. Judgment Criteria

Anemic women were those with a hemoglobin level below 11 g/dL in the first

and third trimesters of pregnancy, and below 10.5 g/dL in the second trimester

3. Results

1) Prevalence of iron deficiency anemia

The prevalence of anemia (among all the pregnant women in the study) according to the definition given by the WHO (hemoglobin level below 11 g/dL) is around 49.1%, however, the prevalence of iron deficiency (ferritin level below 20 µg/l) is estimated at 70%. While iron deficiency anemia (hemoglobin level below 11 g/dL and ferritin level below 20 µg/l), affects 20% of pregnant women (Table 1).

2) The severity

Of the subjects with iron deficiency anemia in the study population, 84.6% had mild anemia (Hb = 8 < 11 g/dL), 11.5% had moderate anemia (Hb = 6.5 < 8 g/dL). /dL) and 3.8% had severe anemia (Hb < 6.5 g/dL) (Table 2).

3) Influence of maternal age:

The statistical results revealed that 46.17% of subjects with iron deficiency anemia were between 25 and 35 years old and 27.13% were between 18 and 24 years old. The group aged 46 and over was the least affected (1.54%) (Table 3).

4) Influence of gesture:

According to the gravidity, 57.14% of the anemic pregnant women had a gestivity number equal to 1 (primigravida), while 30.61% and 12.25% are respectively paucigest and multigest. There is no statistically significant difference, p-value > 0.05 (Table 4).

5) Influence of geographical origin and place of birth on the prevalence of iron deficiency anemia (Table 5).

There is no significant difference (p-value > 0.05) between the group of anemic women and the group of non-anemic women concerning the place of birth and geographical origin.

Table 1. Prevalence of iron deficiency anemia, anemia and iron deficiency.

Iron deficiency anemia	Anemia	Iron deficiency
20%	49.1%	70%

Table 2. Prevalence of iron deficiency anemia according to the severity.

Severity	Mild anemia	Moderate anemia	Severe anemia
Percentage %	84.61	11.54	3.85

Table 3. Influence of maternal age on the prevalence of iron deficiency anemia.

	Anemic women	Non-anemic women (Control)	Statistical comparison	
Age	(%)	(%)	χ^2	p
18 - 24	32.65	26.5		
25 - 35	42.86	45.9	1.597	0.660
36 - 45	24.49	25.74		

Table 4. Influence of gesture on the prevalence of iron deficiency anemia.

	Anemic women	Non-anemic women	Statistical comparison	
Gestality	(%)	(%)	χ^2	P
Primigest	57.14	40.99		
Paucigest	30.61	36.01	5.841	0.12
Multigesture	12.24	22.98		

Table 5. Distribution of pregnant women studied according to their geographical origin.

		Anemic women	Non-anemic women (Control)	Statistical comparison	
		(%)	(%)	χ^2	p
Place of birth	Rural	44.9	47.68	0.895	0.344
	Urban	55.1	52.32		
Geographical origin	Rural	51.02	57.85	0.785	0.376
	Urban	48.98	42.14		

4. Discussion

4.1. Prevalence

1) Anemia: Iron deficiency is the most widespread nutritional deficiency in the world and it accounts for 75% of all types of anemia in pregnancy [5] [6].

In more than 80% of countries in the world, the prevalence of anemia in pregnancy is >20% [7]. The prevalence of anemia in pregnancy varies considerably because of the differences in social conditions, lifestyles and health-seeking behaviors across different cultures. Anemia can affect pregnant women all over the world (the global prevalence in pregnancy is estimated to be approximately 41.8% with rates of prevalence that range from 35% to 60% for Africa, Asia and Latin America and it is reported to be <20% in industrialized countries [4] [5] [6]. The lowest estimated prevalence of anemia is 5.7% in the USA and the highest is 75% in Gambia and 65% - 75% in India [4] [6] [8].

Other studies carried out in Morocco have shown a prevalence of 14.4% in Casablanca [9], 16.8% in Temara [10] and 30% in Marrakech [10]. A study conducted in Essaouira in 2015 shows a prevalence of 41% [11].

During this study, the prevalence of anemia among pregnant women consulting the maternity service at the (RHC) of Agadir is estimated at 49.1%.

2) Iron deficiency anemia: The prevalence of iron deficiency anemia in pregnant women is 20%.

This is significantly lower than that of the study carried out in North Africa on 150 pregnant women where they estimated the prevalence at 33% [12].

The same result was found in Algeria where iron deficiency anemia in pregnant women is presented with a percentage of 20% [13]. The prevalence of iron deficiency anemia in Europe is estimated at 6% to 30% [14]. A study carried out

in France showed that the prevalence of iron deficiency anemia during pregnancy is 20% to 30% [15]. While in Switzerland, only 3% of pregnant women suffer from iron deficiency anemia, and about 2.5% in Portugal (2015) [16].

According to literature data, the results of a survey conducted in Morocco by the Ministry of Health in 1996 revealed that anemia affected 45% of pregnant women and 31% of women of childbearing age [17].

3) Iron deficiency: The prevalence of iron deficiency is estimated at 70% during this study. The same results were found in Pakistan in 2006 where 50% - 60% of pregnant women suffer from iron deficiency [18].

In 1980, a study carried out in Niger on 94 pregnant women estimated that more than 90% of these women were deficient in iron [14]. An analysis of the diets of pregnant women in a study conducted in Essaouira showed moderate consumption of foods high in heme iron (meats and dairy products) associated with higher consumption of cereals, fats and vegetables.

Indeed, the Moroccan diet is based on the consumption of the family tagine, cooked with or without meat, comprising mainly vegetables, fats (the sauce) and traditionally accompanied by bread [11].

A nutrition education program should be designed to improve the quality of the diet of this population by encouraging the target populations to increase the intake of factors that improve iron absorption or at least reduce those that inhibit it.

4) Severity: In our study, mild forms predominate with 84.6%. The same results were found in Palestine and Indonesia with a percentage of 97.9% and 55.60% respectively [19] [20].

4.2. Age Influence

In our study, the age of the pregnant woman had no significant influence on the occurrence of iron deficiency anemia (p-value > 0.05). These results are in agreement with those from Indonesia [20] and others from Burkina Faso who showed that the prevalence of anemia in 248 women was not correlated with age [13].

A study carried out in Cameroon shows that the majority of pregnant women aged 20 to 30 are anemic [21].

A study of the prevalence of iron deficiency anemia in the region of Blida, in Algeriain pregnant women divided into 3 groups according to gestational age (G1; G2; G3), finds that anemia predominates in the section between 25 and 35 years [13].

Contrary to Indonesia, a study proves that the age group of 20 to 35 years is the least affected [20].

4.3. Influence of Gravidity and Parity

57.14% of our anemic women are primigravidae and 64.7% are nulliparous. The analysis of the association between gravidity, parity and the prevalence of iron

deficiency anemia did not find any significant relationship between anemia and gravidity on the one hand, or between anemia and parity on the other. The same results found in Mauritania and Thailand [22] [23]. However, a study carried out in the Democratic Republic of Congo had shown that primigestity was a factor risk of anemia in Congolese women [4]. Indeed, a study carried out in the Souissi maternity hospital in the city of Rabat found that 25.25% of anemic women were nulliparous out of a sample of 400 women and had shown that nulliparity is a major risk factor [24].

4.4. Influence of Geographical Origin and Place of Birth

In our study, about half of the anemic women came from rural areas and the other half from urban areas, without noting a significant association between iron deficiency anemia and geographical origin on the one hand ($\chi^2 = 0.785$; $p > 0.05$) and between iron deficiency anemia and place of birth on the other hand ($\chi^2 = 0.895$; $p > 0.05$)

These findings are in disagreement with study conducted in Ethiopia where residing in rural areas increases risk of anemia by 6 times [25] [26].

5. Conclusions

The prevalence of iron deficiency anemia is more or less low in our study. However, there is a high prevalence of iron deficiency and anemia during pregnancy, which would require special attention to women's diet and regular monitoring during pregnancy.

Although we did not find risk factors for iron deficiency anemia in the study population.

A multicenter study should be conducted on a large sample to better cover all social classes of the Moroccan population.

Consent

Written informed consent was obtained from each study participant after they were introduced to the purpose of the study and informed about their rights to interrupt the interview at any time. Confidentiality was maintained at all levels of the study.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Abbreviations

WHO: World Health Organization;

CBC: Complete Blood Count;

BMI: Body mass index;

EDTA: Ethylenediaminetetraacetic acid;

MCHC: Mean corpuscular hemoglobin concentration;

MCH: Mean corpuscular hemoglobin;

MCV: Mean corpuscular volume.