Prevalence and Factors Associated with Anemia Pregnancy in a Group of Moroccan Pregnant Women

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Abstract

Background: Pregnancy is typically accompanied by an increase of micronutrient requirements in general and especially iron. This increased need may be an additional risk factor for developing anemia. Purpose of the study: The aim of this study is to provide data on the prevalence of anemia of pregnancy in the maternity ward of the regional hospital in the city of Temara, and examine risk factors that may expose women to anemia during pregnancy. Materiel and Methods: A prospective cross-sectional study of a year was conducted to the hospital Sidi Lahcen in the city of Temara. Sociodemographic and nutritional data were collected through a questionnaire, obstetric and medical histories of women in labor and the results of biological tests were recorded from the patient obstetric file. Results: Among the 849 women surveyed, 690 (82%) had performed a blood count, and among these 117 (16.8%) were found anemic, with the following proportions: 57.6% had mild anemia, 41.5% had moderate anemia and a minority (0.8%) had severe anemia. The pregnant women aged over 35 years were the most exposed to anemia during pregnancy (47%) compared with younger women ($p < 0.001$). Women who had a history of anemia aside from pregnancy and those who had anemia in earlier pregnancies were more prone to developing anemia in the current pregnancy with a statistically significant difference ($p < 0.001$). The number of pregnancies,

number of previous abortions and place of residence had no influence on the occurrence of anemia of pregnancy. The consumption of fortified flour with iron and vitamins as well as consuming iron rich foods was not a protective factor against the development of anemia of pregnancy. Tea consumption near the meal was not a factor exposing to anemia during pregnancy. Conclusion: Anemia is a public health problem in Morocco. Evidence from our study emphasizes the need to implement educational programs to improve the nutritional knowledge and sensitization of women.

1. Introduction

Anemia in pregnant women is common in general, and depends partly on the nutritional status of the population, it affects 30% - 80% of women throughout the developing world, while in industrialized countries 10% of pregnant women are concerned. Iron deficiency is most responsible for the anemia. It is most often linked to diets low in iron [1].

High rates of premature delivery, low birth weight and perinatal death associated with maternal anemia, and postpartum maternal infection were reported in the literature [2].

According to WHO, a pregnant woman is anemic if it has a hemoglobin level below 110 g/L for the 1st and 3rd quarter and less than 105 g/L during the second quarter [3].

The pregnancy anemia is a major public health problem associated with an increased risk of maternal and fetal morbidity and mortality, it is a disease with many causes, both nutritional (vitamin and mineral) and not nutritional (infections) that sometimes occur in parallel.

In Morocco, the few surveys carried out at national or regional level show that anemia is still a health problem especially for women. The prevalence of iron deficiency anemia among pregnant women was 37.2% and 32.6% in women of childbearing age [4].

This study has focused on this issue by proposing a survey conducted in a population of Moroccan women in order to realize at first a descriptive analysis of the prevalence of anemia of pregnancy in a Moroccan health unit and in a second time to study the risk factors associated with this disease.

2. Patients and Methods

This is a prospective cross-sectional study conducted over a period of 12 months at the maternity ward of the Prefectural hospital Sidi Lahcen in the city of Temara where we have included a population of Moroccan women (collected between December 2011 and December 2012). It focused on women in labor who came from the town of Temara and its surroundings where their pregnancies were followed in the different local health facilities.

Inclusion criteria: women in labor recruitment concerned a population of women 18 to 40 years with physiological pregnancy and giving birth in this structure during this period.

Exemption criteria: were excluded from the study pathological pregnancy, anemia due to hemoglobinopathies, post-partum anemia and medical termination of pregnancy.

2.1. Data Collection

The study was conducted through a questionnaire on socio-economic data (marital status, occupation, monthly income ...) obstetric history (number of pregnancies, number of abortions), some nutritional habits of the pregnant woman and data on the supplementation of mothers during pregnancy. The study was completed using the obstetrical file: Analysis of the complete blood count (CBC), other assessments (serum iron, ferritin), pregnancy outcomes and neonatal data. Gestational age was calculated by weeks of gestation, from the last menstrual period.

2.2. Judgment Criterion

The principal criterion of judgment to differentiate anemic women from non anemic was a rate of hemoglobin lower than 11 dg/l in the first and third quarters and lower than 10.5 dg/l in the second quarter.

2.3. Definition of Terms

In this study several parameters were investigated including:

The level of education: it describes the level of education which acceded participating; and therefore included 3 classes; a first class concerns illiterate (women who can neither read nor write); a second class concerns women who accessed the Koranic or elementary school, and then the third class gathering women with secondary or university level.

The father's monthly income: according to a 2007 study by the High Commission for Planning, the income is considered low if it is less than 3000 dirhams per month and is considered average if it is more than 3000 dirhams months.

Primiparity: Is called primipare any woman who is on her first childbirth.

Multiparity: Is multipare any woman who has had at least two births.

Pregnancy followed: In our study we considered that pregnancy is followed if the pregnant woman has done at least two antenatal visits with two ultrasounds and routine assessment (CBC, fasting glucose, blood typing and serology).

The consumption of animalist products: She was studied under the angle of a sufficient proteinic contribution or not according to the following criteria:

➤ If the woman states to almost daily consume meat and/or fish, she is regarded as having a sufficient proteinic contribution.

➤ In cases where the woman says she occasionally consumes meat and/or fish, his protein intake is considered to be low (or insufficient)

Indeed the animal proteins are supposed to have the food iron known as heminic whose rate of absorption is superior with that known as not heminic (coming from cereals, dairy produce, eggs, etc) respectively 25% and 5% at the most [5]-[7].

The consumption of the tea: We included this parameter in our study for two reasons: The first is the fact that the Moroccan society is a large consumer of tea as much in urban area that rural, the second is the fact that the inhibiting effect of the tea on the absorption of the food iron because of its strong content of hydrolysables tannins was reported by several authors [8]. Taking tea has been studied depending on whether it is taken immediately after a meal or away from meals. Indeed, it is indicated that the time of taking tea is strongly linked to its effect on the bioavailability of dietary iron as much as one is in pepsin digestion phase (the first hour after the meal) or pancreatic [9].

The consumption of fortified flour: The National Programme for the Fight against disorders caused by micronutrient deficiencies has set a target of reducing third the prevalence of iron deficiency anemia. For this an agreement was signed in 2002 with the National Milling Federation to promote the production of flour fortified with iron, vitamins B1, B2, PP and folic acid. Our investigation of whether women recognized and consumed the flour with the logo "Siha wa Salama" (the logo allows consumers to more easily identify products that have been enriched).

2.4. Ethical Considerations

The administration of the Prefectural Hospital Sidi Lahcen Temara and the Ethics Committee of the Faculty of Medicine and Pharmacy of Rabat has given their agreement for the implementation of the study for epidemiological purposes. Before childbirth, women who met the inclusion criteria were informed of the study objectives and the conditions of participation. Their consent was obtained before starting the filling of farm returns. Participation in the study was free, Respect for anonymity and confidentiality of information was rigorous.

2.5. Statistical Analysis

Statistical analysis was performed using SPSS epidemiological 13.0 software. The quantitative variables were expressed as mean value and standard deviation. The qualitative variables were expressed as percentages. The

comparisons used the student's t-test, for quantitative variables, and the Pearson Chi2 test, for qualitative variables.

A simple and multiple logistic regression was carried out in order to predict the importance of association between the anemia of pregnancy and the other factors studied. A threshold of $p < 0.2$ was retained to include the factors of the univariate analysis in the multivariate model. A threshold of $p < 0.05$ was considered significant.

3. Results

3.1. Socio-Demographic Profile of the Women Surveyed (Table 1)

In this study 849 women in labor were surveyed on admission in labor maternity ward of the hospital of Sidi Lahcen Temara (64.2%) of them were from urban areas while (35.8%) were from the rural area. The average age of women in labor was 39.31 ans ± 5.7. The majority of women living with a partner and 11.4% of women had a degree of relationship with their spouse. Illiteracy was predominant in our study population.

The distribution of women by income of their spouse, employment status and health coverage show firstly that (61%) had low incomes and secondly, that the majority of women were inactive and without a health-care coverage.

Analysis of results in relation to obstetric and medical histories of women in labor, shows that half the women in this study were multiparous (upper gestity or equal to 3), 82% of women had no history of abortions, 2% of women had a notion of anemia in non-pregnant, 12% of women had a notion of anemia in previous pregnancies and finally none of the women had a history of blood transfusion.

Meanwhile, during our study we were interested to know the frequency of consumption of certain foods in relation to the prevalence of anemia in women in labor and our having been the subject of several epidemiological studies namely the consumption of red meat, products rich in iron and tea. Thus the distribution of women according to the consumption of red meat and iron-rich products shows that (41%) of women in labor had sufficient protein intake, while (59%) had a low intake.

Concerning the consumption of tea (88%) of women said they regularly consume tea which (70%) consume tea nearby meals and (18%) take it away meals.

8.8% of women reported recognize and consume fortified flour with iron and vitamins recognizable by the logo "Siha wa Salama".

3.2. Ongoing Pregnancy Data

Analysis of data on pregnancy shows that 92% of women had a pregnancy followed either in hospital or in a local health facilities, 84.4% of them had completed at least two consultations during pregnancy, 67.5% of women received iron supplementation during pregnancy and finally 2.5% of women had bleeding during this pregnancy, 19% of which had in the first quarter, 57% in the second quarter and 24% in the third quarter.

3.2.1. Biological Data

The biological characteristics of the women in our study are presented in Table 2. Of the 849 women enrolled (82.1%) had performed a blood count, (16.8%) of them were found anemic. The mean gestational age of the completion of the initial assessment was 14.77 ± 9.4 SA. Among women with a CBC, half (53.9%) did it in the 2nd quarter. Furthermore none of the women enrolled in the study had made a further analysis as amount of ferritin or that of serum iron.

3.2.2. Distribution of Parturients According to the Parameters Related to the Occurrence of Anemia

Analysis of Table 3 shows the distribution of women depending on various parameters related to the occurrence of anemia. It shows that patients over the age of 35 years were most exposed to the anemia of pregnancy compared to having a lower age and this difference was statistically significant ($p < 0.001$). The prevalence of anemia was significantly higher in the third trimester of pregnancy ($p < 0.001$). Similarly women who had a history of anemia in non-pregnant or anemia in earlier pregnancies ran more risk to develop anemia in the current pregnancy and this with a statistically significant difference ($p < 0.001$). In contrast no statistically significant difference was observed

Table 1. Sociodemographic and epidemiological characteristics of pregnant women[a].

Characteristics	Pregnant women[a] n = 849
Mother's Age (mean ± SD years)	29.31 ± 5.7
Father's Age (mean ± SD years)	36.05 ± 6.5
mother's work	
House wife	810 (95.4%)
Employed	39 (4.6%)
School level	
Illiterate	278 (33%)
Primary or Koranic School	448 (53%)
Secondary or post-secondary	123 (14%)
Medical coverage	
Without	633 (74.6%)
insurance	150 (17.7%)
DISP	66 (7.7%)
monthly income of the father	
low (<3000 DH)	518 (61%)
Medium (≥3000 DH)	331 (39%)
Area of residence	
Urban	545 (64.2%)
Rural	304 (35.8%)
Marital status	
married	842 (99.2%)
single	7 (0.8%)
number of pregnancies	
1	95 (11.2%)
2	323 (38%)
≥3	431 (50.8%)
Previous abortions	150 (17.7%)
Notion of transfusion	0 (0%)
Consumption of flour label	75 (8.8%)
Consumption of animal products	
low	501 (59%)
sufficient	348 (41%)
Consumption of tea	
No	102 (12%)
near mealtimes.	595 (70%)
outside of mealtimes	152 (18%)

[a]Values are expressed as mean ± standard deviation or in count and percentage. DISP: disease insurance scheme for the poor.

Table 2. Distribution of pregnant women according to complete blood count.

Characteristics	Pregnant women n = 849
Women with complete blood count (CBC)	697 (82.1%)
CBC in the 1st trimester	216 (31%)
CBC in the 2nd trimester	376 (54%)
CBC in the 3rd trimester	105 (15%)
GA in the initial check (WA) mean ± SD	14.77 ± 9.4
Women with ferritin	0 (0%)
Women with serum iron	0 (0%)
Anemic women	117 (16.8%)
Degree of severity of anemia	
Mild anemia	67 (57.6%)
Moderate anemia	49 (41.5%)
Severe anemia	1 (0.8%)

[a]Values are expressed as mean ± standard deviation (SD) or in count and percentage. CBC: Complete Blood Count. WA: weeks of amenorrhea. GA: Gestational Age. HB: hemoglobin. Degree of severity of anemia: Mild anemia ($10 \leq HB < 11$ dg/l), moderate anemia ($7 < HB < 10$ dg/l), severe anemia ($HB \leq 7$ dg/l).

Table 3. Distribution of pregnant women according to the factors related to anemia.

Characteristics	No anemia n = 580	Anemia n = 117
Age interval[a]		
Age ≤ 25years	118 (20.3%)	35 (29.9%)
25 < Age < 35 years	383 (66%)	27 (23.1%)
Age ≥ 35years	79 (13.6%)	55 (47%)
Gestational age[a]		
1st trimester	180 (83.3%)	36 (16.7%)
2nd trimester	330 (87.8%)	46 (12.2%)
3rd trimester	70 (66.7%)	35 (33.3%)
Anemia before pregnancy[a]		
No	574 (99%)	108 (92.8%)
Yes	6 (1%)	9 (7.7%)
Anemia during previous pregnancies[a]		
No	525 (90.5%)	82 (70.1%)
Yes	55 (9.5%)	35 (29.9%)
Number of pregnancies		
1	65 (11.2%)	14 (12%)
2	232 (40%)	38 (35.2%)
≥3	283 (48.8%)	65 (55.6%)

Continued

Area of residence		
Rural	220 (38%)	37 (32%)
Urban	360 (62%)	80 (68%)
Previous abortions		
0	482 (83.1%)	91 (77.8%)
1	78 (13.4%)	20 (17.1%)
2	13 (2.2%)	4 (3.4%)
≥3	7 (1.2%)	2 (1.7%)
Bleeding during pregnancy		
No	561 (96.7%)	115 (98.3%)
Yes	19 (3.3%)	2 (1.7%)
Consumption of flour label		
No	526 (90.7%)	110 (94%)
Yes	54 (9.3%)	7 (6%)
Consumption of foods rich in iron		
Sufficient	244 (42%)	45 (39%)
Insufficient	336 (58%)	72 (61%)
Consumption of tea		
No	64 (11%)	15 (13%)
Yes (near mealtimes)	394 (68%)	84 (72%)
Yes (outside of mealtimes)	122 (21%)	18 (15%)

[a]Significance threshold $p < 0.05$.

in parturients of our study on the role of other sociodemographic variables (gestity, number of previous abortions, and area of residence).

Blood loss during pregnancy and nutritional data such as the consumption of animal products rich in heme iron, consumption of fortified flour and tea consumption near meals were not involved in the onset of anemia of pregnancy.

In multivariate analysis (**Table 4**) and adjusting factors associated with anemia of pregnancy in the study population (anemia outside of pregnancy, anemia in previous pregnancies, age range of women in labor, gestational age, place of residence, previous abortions, consumption of flour label) only the history of anemia outside of pregnancy (OR = 3.4 95% CI 1.11 to 10.7, $p = 0.03$) and history anemia in previous pregnancies (OR = 3.33, 95% CI 1.99 to 5.5, $p < 0.001$) were associated with anemia of pregnancy.

4. Discussion

This study in Morocco in a population of women in labor has allowed us to assess the extent of anemia of pregnancy by a descriptive analysis of the prevalence of anemia and the study of risk factors associated with this disorder among pregnant women between 18 and 45 years. In this context our study showed that the prevalence of anemia of pregnancy in this Moroccan population was somewhat important (16.8%). The results of the literature on similar studies are controversial and vary from one country to another, and studies conducted in some countries in Africa have reported lower prevalence 8% north Cameroon [10], whereas others have reported highest prevalence (53.1%) in Nouakchott [11], 52% in Nigeria [12], 34% in Zambia [13], 41% in Tunisia [14], and about 45% Togo [15] [16].

Table 4. Risk factors for anemia among pregnant women in logistic regression.

Variables	Univariate analysis			Multivariate analysis		
	OR	95% CI	*p-value*	OR	95% CI	*p-value*
Anemia aside from pregnancy	7.9	2.7 - 22 .8	**<0.001**	3.4	1.11 - 10.7	**0.032**
Anemia in the previous pregnancies	4.07	2.5 - 6.6	**<0.001**	3.33	1.99 - 5.5	**0.001**
Age interval of pregnant women	0.99	0.71 - 1.38	0.23	1.32	0.99 - 1.48	0.53
Trimester of pregnancy	1.23	0.93 - 1.72	0.29	1.21	0.88 - 1.72	0.32
Area of residence	1.32	0.88 - 1.99	0.17	1.17	0.76 - 1.8	0.47
Previous abortions	1.25	0.9 - 1.7	0.18	1.12	0.79 - 1.5	0.49
Consumption of flour label	0.57	0.25 - 1.28	0.17	0.67	0.28 - 1.56	0.35

OR: Odds ratio, CI: confidence interval.

At the end of our study, the most affected age group by anemia during pregnancy was women aged over 35 years. This result is that of a study conducted in Tunisia and which revealed that women between 30 and 35 years constitute a risk group [17], in contrast to this, an analysis of eight clinical studies in the USA showed that pregnant women aged under 20 years were twice as likely to be anemic as older women [18] [19].

In this study anemia of the third quarter was the most predominant, contrary to a study that said that this is the second quarter that withdrawals from the woman reserves are the most important and therefore the hemoglobin level is lower [20]. The increase in the prevalence of anemia in the evolution of gestational age, demonstrated in this study is also noted by other authors [11] [21] [22], it is consistent with the increase physiological needs during pregnancy.

In our study, no association between anemia and parity were detected. This finding is contrary to the one made in a study on the prevalence of anemia among women of childbearing age in Burkina Faso witch found that the proportion of anemic women increases proportionally with the number of pregnancies [23]. However in other countries such as Nigeria and Ivory coast, primiparity is a risk factor of anemia [24].

Our study showed no relationship between the parturients place of residence and the occurrence of anemia during pregnancy, this result is consistent with that of the national survey conducted in 2001 by the Moroccan Ministry of Public Health [25].

It is reported in the literature that low meat consumption is the main factor associated with nutritional anemia [19]. In fact, meat is a major source of assimilable iron (heme iron). In addition, it promotes the absorption of non-heme iron [26]. However, after our investigation, it has not been shown that there is a relationship between meat consumption and the occurrence of anemia in pregnancy.

Our results show that a minority of women (8.8%) said recognizing and consuming fortified flour, this can be justified particularly in rural areas that people consume the flour derived from their own production, these results approach those of a survey conducted in 2009 in the north and west Morocco which affirms that (10.9%) of women consume fortified flour [27]. These results are still substandard given the efforts made by Morocco to promote the consumption of this flour and this by developing communication strategies including advertising and radio spots, newspaper articles and a social mobilization partner [28].

Concerning the consumption of tea, have been reported in the literature that the iron atom is complexed to tannins tea during pepsin digestion increasing its size and thereby inhibiting its absorption [9] [29]. So excess consumption of tea would be a causative factor of anemia by iron deficiency. However, in our study, tea consumption did not appear to influence significantly the occurrence of anemia during pregnancy.

In Morocco, some improvements were noted in nutrition. Indeed, the Ministry of Health has established a set of specific interventions to improve the nutritional status of vulnerable populations such as growth monitoring, promotion of the practice of breastfeeding, supplementation with vitamins and minerals for children and women during pregnancy and post partum and the promotion of the consumption of micronutrient fortified foods.

However, other steps remain to be taken to ensure safe motherhood, including the establishment of an effective continuum of care that would bring essential services to mothers at crucial stages of life, including the adolescence, before and during pregnancy, at birth and throughout their life women and their childbearing years,

and in strategic locations of households and communities through outreach and in health centers where women have access to care.

Community health partnerships are an essential link in the continuum of care. But to reduce maternal and neonatal mortality, antenatal care of good quality, the presence of skilled health personnel during delivery and administration of post-natal care for the mother and newborn may -be more important. Thus, our study has shown that the main factor correlated with the existence of anemia is the existence of anemia in a previous pregnancy. This leads us to propose a systematic screening of anemia in postpartum and more screening in early pregnancy.

5. Conclusion

Targeted interventions on adequate nutrition especially of women before and during pregnancy are a major challenge for developing countries like ours. It is also interesting that pregnant women undergo laboratory tests to detect anemia at the first prenatal visit, and they receive advice on how to ensure adequate intake of iron and increase iron bioavailability food. Evidence from our study also shows the need to implement educational programs to improve nutrition knowledge and sensitization of women.

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Competing Interests

The authors declare that they have no competing interests.

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