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Determinants of Iron Consumption among Pregnant Women in Southern Senegal

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Abstract

The anemia by iron deficiency is a public health problem. To palliate the multiple maternal and fetal consequences, the WHO recommends the iron supplementation during at least 90 days to all pregnant women. The goal of our study is to study the determinants of this consumption in the Kolda area (Senegal). It's the analytical cross-sectional study referred. We use the survey by clusters with 2 levels and it's about all of the women who gave birth in Kolda area between February 2013 and January 2014. The dependent variable was iron consumption during at least 90 days and the independents variables were grouped on personal factors, knowledge and practices. Data were collected during a personal interview face to face. We used logistic regression to identify the determinants of this consumption. The average age of women surveyed in 1442 was 25.5 years. They had knowledge of iron consumption (93%) and the number of antennal consultation (ANC) (66%). The prevalence of pregnant women who consumed iron at least for 90 days was 51%. The factors associated with consumption were schooling (ORa = 2.49 [1.54 - 4.03]), health awareness (ORa = 1.61 [1.25 to 2.07]), knowledge about number of ANC (ORa = 1.54 [1.18 - 2.00]), councils on the benefits of iron (ORa = 2.66 [1.77 - 4.00]), the household wealth index (ORa = 1.83 [1.04 to 3.19]), number of ANC (ORa = 2.05 [1.56 - 2.69]), age pregnancy on the first ANC (ORa = 2 [1.47 - 2.7]) and iron prescription (ORa = 1.64 [1.25 - 2.16]). The prevalence of iron consumption during at least 90 days is low in Kolda area (51%); however, its determinants are identified; we can solve the problem by increasing communicate more about iron supplementation and antenatal consultation.

Keywords

Iron Consumption, Anemia, Pregnancy, Maternal Mortality, Senegal

1. Introduction

Since late 1980s, the reduction of maternal deaths has been the main focus of international health agendas. Several international summits and conferences have taken this into account, including the Millennium Summit in 2000. One of the eight objectives of the Summit was to improve maternal health (MDG 5) and to reduce the ratio maternal mortality ratio by three-quarters between 1990 and 2015 [1].

Despite several progress in accessibility and availability of maternal health services, this ratio is still high and estimated at 450 maternal deaths per 100,000 live births (NV) in sub-Saharan Africa [2] [3]. In Senegal, there are 392 deaths per 100,000 NV against 723 deaths per 100,000 NV in the region of Kolda where the health care situation is unsatisfactory [4].

According to the World Health Organization, 80% of maternal deaths are due to severe bleeding, infections, hypertensive disorders during pregnancy and dystocia. The 20% would be related to indirect factors including anemia [2]. Prevention of this anemia requires iron supplementation since the only source of iron, which is the diet, and sometimes does not sufficiently meet the needs of the pregnant woman [5] [6] [7].

In 2011, in Senegal, the proportion of pregnant women who consumed iron for at least 90 days was 63%. Factors of non-adherence to iron supplementation in pregnant women would be age, place of residence, educational attainment, household well-being, achievement of PNCS and accessibility, and the existence of certain cultural practices such as geophagy [8] [9] [10] [11]. These factors are not exhaustive and are not all described. Thus, the interest of this study is to help better know the determinants of iron consumption during pregnancy for at least 90 days in the Kolda region.

The aim of this work is to study the determinants of iron consumption for at least 90 days during pregnancy in the Kolda region.

2. Framework, Tools and Methods

2.1. Framework

This study was carried out in the region of Kolda, in the south of Senegal. It covers 13 718 km^2, *i.e.* 7% of the national territory [4]. The population of the region of Kolda recorded in 2013 is 633 675 inhabitants with a density of 46 inhabitants per km^2, a rate of urbanization of 26% and 74% of population living in rural areas [12].

The antenatal care utilization rate (ANC) was 101.6%, the assisted delivery rate was 34.3% away from the target of 40%. Contraceptive prevalence was low at 6.9% versus a national average of 12% and the rate of caesarean section was 1% [4]. The maternal mortality rate is 723 deaths per 100,000 new birth against a national average of 392 per 100,000 new birth [4] [12].

2.2. Type of Study

This was a cross-sectional, analytical study of the determinants of at least 90 days of iron use during pregnancy among women in the Kolda region. The study population represented the female population in child-bearing age in the Kolda region.

All women who gave birth in the last 12 months prior to the study, between February

2013 and January 2014, were included, regardless of whether the delivery occurred in hospitals or at home. The refusal to participate and the absence of the woman at the time of collection constituted non-inclusion criteria.

The sample size was determined by the Schwartz formula, with an expected frequency of 63% and an accuracy of 5%. Given that a two-level random survey would be conducted, the sample size, representative of each of the three health districts in the Kolda region, was estimated at 1413 individuals. The first level of sampling consisted of the basic draw of census districts from the sampling frame used by the National Agency for Statistics and Demography. The second level of sampling corresponded to the systematic sampling of households within pre-selected census districts.

2.3. Ethical Considerations

Participation in this study was voluntary after obtaining the informed consent of the woman. Anonymity was respected and the data collected were secured in order to preserve their confidentiality. The approval of the National Ethics Committee for Health Research in Senegal (CNERS) was obtained before the start of the field activities, as well as the necessary administrative authorizations.

2.4. Data Collection Tool

A previously tested and corrected questionnaire was administered to the women included in the study. This questionnaire included several aspects such as the personal characteristics, the knowledge of these women on the health of the mother and the child and finally the attitudes of supplementation. The woman's personal characteristics related to the age of the woman, her marital status, her professional activities and the economic level of the household (assessed through an assessment of incomes, assets and household size). The knowledge evaluated concerned prenatal consultations (number, importance...), prevention of anaemias and iron supplementation (importance, molecule to be used...). Prenatal consultation and supplementation practices were also assessed through prenatal consultations, accessibility of the PNC service, adherence to supplementation.

Data collection was carried out, over a period of 10 days, by three teams of ten investigators each, previously trained. The collection was done by face-to-face interviews between the interviewer and the woman at her home.

2.5. Data Capture and Analysis

The data thus collected were entered on Epi info version 3.5.3 and analyzed with software R.

A univariate analysis made it possible to describe the variables and to have their proportions for the qualitative variables or their averages and standard deviations for the quantitative variables.

The bivariate analysis made it possible to look for possible associations between the dependent variable (Iron consumption at least for 90 days) and the independent variables. Khi 2 and Fisher tests were used according to their applicability conditions with

a significance threshold of 5%. Multivariate analysis was done in creating a simple logistic regression model from bivariate analysis by integrating all variables with p-values below 0.25 into the model [13]. The simple logistic regression was performed for the determination of factors related to iron consumption for at least 90 days with successive adjustment on personal characteristics, resources and needs taking into account the conditions of applicability, the threshold of significance remaining fixed at 5%.

3. Results

Among the 1442 women surveyed, the mean age was 25.48 with a standard deviation of 6.5 years. The minimum age for women was 14, the maximum for 48, with a proportion of 73% aged between 20 and 34 years.

The majority of women (Table 1) were uneducated (65%), without income-generating activities (52%), residing at a distance of less than 5 km from an antenatal clinic (55% On the importance of PNCS (63%) and iron supplementation (83%) and knew iron as an anemia medication (93%).

The study found that women did not perform at least the four recommended PNCS (68%), were supplemented with iron during the last pregnancy (91%) following a medical prescription (71%), and observed Supplementation for at least 90 days (56%) (Table 1).

Among women who had an income-generating activity, 52.4% had consumed iron for at least 90 days, compared with 48.9% for women who did not. However, this difference was not statistically significant ($p = 0.20$). In bivariate analysis (Table 2), iron consumption for at least 90 days was associated with personal characteristics (educational attainment, household well-being, distance from home to antenatal care, and woman's obstetric experience), knowledge of women (receiving advice on the realization of PNC and iron supplementation, recognition of iron as an anemia treatment) and attitudes (achievement of PNCS and the age of the first PNC, prescribing method iron).

Multivariate analysis showed that the factors that increased iron consumption for at least 90 days were higher levels of education, higher levels of household welfare, an income-generating activity for women, the prescription of iron supplementation by health personnel, the precociousness of the first prenatal consultation (PNC 1) and the realization of at least four PNCS (Table 3).

4. Discussions

The main limitation of this study is that the survey was conducted almost one year after delivery; which can be a source of memory bias. However the simplicity of the questions asked and the use of the notebooks of follow-up of the pregnancy made it possible to control it.

The results of our study show that 56% of women consumed iron for at least 90 days. The main determinants are personal characteristics (schooling, household well-being and income-generating activities) advice on iron intake and attitudes (method of prescribing iron, age of pregnancy at first NPC and number of NPCs performed).

Table 1. Distribution of women who gave birth between February 2013 and January 2014 in the Kolda region according to their personal characteristics, knowledge and attitudes (N = 1442).

Variables	Terms and conditions	Absolute frequencies (n)	Relative frequencies (%)
Education level	Not in school	943	65
	Primary	362	25
	Secondary	135	9
	Superior	2	1
Level of household well-being	The poorest	962	67
	Intermediate	398	27
	The richest	82	6
Existence of income-generating activities for women	Any	747	52
	Crafts	38	3
	Cash crops	239	17
	Small business	285	20
	Domesticated	22	2
Distance between home and antenatal care	Less than 5 km	783	55
	Between 5 and 10 km	271	19
	Between 10 and 15 km	118	12
	More than 15 km	175	12
Number of deliveries of women	<4	767	52
	≥4	675	48
Receiving advice on the 4 PNCS	Yes	912	63
	No	511	35
	Do not remember	19	2
Knowledge of anemia medications	Iron-folic acid	1336	93
	Other	106	7
Receiving advice on taking iron	Yes	1201	83
	No	241	17
Number of PNCS performed	≥4 PNC	459	32
	<4 PNC	983	68
Age of pregnancy at CPN1	<3 months	326	52
	≥3 months	307	48
Taking iron during the last pregnancy	Yes	1319	91
	No	80	6
	Do not remember	43	3
Prescription of iron supplementation during the last pregnancy	Yes	1020	71
	Self-medication	209	14
	Do not remember	213	15
Number of iron intake days	0 - 59 days	664	43
	60 - 89	18	1
	90 days and more	760	56

Table 2. Characteristics, knowledge and attitudes of women who gave birth between February 2013 and January 2014 in the Kolda region and consumption of iron for at least 90 days.

Variables	Terms and conditions	Iron intake for at least 90 days (%)	*p*-value
Education Level	Not in school Primary Secondary/higher	45.9 53.9 74.1	<0.001
Existence of income-generating activities for women	Yes No	52.4 48.9	0.20
Level of household well-being	The poorest Intermediate The richest	44.5 61.6 68.3	<0.001
Distance between home and antenatal care	<10 km ≥10 km	53.2 43.3	0.001
Number of deliveries of women	<4 ≥4	55.2 46.1	0.002
Knowledge of anemia medications	Iron-folic acid Other	52.6 24.5	<0.001
Receiving advice on the 4 PNCs	Yes No	58.6 36.8	<0.001
Receiving advice on taking iron	Yes No	56.5 21.2	<0.001
Age of pregnancy at PNC 1	<3 months ≥3 months	70.7 44.6	<0.001
Number of PNCs carried out	≥4 visits <4 visits	67.1 42.8	<0.001
Prescription of iron	Yes Self-medication	56.6 36.0	<0.001

Table 3. Modeling factors related to iron consumption for at least 90 days in women who gave birth between February 2013 and January 2014 in the region of Kolda.

Variables	Terms and conditions	Model 1 OR (95% CI)	Model 2 OR (95% CI)
Education level	Not in school Primary Secondary/higher	1 1.17 (0.89 - 1.54) 2.42 (1.51 - 3.88)	1 1.16 (0.88 - 1.54) 2.49 (1.54 - 4.03)
Existence of income generating activities for women	No Yes	1 1.2 (0.95 - 1.52)	1 1.28 (1.10 - 1.63)
Level of household well-being	The poorest Intermediate The richest	1 1.61 (1.22 - 2.13) 1.96 (1.14 - 3.37)	1 1.66 (1.25 - 2.21) 1.83 (1.04 - 3.19)
Distance between home and antenatal care	≥10 km <10 km	1 1.02 (0.75 - 1.37)	1 0.99 (0.73 - 1.34)
Number of deliveries of women	≥4 <4	1 1.2 (0.92 - 1.56)	1 1.09 (0.83 - 1.43)

Continued

Knowledge of anemia medications	Other	1	1
	Iron-folic acid	0.84 (0.49 - 1.42)	1.02 (0.61 - 1.76)
Receiving advice on the 4 PNCs	No	1	1
	Yes	1.3 (0.99 - 1.7)	1.13 (0.88 - 1.53)
Receiving advice on taking iron	No	1	1
	Yes	3 (2.02 - 4.47)	2.66 (1.77 - 4.0)
Age of Pregnancy at PNC 1	<3 months	-	1
	≥3 months		2 (1.47 - 2.7)
Number of PNCs carried out	<4 visits	-	1
	≥4 visits		2.05 (1.56 - 2.69)
Prescription of iron	Yes	-	1
	Self-medication		1.64 (1.25 - 2.16)

Our study limits the fact that the survey was conducted almost one year after women gave birth; which can be a source of bias information including flawing memorization. However, the precision of the collection tool avoided this type of bias. The main strengths of this study are its accuracy because of the relatively high sample size (1442 women surveyed) and the method of analysis that allowed for correcting confusing factors.

According to the World Health Organization, all pregnant women in developing countries with a high prevalence of anemia must consume iron for at least 90 days to prevent pregnancy anemia and improve pregnancy outcomes, as well as maternal and child health [14] [15] [16]. This recommendation is not fully respected. Thus, the proportion of pregnant women who consume iron for at least 90 days during pregnancy varies from country to country and from region to region within the same country.

The results reported here are those of a cross-sectional analytical study carried out in the region of Kolda in 1442 women who gave birth between February 2013 and January 2014. They reveal that 91% of women had consumed iron during their pregnancy, but the proportion who consumed it for at least 90 days was only 51%. This low proportion has also been found in several developing countries such as Cambodia, Mali, Nepal and Indonesia, where they are respectively 47%, 28%, 20.7% and 40% [17] [18] [19] [20]. However, relatively high rates have also been observed in other developing countries such as Nigeria [21] and India [22] where the authors reported rates of 65.9% and 64.7%, respectively. In Europe, studies of pregnant English women indicated that 70% of these women adhered to iron supplementation [23] [24].

These prevalence differences across the world may be related to the sociodemographic characteristics of the study population or to whether or not prenatal care is available; However, Lacerte *et al.* in a study conducted in Cambodia stated that this is rather the consequence of the ineffectiveness of the implementation of prevention programs in place [19].

Several factors have been identified as associated with iron consumption for at least 90 days in pregnant women. Schooling, especially at the secondary or higher level, can

positively influence this consumption. Indeed, in our study 74.1% of women who had this level of education had respected the appropriate duration of iron consumption and were 2.49 times more likely to respect it. Corresponding findings were found in Nepal [18] with an OR of 3.1, Nigeria [21] with an OR of 5.5 and Pakistan [25] with OR of 2.36. These results are similar to previous studies in the DHS where the authors found that women with a high level of education were likely to consume iron properly [8] [9] [17]. This may be explained by the fact that educated women have better access to health information, increasing their concern about their health and that of their future babies, but also have easier access to health information. Health services that provide iron.

Indeed, it is often through awareness that women receive information about health. Women of reproductive age who have attended health awareness sessions acquire knowledge that pushing them to adhere to the consumption of iron. In our study, nearly 60% of women met this criterion with ORa of 1.62. Previous studies in Cambodia [19] and Sweden [26] have also reached similar conclusions.

According to Khanal *et al*., counseling about the benefits of consuming iron throughout pregnancy and postpartum may influence women to consume it [18]. This hypothesis is verified in our study where women who received these tips were 2.66 times more likely to consume iron for at least 90 days. These results are similar to those found by several authors, such as in Senegal [27], India [28], Ethiopia [29] and Viet Nam [30]. This suggests that IEC interventions and especially the quality of information provided to women can play an important role in accessing health care facilities and hence in the consumption of iron for at least 90 days.

The results of our study showed that the higher the level of economic well-being of the household, the more likely a woman is to consume iron properly. Superposable results have been found in the literature [8] [9] [17] [21] [25] [28]. On the other hand, studies in Denmark and Ethiopia have shown contrary results [29] [30]. This may be explained by the fact that women from wealthy backgrounds may consider themselves to be less vulnerable to anemia and therefore have poor compliance.

Iron supplementation is an integral part of the refocused PNC and it is during these PNCS that midwives reiterate and reinforce the interest in iron use throughout pregnancy among women. The high percentages found in women who had early PNC (70.7%) and those with 4 or more PNCS (67%) were justified and were similar to those reported in several studies [19] [27].

We know that the prescription of iron is the proof of the contact between the pregnant woman and the health professional. At present, the association between prescription and iron consumption is not documented in the literature, but we have shown by showing that the chance of consuming iron for at least 90 days was multiplied by 1.64 Women with a prescription in iron than in women in self-medication.

5. Conclusions

The use of iron for at least 90 days during pregnancy remains an effective means of controlling serious deficiency anemia and thus reducing maternal and infant morbidity and mortality.

The results of this study reveal that this consumption is still low (51%) in the Kolda region, where it is influenced by a number of factors, including women's education, awareness of women in health, counseling on the benefits of iron intake during pregnancy, the level of well-being of the household and the woman's attitudes (number of PNCS performed, age of pregnancy at the first PNC and mode of prescription of iron).

Knowledge of these determinants may contribute to the development of good practice guidelines for reproductive health interventions to improve the prevalence of iron use for at least 90 days during pregnancy.

Acknowledgements

Conflict

No conflict of interest to declare.

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