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Inequality in iron sulfate supplementation among pregnant women in Southern Brazil

Iniquidade na suplementação de sulfato ferroso entre gestantes no sul do Brasil

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ABSTRACT: ***Introduction:*** The use of ferrous sulfate is recommended for all pregnant women from the 20th week of gestation to the 3rd month after delivery. ***Objective:*** To evaluate the coverage of ferrous sulfate among pregnant women and differentials according to demographic and socioeconomic variables. ***Method:*** A cross-sectional population-based study with women who had children in Rio Grande, Rio Grande do Sul, Brazil, from January 1st to December 31st, 2013. Ferrous sulfate coverage was assessed according to maternal age, schooling, family income, and type of prenatal care. Statistical analysis included Pearson's χ^2 test and Poisson regression. ***Results:*** 2,685 postpartum women (97% of the total) were interviewed and the ferrous sulfate coverage was 63%. The largest relative differences were between the extreme maternal schooling groups (50%) and the type of medical care in prenatal care (72%). Women aged between 13 and 19 years were significantly associated with the use of supplement (RP = 1.16; 95%CI 1.08 – 1.25) when compared to women aged ≥ 30 years. Those who used the public service in prenatal care were more strongly associated with the outcome when compared to those who used the private system (PR = 1.61; 95%CI 1.49 – 1.74). ***Conclusion:*** Considering that there are unusual situations in the health sector in which disadvantaged groups are privileged, these findings are rare and indicate the presence of inequality in a way that is opposite to what was expected. The supplement should consider all women, especially older women, with higher education and better socioeconomic status.

Keywords: Ferrous sulfate. Prenatal care. Health inequalities. Pregnancy. Gestation.

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RESUMO: ***Introdução*:** O uso de sulfato ferroso é recomendado a todas as gestantes a partir da vigésima semana de gestação até o terceiro mês após o parto. ***Objetivo:*** Avaliar a cobertura de sulfato ferroso entre as gestantes e diferenciais de acordo com variáveis demográficas e socioeconômicas. ***Metodologia*:** Estudo transversal de base populacional com mulheres que tiveram filhos em Rio Grande, Rio Grande do Sul, no período de 01 de janeiro a 31 de dezembro de 2013. A cobertura de sulfato ferroso foi avaliada de acordo com idade e escolaridade materna, renda familiar e tipo de assistência médica no pré-natal. A análise estatística incluiu teste do χ^2 de Pearson e regressão de Poisson. ***Resultados*:** Foram entrevistadas 2.685 puérperas (97% das mulheres elegíveis). A cobertura de sulfato ferroso foi de 63%. As maiores diferenças relativas foram entre os grupos extremos de escolaridade materna (50%) e em relação ao tipo de assistência médica no pré-natal (72%). Mulheres com idade entre 13 e 19 anos mostraram-se significativamente associadas ao uso do suplemento (RP = 1,16; IC95% 1,08 – 1,25) quando comparadas às mulheres com idade ≥ 30 anos. Quem utilizou o serviço público no pré-natal esteve mais fortemente associado ao desfecho quando comparado com quem utilizou o sistema privado (RP = 1,61; IC95% 1,49 – 1,74). ***Conclusão*:** São incomuns situações no setor de saúde em que os grupos menos favorecidos são privilegiados. Esses achados são raros e indicam a presença de iniquidade de forma contrária ao esperado. O suplemento deve considerar todas as mulheres, em especial as mais velhas, com maior escolaridade e de melhor nível socioeconômico.

Palavras-chave: Sulfato ferroso. Pré-natal. Desigualdades em saúde. Gravidez. Gestação.

INTRODUCTION

The prophylactic use of ferrous sulfate in pregnancy reduces the occurrence of maternal iron-deficiency anemia[1], and has been recommended to all pregnant women by the World Health Organization since 1959[2]. In Brazil, it was instituted in 2005, and its use is recommended after the 20th week of pregnancy until the third month after labor (regardless of the hemoglobin level)[3].

Even though the program recommending the supplementation at a national level has been valid for over a decade, the coverage of ferrous sulfate is still low. In Brazil, few studies present the prevalence of use of this supplement among pregnant women. A study conducted in 2007 with all puerperal women in Rio Grande, Rio Grande do Sul, presented 59% of coverage[4]. An analysis with puerperal women from the school hospital of Campinas, São Paulo, found 31% of prevalence of use of ferrous sulfate in the last pregnancy[5]. A study that observed the use of medications during pregnancy in health units in Natal, Rio Grande do Norte, showed that the prevalence of ferrous sulfate after the second trimester of pregnancy was 69%[6]. None of these studies, however, explored the results considering the socioeconomic and demographic differentials.

One of the most remarkable characteristics of the Brazilian society is the presence of iniquity, that is, inequality resulting from social injustice[7]. This happens because, despite the rights being equal in the constitution, people end up having different access to goods and services, especially in the health sector[8,9]. The access to health services is strongly influenced by the social condition of the people and the location where they

reside[9]. Usually, the availability of medical care varies inversely in relation to the necessity of the population assisted[10]. Therefore, the better the socioeconomic status, the higher the access, the higher the coverage, and, consequently, the better the health indicator in this population group in comparison to the others. Besides the easier access, richer people also receive more qualified care and have priority access to new technologies[11]. The richer also receive unnecessary interventions more often, as is the case of C-sections[12,13] and episiotomy[14].

The objective of this study was to assess differentials regarding the coverage of ferrous sulfate supplementation according to maternal demographic and socioeconomic characteristics of the families of pregnant women living in Rio Grande, who had children in 2013.

METHODS

This is a cross-sectional, population-base study. The data used in its elaboration were collected as part of a larger study, called "Perinatal Study, 2013", conducted in the city of Rio Grande, Rio Grande do Sul, which approaches the evaluation of the quality of pregnancy and labor care in the city, and has been conducted every three years, since 2007. Rio Grande is located in the extreme South of Brazil, 250 km away from the border with Uruguay and about 300 km away from Porto Alegre. In 2013, it had a territorial area of 2.7 km^2, and little less than 200 thousand inhabitants[15]; its human development index (HDI) was 0.74.

Women who had children in two local maternity wards, Santa Casa de Misericórdia de Rio Grande (SCMRG) and Hospital Dr. Miguel Riet Corrêa Junior da Universidade Federal do Rio Grande (HU/FURG), were interviewed up to 48 hours after labor, from January 1st to December 31st, 2013. Puerperal women living in the urban or rural area of the city, with 20 weeks or more in gestational age or whose newborn had weight at birth of 500 g or more were considered eligible for this study. The illegible women were those living in another city, who did not adapt to the eligibility criteria in this study. Considering an estimated coverage of 60% for ferrous sulfate supplementation[4], 69% confidence interval, losses of up to 5%, margin of error of 2.0 percentage points, this study should include at least 2,395 mothers of newborns[16]. In 2013, the total number of women living in Rio Grande who had children in one of the maternity wards of the city was 2,769.

The information collected in this study were obtained using a single questionnaire, standardized and pre-codified, which was applied to the mothers, still in the hospital, by previously trained interviewers. Data about demographic characteristics, such as maternal age and skin color, were collected, besides socioeconomic ones, like family income in the past month and schooling years; prenatal care, such as the number of appointments conducted, trimester of beginning, type of service where prenatal care appointments took place (public or private). Those who used the outpatient clinics (at HU/FURG or SCMRG) and basic health units were classified as public; and appointments conducted at a private office or by

a health insurance plan were private. The outcome was the use of ferrous sulfate during the last pregnancy using the following question: "Have you had ferrous sulfate or any drug containing iron during this pregnancy?".

For the conduction of the interviews, four interviewers were trained by reading the questionnaire and the manual of instructions, followed by the conduction of a pilot study, in the same maternity wards where the study was conducted, during the first fortnight in December, 2012. Two interviewers were hired to work full-time, and the others, during the weekends and holidays. On a daily basis, the interviewers went to the maternity wards to check which puerperal women that had been admitted lived in the city of Rio Grande. After identifying them, they went to the infirmary and explained the study to them. After the newborn's mother agreed, she signed two copies of the Informed Consent Form; one was with her, and, then, the interview was conducted. At the end of each day of work, the interviewer codified the questionnaires applied, and, afterwards, delivered them in the project's office to be revised and typed.

The typists were Medical students from FURG, with scholarships for scientific initiation. For data entry, comparison and correction of the typing, the software Epidata 3.1 was used[17]. The data were typed twice, at an inverse order, by different typists and compared to each batch of one hundred questionnaires. All inconsistencies identified were solved by verifying the physical questionnaire, and, if necessary, the woman was contacted again. The consistence and final analysis of the data was conducted using the statistical package Stata, version 12[18]. The population was described for each one of the independent variables, and the coverage of ferrous sulfate use was analyzed considering four characteristics: age, maternal schooling, family income and type of service where the prenatal care appointments took place (public or private). The comparison of proportions was made using the Pearson's χ^2 test, and the prevalence ratios (PR), with their respective 95% confidence intervals (95%CI), using the Poisson regression with robust variance; all variables included were at the same level and were adjusted.

Quality control was conducted with the repetition of approximately 7% of the interviews. This evaluation was conducted by a person hired for this purpose, who used a reduced questionnaire, applied by telephone, with mothers selected randomly. The Kappa index, which measures the concordance between the answers given by the mother on both occasions, was always above 0.70, which is considered satisfactory. The project was approved by the Research Ethics Committee in the Health Field (CEPAS) at Universidade Federal do Rio Grande, report n. 85/2012, on September 25, 2012.

RESULTS

This study identified 2,769 puerperal women living in Rio Grande, who had a child in 2013. It was possible to interview 2,685 of them, representing 97% of the eligible women. Table 1 shows the distribution of the main maternal characteristics. A little more than 17% of the puerperal women were teenagers, and one third of them were aged 30 years

Table 1. Main characteristics of puerperal women who had children in the city of Rio Grande, Rio Grande do Sul, 2013.

Characteristic	n	%
Maternal age (years)		
13 – 19	464	17.3
20 – 24	707	26.3
25 – 29	648	24.1
≥ 30	866	32.3
Skin color (self-reported)		
White	1,776	66.2
Brown	597	22.2
Black	312	11.6
Maternal schooling (years)		
1 – 8	1,064	39.6
9 – 11	1,201	44.8
≥ 12	420	15.6
Monthly family income in minimum wages		
Up to 1.99	909	33.8
2 to 3.99	1,060	39.5
4 or more	716	26.7
Number of appointments conducted in prenatal care		
1 to 3	111	4.2
4 or 5	261	10.0
6 or more	2,244	85.8
Trimester of beginning of prenatal care		
First	2,056	78.6
Second	511	19.5
Third	48	1.8
Type of prenatal care		
Public	1,351	51.6
Private	1,265	48.4
Ferrous sulfate supplementation	1,683	62.6
Total	2,685	100

or more. Most women declared to be white 966%). Forty percent had at least eight complete schooling years, and one third of them received two minimum wages of monthly family income. Finally, 86% had six or more prenatal appointment, and practically 80% began these appointments in the first trimester of pregnancy. There was a slight prevalence of pregnant women who had prenatal appointments in the public network (51.6%). Among the interviewees, 62.6% (95%CI 60.8 – 64.5) reported having used ferrous sulfate in the past pregnancy.

Table 2 presents the prevalence of iron supplementation for each one of the categories of the independent variables. The higher the age of the puerperal woman, the lower the coverage of ferrous sulfate supplementation. By considering all puerperal women, the relative difference between extreme age groups is 40% (77% / 55%). The more schooling years, the lower the coverage of ferrous sulfate. The relative difference between

Table 2. Prevalence of ferrous sulfate supplementation in pregnancy by maternal age, schooling, Family income and type of prenatal care. Rio Grande, Rio Grande do Sul, 2013 (n = 2,685).

Variable	Iron supplementation	Prevalence ratio (95%CI)	Prevalence ratio (95%CI)
		Crude analysis	Adjusted analysis
Maternal age (years)	*p < 0.001		
13 – 19	77.4%	1.41 (1.30 – 1.52)	1.16 (1.08 – 1.25)
20 – 24	64.9%	1.18 (1.09 – 1.28)	1.09 (1.01 – 1.18)
25 – 29	59.9%	1.09 (1.00 – 1.19)	1.06 (0.98 – 1.14)
≥ 30	54.9%	1.00	1.00
Maternal schooling (years)	*p < 0.001		
1 – 8	71.7%	1.49 (1.35 – 1.67)	1.06 (0.94 – 1.19)
9 – 11	59.7%	1.25 (1.12 – 1.39)	1.04 (0.93 – 1.17)
≥ 12	47.9%	1.00	1.00
Monthly family income in minimum wages	*p < 0.001		
Up to 1.99	73.3%	1.45 (1.33 – 1.57)	0.98 (0.90 – 1.08)
2 to 3.99	61.6%	1.22 (1.12 – 1.33)	1.05 (0.95 – 1.15)
4 or more	50.6%	1.0	1.0
Type of prenatal care (n = 2,616)	*p < 0.001		
Public	80.5%	1.71 (1.60 – 1.82)	1.61 (1.49 – 1.74)
Private	47.1%	1.0	1.0

*p-value < 0.05: statistically significant. Pearson's χ^2 test.

who studied for less than 8 years and who studied for 12 years or more is 50% (72/48). Regarding family income, the poorer women had higher coverage rates of ferrous sulfate supplementation when compared to richer women, and the relative difference was 43% (73/51). When comparing the women who used the public health system during prenatal appointments with those who were assisted at the private system, the relative difference reaches 72% (81/47).

In Table 2, it is also possible to verify the PR with 95%CI for each one of the independent variables. By analyzing the use of ferrous sulfate according to each variable by the Poisson regression, the adjusted analysis reveals that maternal age and type of prenatal care are the variables significantly associated with its use among puerperal women in Rio Grande.

DISCUSSION

This study showed low coverage (63%) of ferrous sulfate supplementation among puerperal women in the city of Rio Grande, and presented an unequal distribution among pregnant women when considering age groups, maternal schooling, Family income and type of service where the prenatal care appointments took place (public or private). Since the rule of the Ministry of Health[3] is to prescribe ferrous sulfate supplementation as a routine for all pregnant women, a higher prevalence was expected.

The higher coverage of supplementation was observed among younger mothers, with low schooling, which are the ones most vulnerable to presenting worse performance in terms of gestational outcomes (perinatal mortality and low weight at birth)[19]. This finding is opposed to the inverse care law, described by Hart in 1971, which describes that "the availability of good medical services tends to be inversely proportional to the necessities of the population assisted"[10]. In this study, the health services seem to differentiate mothers regarding age and schooling by acting with discrimination against older pregnant women, with higher schooling. This situation can be owed to the fact that health professionals consider that older women, with higher schooling, eat better than young ones, with lower schooling, and, therefore, the supplement would not be so necessary. Besides, health professionals may have understood that anemia occurs more frequently among poorer women, therefore highlighting the importance of ferrous sulfate supplementation in pregnancy to the group of puerperal women in a less favorable economic status. Once again, it is important to warn that, regardless of the hemoglobin level, the recommendation of ferrous sulfate is valid for all pregnant women.

The coverage was also higher among puerperal women whose family income was lower than two minimum wages, and who used the public system in prenatal care. This situation indicates the presence of inequity unlike the expected, considering that this concept, in health, is assessed as an "unfair inequality"[20]. The expected reality was that women with higher schooling and income had used the iron supplement more often. The inverse

iniquity took place because the less favored women were actually the most privileged ones. There are rare situations in the health field in which less favored groups are privileged. Therefore, in this study, we will approach such disparity as an inverted iniquity. Similarly to this finding, a study about the quality and equity of care in prenatal care and labor in Criciúma, Santa Catarina, showed that, among the ten prenatal care procedures studied, only the iron prescription was significantly higher among the poorer[21]. Some studies presented other situations in which the lower income population was benefitted. A study with a random sample of women living in Campinas, São Paulo, showed that some indicators of health quality care, such as the performance of routine examinations and anti-HIV tests, were conducted by a higher number of pregnant women with lower income[22]. However, the same study showed that the evaluation of prenatal care by pregnant women was very positive, even though it was significantly less favorable in the lower income group[22]. A study about social inequities in health and nutrition of children in low and mid-income countries showed that, of all the analyzed adverse conditions, only child obesity and inadequate practices of breastfeeding had lower prevalence among children from less favored families[8]. In general, socioeconomically less favored populations are the ones that receive less care from health services[19,23].

The study of inequalities in care has been analyzed based on the variable family income[21,24,25]. In this study, by analyzing the coverage of ferrous sulfate considering Family income, there was a relative difference between the poorest and the richest pregnant women, of 43%. However, the highest relative difference was found when analyzing the coverage of ferrous sulfate, considering the type of medical service in prenatal care (72%). Of all analyzed puerperal women, a little more than half (52%) used the public system in prenatal care. A similar result was found in the study about equity and health care of pregnant women conducted in Campinas, which showed that the public system was in charge of 53% of the prenatal care[22]; and it was lower than the results found in the study *Nascer no Brasil*, in which 67% of the pregnant women in the South region referred having used the public prenatal care system[26]; and lower to that reported by the mothers of children younger than three years old, who took place in the study about quality and equity in prenatal care and labor in Criciúma, Santa Catarina (75%)[21].

The analysis of the ferrous sulfate coverage by pregnant women who used the private sector in prenatal care showed significant difference by family income (data not shown in table), showing that, even in the group of puerperal women who used the private sector, the poorer pregnant women used the supplement more often when compared to the richer pregnant women ($p = 0.006$). This finding shows that there seems to be inequity regarding the coverage of ferrous sulfate according to family income, even when analyzing only the group of women who used the private system, and is characterized as inverse inequity for favoring the poorest, which is a rare finding in the offer of health services[8]. The fact that the inequality is inverse to the expected in the group of women assisted in the private sector indicates that the health professionals in this field are not properly aware of the Ministry of Health rules. It is worth to

mention that the public health policies in the country were not created to assist only the poorest, but the entire population.

By assessing the coverage of ferrous sulfate in relation to the type of service provided in prenatal care, it is necessary to contextualize the city of Rio Grande, which, in the past few years, has stood out nationally. In 2013, the fact that Rio Grande has the port sector as one of its main economic activities led to socioeconomic growth, which may have resulted in higher access to the private health sector, especially using insurance companies, regarding prenatal care. In this study, it is possible to observe a similar percentage of women who underwent prenatal care in the public and private health sectors, but, in a previous study conducted in Rio Grande, in 2007, the percentage of women who conducted prenatal care in the public service was higher (61%) than that of women who used the private system (39%)[4].

Most of the time, health services tend to practice the "inverse care law"[10], in which those who need care the most are the least benefitted by the good health practices. Therefore, the health programs reach more coverage specifically on the population groups that would need it the least[8-10]. This study revealed the opposite, that is, the ferrous sulfate supplementation in the city of Rio Grande is more frequent among puerperal women who needed care the most, and who would possibly be subject to more risks of complications during pregnancy. A study conducted in 2007 in the same city found a 59% coverage of ferrous sulfate supplementation, lower to that in this study, and had already shown higher chances of supplementation with ferrous sulfate among pregnant women aged between 15 and 19 years, with less than 8 schooling years, belonging to the lower income tercile and who had prenatal care appointments in the public health network[4]. However, in this study from 2007, the presence of inequity was not analyzed.

A study about equity in health systems showed that, in general, the health services are unequal, with more and better services for those who need them the least; and also that public services in developing countries favor the richer[9]. In this case, with the ferrous sulfate supplementation, besides favoring the poorer puerperal women, it was also more frequent among those who used the public system, contradicting this finding.

This study aims at filling a gap in the literature regarding the ferrous sulfate supplementation during pregnancy, according to the existing inequalities. The data presented here can be considered original in its contribution in the field of social inequalities in health, since it shows that older women, with higher socioeconomic status, are the least favored ones regarding the use of ferrous sulfate supplementation in pregnancy. The main advantage of this study is the fact that it includes all women who had children in 2013, in the city of Rio Grande, to evaluate the use of ferrous sulfate. The limitation is that the data in this study were collected by self-report in the immediate puerperium. Since the data were not collected during pregnancy, they are subject to memory bias at the time of the interview. However, it is believed that this possible bias would not change the results between the analyzed groups.

CONCLUSION

The highest coverage of supplementation presented among younger women, with worse socioeconomic level, suggests that the use of ferrous sulfate supplementation is a practice that favors the poorest. In this case, the unequal treatment that occurred in relation to the distribution of ferrous sulfate among pregnant women in the city of Rio Grande was assessed as being beneficial, since it favors women who need the supplement the most. In spite of that, we should consider that the inequity persists among women of higher income. Therefore, the results presented here reveal the need to improve the coverage of ferrous sulfate supplementation among pregnant women in the city of Rio Grande, in order to reduce the inequalities. For that, it is important to motivate and train health professionals, especially in the private network, as to the importance of supplementation for all women, especially those aged more than 20 years, with higher schooling and family income higher than 2 minimum wages. Finally, further studies should be conducted to monitor the determinants of health inequities regarding ferrous sulfate.

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