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ORIGINAL ARTICLE

Geoprocessing and prevalence of incomplete prenatal booklets and gestational diabetes screening in a southern Brazilian University Hospital

Geoprocessamento e prevalência de caderneta de pré-natal incompleta e rastreamento de diabetes gestacional em hospital universitário do sul do Brasil

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ABSTRACT

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Objective: to evaluate the prevalence of an incomplete prenatal booklet and gestational diabetes mellitus (GDM) screening of postpartum women in a southern Brazilian University Hospital, relating to their municipality of origin and neighborhood. **Method:** cross-sectional study, including 283 postpartum women, aged over 18 years, who gave birth at the University Hospital of Santa Maria/Brazil from January to April 2015. An incomplete prenatal booklet was defined as the absence of any data regarding the obstetric history and the current pregnancy, as well as the lack of identification of the pregnant woman and the health unit where prenatal care was performed. For GDM screening, information on fasting blood glucose and risk factors collected from the postpartum women was used. The SPSS 20.0 program was used for descriptive statistics and the Geolocation maps were separated by municipalities of origin and by neighborhoods where the prenatal care of the puerperal women occurred and plotted according to the variables evaluated, using the ArcGIS 10.3 software. **Results:** the prevalence of an incomplete prenatal booklet was 79.2%, while prevalence of positive GDM screening was 73.9%. Geolocation pointed out 14 municipalities of origin and six neighborhoods where prenatal care had the highest prevalence of incomplete prenatal booklets. For GDM screening, spatial distribution showed ten municipalities of origin and four neighborhoods with a higher prevalence of positive screening for GDM. **Conclusion:** geolocation showed that 14 municipalities of origin and six neighborhoods had the highest prevalence of incomplete prenatal booklets. In addition, ten municipalities of origin and four neighborhoods presented a higher prevalence of positive screening for GDM.

Keywords:

Pregnancy; Prenatal Care; Gestational Diabetes; Spatial Distribution.

RESUMO

Objetivo: avaliar a prevalência de caderneta de pré-natal incompleta e rastreamento de diabetes mellitus gestacional (DMG) em puérperas de um Hospital Universitário do sul do Brasil, segundo o município de origem e vizinhança. **Método:** estudo transversal, incluindo 283 puérperas, com idade superior a 18 anos, que deram à luz no Hospital Universitário de Santa Maria/Brasil no período de janeiro a abril de 2015. A caderneta de pré-natal incompleta foi definida como a ausência de quaisquer dados referentes à obstetria, história e gravidez atual, bem como a falta de identificação da gestante e da unidade de saúde onde foi realizado o pré-natal. Para o rastreamento do DMG, foram utilizadas informações sobre a glicemia de jejum e fatores de risco coletados das puérperas. Utilizou-se o programa SPSS 20.0 para estatística descritiva e os mapas de Geolocalização foram separados por municípios de origem e por bairros onde ocorreu o pré-natal às puérperas e plotados de acordo com as variáveis avaliadas, por meio do software ArcGIS 10.3. **Resultados:** a prevalência de caderneta de pré-natal incompleta foi de 79,2%, enquanto a prevalência de rastreamento positivo para DMG foi de 73,9%. A geolocalização apontou 14 municípios de origem e seis bairros onde o pré-natal teve as maiores prevalências de caderneta de pré-natal incompleta. Para a triagem de GDM, a distribuição espacial mostrou dez municípios de origem e quatro bairros com maior prevalência de triagem positiva para GDM. **Conclusão:** a geolocalização mostrou que 14 municípios de origem e seis bairros apresentaram as maiores prevalências de caderneta de pré-natal incompleta. Além disso, dez municípios de origem e quatro bairros apresentaram maior prevalência de rastreamento positivo para DMG.

Palavras-chave:

Gravidez; Cuidados pré-natais; Diabetes gestacional; Distribuição espacial.



INTRODUCTION

During pregnancy, prenatal care aims to identify risks in a timely manner and to take actions that maintain a high level of attention to maternal and child health.¹⁻³ In Brazil, prenatal care is a matter of concern⁴ due to deficiencies in healthcare coverage that vary from 1 to 20%.² In addition, other studies revealed social inequities present in healthcare, showing that women with lower family income, less education and who are non-white are those who receive lower quality of prenatal care.^{1,5,6}

In 2000, the Brazilian Ministry of Health created the Humanization Program in the Prenatal Period and Birth (PHPN) which standardized the assistance to pregnant women and proposed a change in the assistance model for the pregnancy-puerperal cycle to ensure women's right to humanized care during pregnancy, childbirth and puerperium and access to prenatal care with quality and care in a universal and timely manner.⁷ Thus, filling the prenatal booklet properly becomes an essential instrument to guarantee a good outcome for the pregnancy, while at the same time functioning as a communication mechanism between the levels of attention. In addition, the absence of information on maternal and child health on the prenatal booklet can directly impair the quality of prenatal care services, causing procedures or tests that protect the fetus and the mother to be neglected or repeated unnecessarily.^{7,8} At the same time, the prenatal booklet is also an important tool for obtaining information on early diagnosis, monitoring and treatment of diseases that increase the risk of perinatal mortality, such as gestational diabetes mellitus (GDM).⁹

With this in mind, it is essential that managers know the living conditions and health status of the population when planning the provision of services and the impact of health actions. Therefore, it is not enough to know the characteristics of the populations involved; it is necessary to locate, as precisely as possible, the place where the damages occur. Thus, mapping areas of higher risk is extremely important for health surveillance. With mapping, the knowledge of the spatial distribution of the area makes it possible to determine patterns of health status and thus show geographical disparities. In addition, the delimitation of risk areas can contribute to support better planning and management decisions for public policies.¹⁰

The use of geoprocessing in health enables,

through data crossing, the vision of their spatial distribution, facilitating the insertion of intersectoral data, expressing the relationships between living conditions and health levels.¹¹ As a result, the geolocation is a concern of the Ministry of Health in recent decades, being a tool of paramount importance in the area of public health, because through this technique it is possible to recognize the local reality and, thus, reorient health actions.¹²

Thus, to evaluate the prevalence of an incomplete prenatal booklet and gestational diabetes mellitus (GDM) screening of postpartum women in a southern Brazilian University Hospital, relating to the municipality of origin and the neighborhood in which they live.

METHOD

This is a cross-sectional, prospective study, with puerperal women who performed prenatal care in the basic health network of the 4th Regional Health Coordination of Rio Grande do Sul and the region covered by the University Hospital of Santa Maria/Brazil (HUSM). The study included postpartum women over 18 years of age, carrying a prenatal booklet and who had their deliveries performed at the Obstetrics Service of HUSM/RS, from January 1st to April 30th, 2015.

The Basic Health Network covered by HUSM comprises 32 municipalities, 100% of which are part of the Unified Health System (SUS) and located on the campus of the Federal University of Santa Maria (UFSM), in the city of Santa Maria, Rio Grande do Sul/Brazil. For the sample calculation, an average frequency of 140 births/month at the HUSM was considered, with an error margin of 5% for a heterogeneous sample calculated at 80%. The risk of losses was considered and, for this purpose, the number of cases to be analyzed was increased by 50%, resulting in 283 puerperal women.

It was standardized as an incomplete prenatal booklet, when any of the following data were missing: i) identification of the pregnant woman and the Health Unit where prenatal care was performed; ii) all data referring to obstetric history and current pregnancy; iii) data referring to personal and family risk factors and past pathologies, complete records of consultations-date, gestational age, weight, blood pressure, uterine height, fetal heartbeat; iv) guidance and identification of the professional who cared for the puerperal

woman and; v) recording of data from laboratory tests, ultrasounds, vaccination and data regarding folic acid and iron supplementation.⁹ In addition, sociodemographic data such as age, ethnicity, schooling, marital status, and socioeconomic level were used to characterize the sample. Data collection was performed by medical students from January 1st to April 30th, 2015.

To assess for GDM screening, the parameters defined by the Ministry of Health in 2012 were used.⁹ Pregnant women with fasting plasma glucose levels equal to or higher than 85 mg/dL and/or who presented any risk factor were considered as positive screening for GDM. The risk factors considered were the following: age equal to or greater than 35 years; body mass index (BMI) > 25 kg/m²; previous GDM; history of a first-degree relative with diabetes mellitus (DM); history of previous macrosomic pregnancies, fetal death without apparent cause and/or fetal malformation; use of hyperglycemic drugs such as corticosteroids and thiazide diuretics; polycystic ovary syndrome; chronic arterial hypertension, and whether excessive weight gain occurred in the current pregnancy. As an integral part of the process of identifying GDM by the Ministry of Health in 2012, the recommendations of the International Association of the Diabetes and Pregnancy Study Groups¹³ were considered for the diagnosis of GDM using the oral glucose tolerance test (OGTT). For this, data regarding 75-g OGTT of glucose records between 24-28 weeks of gestational age, at time 0 (fasting), 1 and 2 hours were evaluated and positive values for GDM were considered as values above 92 mg/dL in the fasting state, 180 mg/dL in the first hour and 153 mg/dL in the second hour. This last parameter (OGTT) is part of the updated diagnosis for screening GDM in pregnant women with financial viability and/or partial technical availability, provided by the guidelines of the Brazilian Diabetes Society 2019-2020.¹⁴

The collected data were entered and analyzed using the Statistical Package for the Social Science (SPSS) version 20.0. Descriptive statistical analysis was performed by calculating absolute frequency and relative frequency. For the spatial distribution of data, ArcGIS software version 10.3 was used and the administrative areas were represented by the municipalities that make up the 4th Health Coordination of Rio Grande do Sul/Brazil and the neighborhoods of the city of Santa Maria/Brazil.

For the construction of the maps, a shade of the same color was used to identify the prevalence of an incomplete pregnant woman's card as well as the postpartum women regarding the non-realization of a fasting blood glucose test and a GDM positive screening.

This study was approved by the Research Ethics Committee of the University of Santa Cruz do Sul, under protocol No. 091663/2014 and in the Information System for Teaching (SIE) of the Federal University of Santa Maria, where it was registered under the protocol 039174, in accordance with the Declaration of Helsinki. All puerperal women who participated in the study signed the Free and Informed Consent Form.

RESULTS

The sample consisted of 283 puerperal women from the basic health network, with an average age of 26.82±6.00 years (age between 18 years and 45 years). In addition, 59.0% (n=167) of the participating mothers were white, 50.9% (n=144) had 9 to 11 years of study, 63.6% (n=180) lived with a companion, 66.4% (n=188) belonged to class C1/C2 and 48.8% (n=138) had 2 to 3 pregnancies. Regarding the prenatal booklet, 79.2% (n=224) had and incomplete filling.

Among the puerperal women observed, 14.5% (n=41) did not undergo GDM screening with the monitoring of fasting blood glucose during pregnancy. According to the GDM screening criteria recommended by the Ministry of Health in 2012,⁹ 25.2% (n=61) had a positive screening, considering only fasting blood glucose. However, when considering positive GDM screening as using fasting glucose data associated with the presence of risk factors, the prevalence of positive screening increased to 73.9% (n=209). In addition, of the 80.6% (n=228) of the mothers who presented with risk factors, it was found that 77.2% (n=176) of the mothers had up to two risk factors, 18.0% (n=41) had three risk factors and 4.8% (n=11) women had more than four risk factors. On the other hand, when evaluating the criteria proposed by the IADPSG,¹³ 36.4% (n=103) of postpartum women underwent the 75-g OGTT and only 29.1% (n=30) of women performed the test with collection of all 3 points (0, 1h and 2h), with only 1 case of GDM diagnosed by this criterion (Table 1).

Table 1 - Distribution of postpartum women cared for at the HUSM, according to the criteria used for gestational diabetes mellitus (GDM) screening recommended by the Ministry of Health in 2012.

GDM screening	N	%
Fasting glucose		
<85 mg/dL	181	74.8%
≥85 mg/dL	61	25.2%
Fasting glucose associated with risk factors		
Negative	34	12.0%
Positive	209	73.9%
75-g OGTT		
Negative	102	99.0%
Positive	1	1.0%

GDM: gestational diabetes mellitus; OGTT: oral glucose tolerance test.

Figures 1 and 2 show the spatial distribution of the prevalence of incomplete filling of the prenatal booklet. It was found that 14 municipalities of the 4th Health Coordination/RS and 6 districts of Santa Maria/RS had a higher prevalence of an incomplete prenatal booklet.

The spatial distribution of data between the municipalities of the 4th Health Coordination/RS

and the municipality of Santa Maria, referring to the prevalence of postpartum women who had positive GDM screening as recommended by the Ministry of Health in 2012,⁹ were represented in figures 3 and 4, respectively. It was found that ten municipalities of the 4th Health Coordination/RS and four neighborhoods of Santa Maria/RS had a higher prevalence of positive screening for GDM.

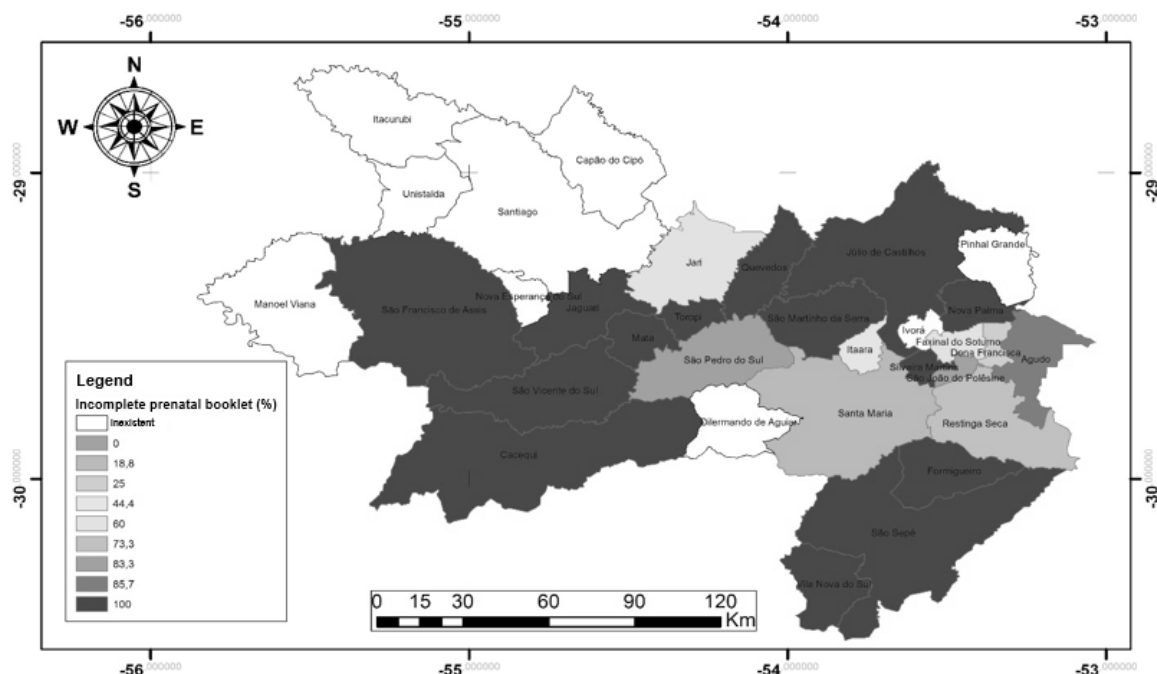


Figure 1 - Mapping of the percentage of incomplete prenatal booklets of postpartum women assessed at HUSM, according to their municipalities of origin from the 4th Health Coordination/RS.

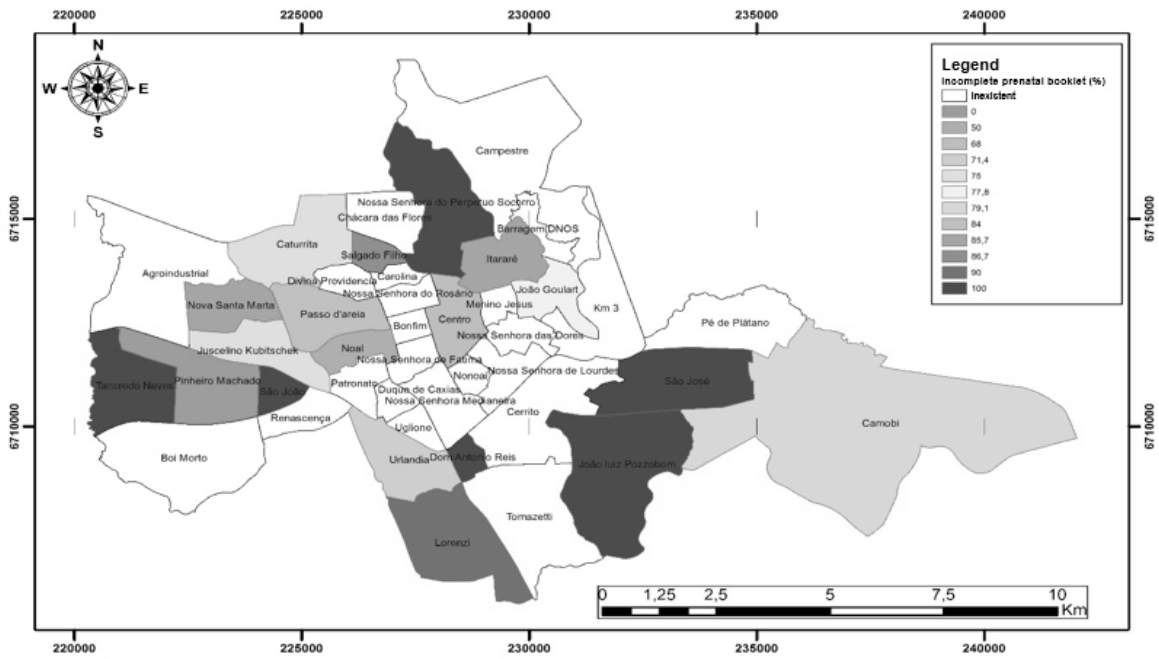


Figure 2 - Mapping of the percentage of incomplete prenatal booklets of the postpartum women assessed at HUSM, according to the main neighborhoods of the city of Santa Maria, RS.

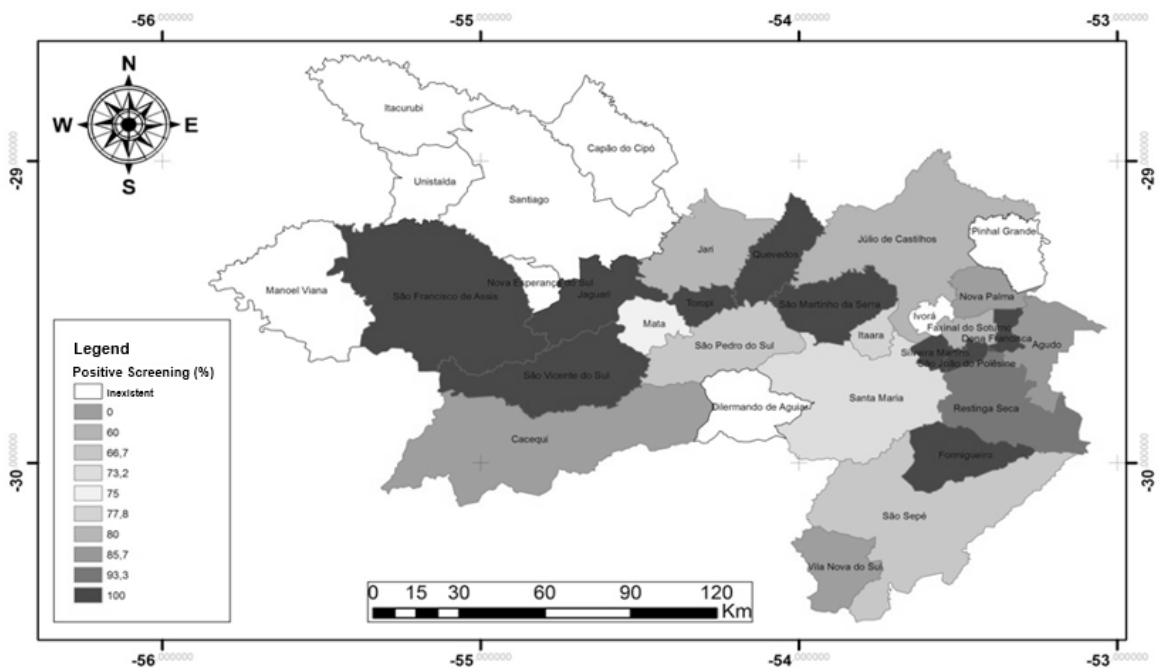


Figure 3 - Mapping of the percentage of positive GDM screening of the postpartum women assessed at HUSM, according to their municipalities of origin from the 4th Health Coordination/RS.

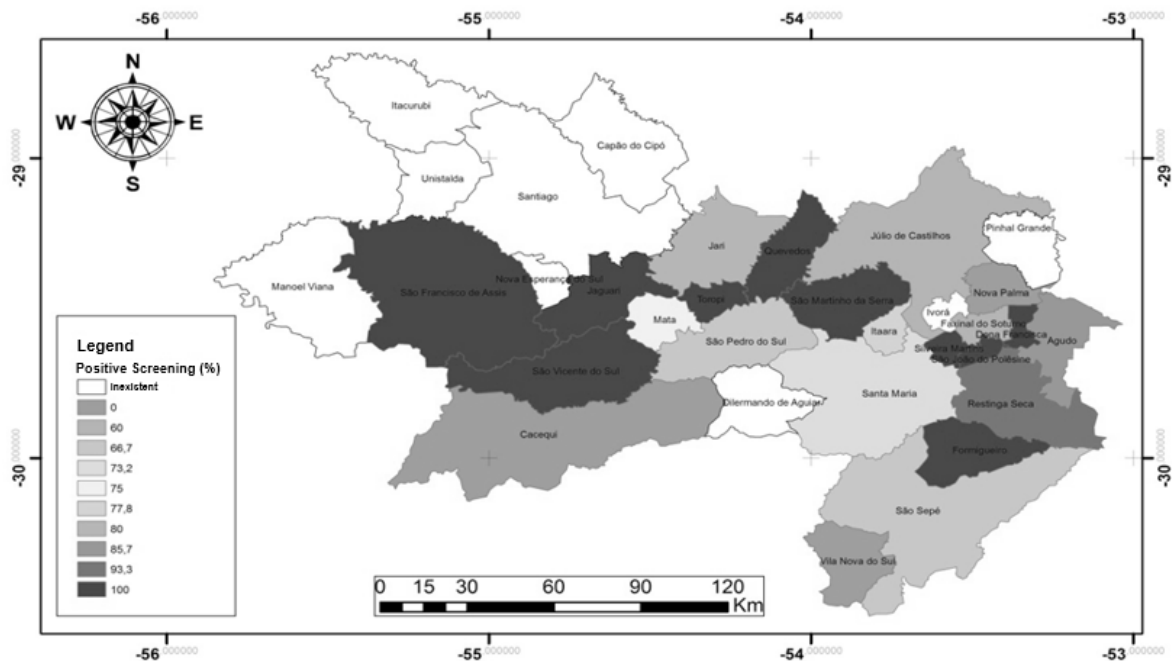


Figure 4 - Mapping of the percentage of positive GDM screening of postpartum women assessed at HUSM, according to their neighborhood of origin in Santa Maria/RS.

DISCUSSION

The present study aimed to assess the prevalence of incompletely filled prenatal booklets and GDM screening for pregnant women of a University Hospital in Southern Brazil, as well as to describe the geolocation of the municipality of origin and the neighborhood in which they reside. The prenatal booklet is the main tool for integrating information from the prenatal period to the time of delivery.⁸ Our results show that 79.2% of the postpartum women evaluated had an incomplete prenatal booklet, showing disregard in relation to the proper filling of the records in the prenatal booklet in the Basic Health Network. Other Brazilian studies also found that the records on the prenatal booklet were filled out in an unsatisfactory and incomplete form.^{7,8} It is important to highlight that the lack of registration, as well as the failures in filling of the prenatal booklet are factors that compromise the quality of prenatal care, putting maternal and child safety at risk.¹⁵ In addition, the omission of information on the prenatal booklet prevents the main principle of this tool, which is to be the means of communication between the professionals who provide assistance during the pregnancy-puerperal process,¹⁶ and therefore, leading to omission or repetition of procedures and interventions,⁸ as well as neglect or unnecessary repetition of tests that protect maternal and child

health.

On the other hand, good quality prenatal care must take place in an interdisciplinary way. This approach involves the collection and measurement of information for screening for gestational diseases, and enabling the promotion of maternal and child health during and after pregnancy.⁹ A great example of a gestational disease that should be screened during prenatal care is GDM, which affects about 3 to 25% of pregnancies, according to data from the Brazilian Diabetes Society.¹⁴ In the present study, according to the screening criteria recommended by the Ministry of Health in 2012,⁹ the prevalence of GDM positive screening was 25.2%, considering only fasting blood glucose. However, added to the risk factors, there was a positive screening increase to 86.4%.

Currently, due to the financial viability and technical availability of the Brazilian regions, two criteria have been proposed for GDM screening, in order to achieve the greatest possible coverage and, thus, to reduce inequity in access. Therefore, in regions with financial viability and/or technical availability, all pregnant women should perform the fasting glucose test and OGTT.¹⁴ Considering these recommendations, in the present study, 14.5% of the evaluated mothers did not perform a test for GDM screening by monitoring fasting blood glucose. This is a matter of great concern since GDM is one of the

main causes of morbidity during pregnancy and its identification, as well as the control of its risk factors, should be aimed for in order to ensure maternal and child well-being. On the other hand, the prevalence of pregnant women assessed in the present study who underwent the 75-g OGTT was 36.4%, which could be hindering the screening for GDM, since according to the Brazilian Diabetes Society 2018-2019,¹⁴ it is estimated that 100% of cases are detected with OGTT.

In Popayán, Colombia, also by evaluating pregnant women at a University Hospital, España-Dorado and collaborators¹⁴ found that 16.32% of the pregnant women evaluated had a diagnosis of GDM, considering the IADPSG criterion (using OGTT). It is a higher prevalence than the one found in the present study, since only one pregnant woman out of the 103 who underwent OGTT presented GDM positive screening. On the other hand, a study carried out with pregnant women from a Basic Health Unit in Lajeado,¹⁸ also located in Rio Grande do Sul/Brazil, which considered only blood glucose data, found a prevalence of GDM positive screening (22.0%) similar to our study. In part, the low adherence to the correct filling out of the prenatal booklet, as seen in the present study, indicates a gestational risk factor¹⁹ that can lead to unfavorable perinatal outcomes such as the omission of the real scenario of a positive screen for GDM.

In view of this scenario, geolocation can be an important tool in the area of health surveillance, especially during pregnancy, in which attention to maternal and child health is extremely important.¹⁰ When verifying the prevalence of an incomplete prenatal booklet, through an epidemiological map, the present study found that 60.9% of the municipalities of the 4th Health Coordination/RS of origin of the evaluated mothers had a high prevalence of incomplete prenatal booklets. In Santa Maria/Brazil, where HUSM is located, 14.6% of the neighborhoods in the municipality had a higher prevalence of incomplete prenatal booklets. In Brazil, some municipalities are already developing ongoing work with the Geographic Information Systems-GIS, in order to map the distribution of events and to discuss preventive measures, whether they are assistance, environmental or educational in nature.¹² Therefore, through the mapping of epidemiological data, it was possible to verify the frequency of filling of the prenatal booklet of the studied mothers, as this is the

main document that transits throughout prenatal care, according to the municipalities and neighborhoods of Santa Maria, and serves as an important management tool to identify and execute interventions that are necessary to correct the prenatal care policies.

This tool also served to identify the presence of GDM screening and its relationship with the place where the puerperal woman performed her prenatal care. Thus, it was possible to verify that 43.5% of the municipalities of the 4th Health Coordination/RS and 21.0% of the neighborhoods of Santa Maria/Brazil evaluated had a higher prevalence GDM positive screening. With this panorama, it was possible to identify which locations, at the regional and municipal levels, deserve greater attention in order to promote changes in prenatal care, aimed toward reducing diseases during pregnancy and puerperium.

Although the cutoff points for GDM positive screening are a limitation of the present study, as in the case of fasting blood glucose, which was recently updated, the strongest aspect of the present study was the use of the geoprocessing technique as a management and identification tool in the health area of the region of coverage of the studied women.

CONCLUSION

With the use of geolocation, the municipalities of the 4th Coordination Health/RS and the neighborhoods of Santa Maria/Brazil with the highest prevalence of incomplete prenatal booklets were identified. At the same time, it was possible to verify the locations with higher prevalence of a positive screen for GDM.

Thus, monitoring the prevalence of an incomplete prenatal booklet and positive GDM screening, through the use of geolocation, was important to map the areas considered to be at greatest risk during the pregnancy-puerperal process. Through this identification, health managers can be guided to carry out future interventions in order to improve the coverage of prenatal care, and aiming for better maternal and child well-being.

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