Near Miss Materno e Fatores Socioeconômicos: Construção de um Modelo Teórico Hierárquico a Partir da Teoria dos Atrasos

Maternal Near Miss and Socioeconomic Factors: Construction of a Hierarchical Theoretical Model from the Theory of Delays

Near Miss Materno y Factores Socioeconómicos: Construcción de un Modelo Teórico Jerárquico a Partir de la Teoría de los Retrasos

RESUMO

Objetivo: Propor um modelo teórico que incorpora a relação entre condições sociodemográficas e antecedentes pessoais à teoria dos três atrasos na ocorrência de episódios de Near Miss Materno (NMM). **Método:** Estudo transversal, analítico, de série histórica, com análise de 3.147 prontuários de mulheres internadas em três maternidades terciárias em Fortaleza, Ceará, Brasil, entre 2010 e 2019, que preenchiam os critérios para NMM. Os dados foram analisados com estatística descritiva e regressão logística hierárquica. **Resultado:** O NMM foi identificado em 6,4% das participantes, com risco maior para mulheres negras e pardas. Fatores como baixa escolaridade, idade materna avançada, multiparidade, doenças pré-existentes e os três atrasos (na procura por cuidado, no acesso ao serviço e no recebimento do cuidado) associaram-se significantemente ao NMM. **Conclusão:** O modelo teórico proposto foi validado, demonstrando a relação hierárquica entre os determinantes sociais, os antecedentes de saúde e os atrasos no cuidado como fatores de risco para o NMM, reforçando a necessidade de políticas públicas que abordem essas iniquidades.
DESCRITORES: Near Miss Materno; Fatores Socioeconômicos; Cuidado Pré-Natal; Mortalidade Materna; Qualidade da Assistência à Saúde.

ABSTRACT

Objective: To propose a theoretical model that incorporates the relationship between sociodemographic conditions and personal history to the three delays model in the occurrence of Maternal Near Miss (NMM) episodes. **Method:** A cross-sectional, analytical, historical series study was conducted, with the analysis of 3,147 medical records of women admitted to three tertiary maternity hospitals in Fortaleza, Ceará, Brazil, between 2010 and 2019, who met the criteria for NMM. Data were analyzed using descriptive statistics and hierarchical logistic regression. **Result:** NMM was identified in 6.4% of the participants, with a higher risk for black and mixed-race women. Factors such as low education, advanced maternal age, multiparity, pre-existing diseases, and the three delays (in seeking care, in accessing the service, and in receiving care) were significantly associated with NMM. **Conclusion:** The proposed theoretical model was validated, demonstrating the hierarchical relationship between social determinants, health history, and delays in care as risk factors for NMM, reinforcing the need for public policies that address these inequities.
DESCRIPTORS: Maternal Near Miss; Socioeconomic Factors; Prenatal Care; Maternal Mortality; Quality of Health Care.

RESUMEN

Objetivo: Proponer un modelo teórico que incorpore la relación entre las condiciones sociodemográficas y los antecedentes personales a la teoría de las tres demoras en la ocurrencia de episodios de Near Miss Materno (NMM). **Método:** Se realizó un estudio transversal, analítico, de serie histórica, con el análisis de 3.147 expedientes de mujeres ingresadas en tres maternidades terciarias de Fortaleza, Ceará, Brasil, entre 2010 and 2019, que cumplían los criterios de NMM. Los datos se analizaron mediante estadística descriptiva y regresión logística jerárquica. **Resultado:** Se identificó NMM en el 6,4% de las participantes, con mayor riesgo para las mujeres negras y mestizas. Factores como la baja escolaridad, la edad materna avanzada, la multiparidad, las enfermedades preexistentes y las tres demoras (en la búsqueda de atención, en el acceso

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al servicio y en la recepción de la atención) se asociaron significativamente con el NMM. **Conclusión:** El modelo teórico propuesto fue validado, demostrando la relación jerárquica entre los determinantes sociales, los antecedentes de salud y las demoras en la atención como factores de riesgo para el NMM, lo que refuerza la necesidad de políticas públicas que aborden estas inequidades.
DESCRIPTORES: Near Miss Materno; Factores Socioeconómicos; Atención Prenatal; Mortalidad Materna; Calidad de la Atención de Salud.

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INTRODUCTION

Maternal Mortality is a serious public health problem, whose indicators are extremely sensitive to the adequacy and timeliness of obstetric care [1]. In this context, Thaddeus and Maine, in 1994, proposed the "three delays model" [2], initially associated with maternal mortality, and extended to the universe of survivors based on its association with Near-Miss Maternal (NMM) events [1].

NMM is defined as situations in which a woman survives after experiencing severe clinical complications that endangered her life during pregnancy, childbirth, or the postpartum period, but who survived due to adequate care from health services [3]. In 2011, the WHO standardized the criteria defining NMM, recommending their use as an indicator of the quality of obstetric care [4]. The association with the "three delays" model reinforces this trend, as this theory proposes a structured sequence for delays in care, divided into three phases: delay in the woman's and/or family's decision to seek care; delay in reaching a facility providing adequate health care; and delay in receiving adequate care at the referral facility [2].

However, while it is unquestionable that delays emerge as an important factor associated with maternal deaths from preventable causes and the MMR, it is also a fact that neither these outcomes nor the delays are distributed uniformly among women. Socioeconomic conditions interact with the organization of health services in determining these outcomes [5]. In this context, it is worth noting that social conditions exert a negative influence on health services and consequently interfere with maternal health care [6].

Thus, the objective of this article was to propose a theoretical model that incorporates the relationship between sociodemographic conditions and personal history into the theory of the three delays in the occurrence of NMM episodes.

METHOD

This is a cross-sectional, analytical, historical cohort study based on the analysis of medical records of women who were admitted to the three tertiary maternity hospitals comprising the Maternal and Child Care Network of the Unified Health System in the municipality of Fortaleza, Ceará, Brazil, between 2010 and 2019 and who met the criteria for NMM. A total of 3,147 medical records were reviewed.

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The inclusion criteria were: being a pregnant woman or a postpartum woman admitted to one of the three referral services during the established period due to complications arising from pregnancy. Medical records of women who were still hospitalized during the study were excluded.

The instrument recommended by the World Health Organization was used to retrospectively identify cases of NNM, including information on sociodemographic variables (age, ethnicity, socioeconomic status, and place of origin) [4]. For clinical variables, the following were collected: prior history of other diseases, gynecological and obstetric history, prenatal visits, type of pregnancy, type of delivery, comorbidities, complications, and hospitalizations during pregnancy, number of emergency services sought, and perinatal outcome.

The data were analyzed using SPSS software, version 25. Exploratory analysis was described using frequencies and their respective confidence intervals (95% CI). For the bivariate analysis, we examined the association of all independent variables with the outcomes characterized as Near Miss (=1) and non-Near Miss (=0), using the hypothesis test (Fisher's exact test) and odds ratio (OR), with a 95% confidence level.

To assess the independent effect of the variables and better guide the analyses between the group exposed to and not exposed to Near Miss, we defined, based on a literature review, a theoretical model organized into hierarchical blocks, with factors considered more distal, intermediate, and proximal relative to the presence of Near Miss.

The statistical model was developed in three stages. First, univariate regression analysis was performed for each of the organized variables. Next, the independent variables that showed $p<0.20$ in the univariate regression were subjected to multivariate regression analysis, according to the composition of each block, with adjustment for confounding factors and intra-block collinearity. Finally, the hierarchical regression model followed the distal-intermediate-proximal order of the theoretical conceptual model, with adjustment for confounding factors among hierarchically superior blocks. Variables with $p < 0.05$ were considered statistically significant and were represented by the odds ratio (OR) and 95% confidence intervals. After each regression, multicollinearity was checked to ensure that the covariates were not redundant.

This study is grounded in the ethical principles of Resolution No. 466/12 and was approved by the Research Ethics Committee of the University of Fortaleza with the Certificate of Submission for Ethical Review (CAAE) 60900216.9.0000.5052 under opinion No. 1,865,363.

RESULTS

The medical records of 3,147 women of childbearing age, ranging from 12 to 46 years old, were analyzed. Table 1 presents the descriptive and bivariate analysis of socioeconomic factors. NMM was diagnosed in 6.4% of the participants. The risk of NMM was 10.1 times higher in women who self-identified as Black and 7.5 times higher in women who self-identified as Brown compared to women who self-identified as White. Education up to elementary school also constitutes an increased risk compared to those who completed high school and higher education. Women aged 40–49 had a 2.1-fold increased risk compared to women aged 20–29.

Bivariate analysis of pre-existing conditions, obstetric history, and current pregnancy showed that the association with NMM increases 2.1-fold in cases of 3 or more pregnancies compared to a first pregnancy and 2.2-fold in cases of 3 or more births compared to a single birth. A significant association with the occurrence of NMM was found for a history of cardiovascular diseases, nephropathies, and collagenoses. The pre-pregnancy history of chronic arterial hypertension and diabetes mellitus, unusually, showed a tendency toward association, but without statistical significance.

Paradoxically, preeclampsia was associated with an increased risk, while the use of magnesium sulfate was a protective factor. Regarding the current pregnancy, a reduced number of prenatal visits (up to 3) was associated with a 2.3-fold increased risk compared to 4 to 7 visits. Receiving prenatal care at a tertiary referral center, on the other hand, did not result in a significant reduction in the risk of NMM compared to receiving care at another facility. The occurrence of preterm delivery, with resolution in the second trimester of pregnancy, increased the risk of maternal near miss by 2.9 times compared to pregnancies with resolution in the third trimester. Regarding mode of delivery, cesarean section before the onset of labor showed a trend toward increased risk, though not statistically significant. Cesarean section after the onset of labor, on the other hand, proved to be a protective factor. Pregnancies terminated by abortion increased the risk of maternal near miss. It should be noted that there is no information in the medical records regarding whether these terminations were induced or spontaneous, so we cannot assess the relationship with unsafe abortion.

As expected, the three delays were associated with the occurrence of maternal near miss. The first delay, corresponding to the delay in seeking care from the health service and/or system; the second delay (delay in reaching a facility providing adequate health care); and the third delay (delay in receiving adequate care at the referral facility) showed a significant association with maternal near miss.

Some aspects associated with the second delay were significant. Delays in diagnosis at the referring facility, delays in initiating treatment, delays in case referral, and a lack of trained staff increased the risk. Difficulties in communication between the referring hospital and the dispatch center were also associated with MMM. Regarding the third delay, the lack of medications and difficulty in

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monitoring, associated with difficulties in securing intensive care unit beds, increased the risk of Maternal Near Miss.

The final analysis of the constructed theoretical model showed a sensitivity of 53.59% and a specificity of 98.82%. The positive predictive value was 75.17% and the negative predictive value was 96.97%.

DISCUSSION

The results of this study validate the proposed theoretical model, demonstrating the hierarchical relationship between sociodemographic conditions, personal history, the theory of the three delays, and the occurrence of MMM.

The occurrence of NMM was identified in 6.4% of the study participants, being higher among women who self-identified as Black and Brown. These data reinforce the findings of an ecological study that analyzed data from different regions of Brazil between 2010 and 2018 [8]. It is worth noting that the racialization of maternal risk is not a phenomenon restricted to Brazil. Studies conducted in the United States have also found an increased risk of severe maternal morbidity among Black and non-white women [9,10]. The structural causes of racial and ethnic disparities associated with pregnancy complications and the risk of NMM warrant further investigation in subsequent studies, but it is undeniable that structural and institutional racism manifests as poorer health indicators for the Black population, making the implementation of public policies aimed at health equity essential.

The higher risk of postpartum hemorrhage in multiparous women compared to nulliparous women is similar to that found in Ethiopia [11]. This finding may be explained by the fact that multiparity is associated with a higher likelihood of obstetric complications, such as placenta previa and uterine atony, which are major causes of postpartum hemorrhage and, consequently, postpartum hemorrhage. In addition, women with a higher number of pregnancies may have shorter interpartum intervals, which also increases the risk of complications.

CONCLUSION

The proposed theoretical model was validated, demonstrating the hierarchical relationship between social determinants, health history, and delays in care as risk factors for NMM. The identification of these risk factors, ranging from the most distal, such as socioeconomic conditions, to the most proximal, such as gaps in care, enables the development of more effective prevention and intervention strategies. The model's high sensitivity and specificity reinforce its utility as a tool for monitoring NMM and for evaluating the quality of obstetric care. The findings underscore the need for public policies that address health inequities, with a focus on improving access to and the quality of prenatal care, training health care teams, and organizing referral services, in order to reduce maternal morbidity and mortality and guarantee the right to health for all women.

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