International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Factors Associated with Maternal Near Miss in Tertiary Maternal Health Centers in Fortaleza

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Abstract: ***Maternal Near Miss (MMN), defined by the WHO as "a woman who almost died, but survived the complication that occurred during pregnancy, childbirth or up to 42 days after the end of pregnancy". The objective of this research was to identify social determinants associated with NMM in three maternal health care centers in Ceará. Study of the analysis of secondary data from previous research, coordinated by the National Network for the Vigilance of Severe Maternal Morbidity, national scope, multicentric, cross-sectional, period from 2009 to 2019. Identified 3, 351 women, 204 of them presented criteria for NMM. The NMM was 10.1 and 7.5 times higher for women self-identified as black and brown, respectively. The age of 40-49 years increased the risk by 2.1 compared to 20-29 years. Schooling up to elementary school constitutes an increased risk (OR=3.2) compared to high school and higher education. Obstetric history showed an association with MNM increased by 2.1 when there were 3/+ pregnancies compared to primiparous women and 2.2 compared to 3/+ deliveries in relation to a single delivery. Heart disease (OR=2.6), kidney disease (OR =6.0)HIV/AIDS (OR=1.2) and collagenosis (OR=4.6) showed association with NMM. Chronic Arterial Hypertension (OR=1.4), pre-gestational Diabetes Mellitus (OR=1.6) showed an association statistics paradoxically the literature. It is therefore concluded that the majority black or brown, with low education, advanced age, and with main risk factors: number of prenatal consultations, multiparous, pre-existing cardiovascular diseases.***

Keywords: Maternal Health, High Risk Pregnancy, Near Miss.

1. Introduction

The World Health Organization (WHO) defines Maternal Mortality (MM) as deaths in women during pregnancy or up to 42 days after its termination, regardless of gestational time or location, secondary to any cause related to or aggravated by pregnancy, excluding accidental causes. or incidental. It constitutes one of the main indicators of discrepancies in health between developed and underdeveloped countries (SCARTON et al., 2019). Risk factors for MM are considered individual characteristics and unfavorable sociodemographic conditions; pre-existing medical conditions; reproductive history; undue exposure to teratogenic factors; and obstetric diseases in the current pregnancy and clinical intercurrences. Its causes are classified as direct, related to the quality of care provided during this period, such as interventions, omissions or incorrect or indirect treatments, arising from pre-existing causes or that developed with aggravation due to the physiological effects of pregnancy (GOMES et al., 2018). Information on Near Miss reflects in a group close to those in which MM occurred, as both groups have the same pattern: a complication that becomes potentially fatal, evolving or not with risk of death, with death or Near Miss as outcomes. In this way, it becomes viable for MM investigations, enabling monitoring of the quality of emergency services and, consequently, the implementation of improvements in health services and improvement of public policies aimed at women's health. (RUDEY, CORTEZ, YAMAGUCHI, 2017). This way, determining the proportion of women who arrive at a health unit with Maternal Near Miss is feasible, since there are certain criteria (WORLD HEALTH ORGANIZATION, 2011). In addition to being feasible, this monitoring can provide information on delays in care, being a determinant of potential relevance for the development and reorientation of public policies and for the development of strategies to promote women's health and the mother-fetus binomial (OLIVEIRA et al. COSTA, 2015).

In this sequence of actions, the Agenda of Commitments for the Comprehensive Health of Children and Reduction of Infant Mortality is launched, which inserts women's health actions with humanized and qualified care for pregnant women and newborns within the lines of care of the Comprehensive child health care (BRASIL, 2004b). Based on the diagnosis that maternal and infant mortality remained high despite the measures already established and considering that an intense medicalization of birth still prevailed, the Ministry of Health launched, in 2011, the Rede Stork (RC). CR was standardized by Ordinance No. 1, 459, of June 24, 2011, with the aim of expanding access and improving the quality of prenatal care, delivery and puerperal care and care for children up to 24 months of age. life (BRASIL, 2011). In this way, CR led to the development and validation of clinical guidelines, structured in guidelines, technical norms and clinical protocols, in addition to promoting attitudinal changes in health

professionals through continuing education (GIOVANNI, 2013). In this context, CR has played an important role in the ongoing restructuring of the Maternal and Child Health Assistance Network, helping Brazil to face problems related to hospital beds, precarious medical and hospital care, high rates of maternal and child mortality (CAVALCANTI et al., 2013). One of the elements advocated by the RC is its periodic reassessment, which enables the expansion of the capacity for reflection and action of SUS managers and obstetrics and neonatology services (VILELA et al., 2021). In this way, two evaluation cycles were carried out; the first in 2013-2015 and the second in 2016-2017. In the first evaluation cycle, between 2014 and 2015, three guidelines and their respective devices were evaluated: (I) embracement and risk classification in obstetrics; (II) companion of choice and full time; and (III) skin-to-skin contact between mother and newborn (NB) (BRASIL, 2016). The second evaluation cycle, between 2016-2017, expanded the guidelines to be evaluated, namely: (I) embracement in obstetrics; (II) good practices in labor and birth care; (III) monitoring of care and surveillance of maternal and neonatal mortality; (IV) participatory and shared management; and (V) ambience (VILELA et al., 2021). The results of the second evaluation cycle showed that the global component "delivery and birth" of the CR strategy showed a partially adequate degree of implementation in all regions, with the exception of the North, which obtained an inadequate degree. A quarter (1/4) of maternity hospitals in Brazil were classified as not adequate, with the highest percentage observed in the North region, followed by the Midwest, Northeast, Southeast and South. The study also showed that delivery and birth care is in different stages of implementation, with variations between major regions. The South and Southeast regions still had a privileged situation regarding the degree of implementation of most of the analyzed items (VILELA et al., 2021),

2. Introduction to Literature

The WHO has defined a case of Maternal Near Miss (NMM) as a woman who almost died from direct or indirect obstetric causes, but survived pregnancy, childbirth and puerperium complications up to 42 days after childbirth (SAY, SOUZA AND PATTINSON, 2009). Considering its potential for assessing the quality of services and the Mother and Child Health Care Network, but recognizing the need for standardization, the WHO established the NMM defining criteria, dividing them into clinical, laboratory and management criteria (WORLD HEALTH ORGANIZATION, 2011). These criteria are summarized in table 1.

Table 1: Diagnostic criteria for maternal Near Miss proposed by the WHO

Clinical Criteria	
FR > 40 irpm or < 6 irpm	Reentrant seizures/paralysis total
clotting disorder	Jaundice in the presence of PE
acute cyanosis	loss of consciousness ≥12 pm
Shock	agonic breathing ("Gasping")
Oliguria unresponsive to hydration and medications	Loss of consciousness + absent pulse
	stroke
Laboratory Criteria	
Acute thrombocytopenia (<50, 000 platelets)	Loss of consciousness associated with the presence of glucose in the urine and ketoacidosis
pH < 7.1	PaO2/FiO2 <200mmHg
Creatinine > 3.5mg/dL or > 300mmol/L	SatO2 < 90% for > 60 minutes
Bilirubin greater than 6mg/dLor> 100mmol/L	Lactate > 5
Management Criteria	
Transfusion of 5 or more units of Red Cells	Intubation and mechanical ventilation for 60 or more minutes unrelated to anesthesia Post-
infection hysterectomyor bleeding	Dialysis for kidney failure acute
Continuous use of vasoactive drugs	Cardiopulmonary resuscitation Source: adapted from WHO (2011)

Source: author

The combined weighted worldwide prevalence of MNM is estimated to be 18.67/1000 (95% CI: 16.28-21.06) (ABDOLLAHPOUR, MIRI and KHADIVZADEH, 2019). A population-based study conducted in seven countries (Democratic Republic of Congo; Guatemala; Belagavi and Nagpur, India; Kenya; Pakistan; and Zambia) between January 2014 and April 2016 found that among 122, 707 women screened, 4866 (26, 6%; 4.0% of all women) had an NMM event. The overall maternal mortality rate was 155 per 100, 000 live births. The ratio of Near Miss events to maternal deaths was 26 to 1 (GOLDENBERG et al., 2017). Despite these proportions and WHO recommendations, cases of MNM have not yet been measured as part of a public policy, being restricted to research contexts or specific initiatives.

A study conducted in India found a Near Miss incidence rate of 6.85/1000. Sepsis, hypertensive disorders and hemorrhage were the most common underlying conditions in women. Among the associated factors, the following were significant: Older age (OR 2.01, CI 1.02-3.93), lack of formal education (OR 2.05, CI 1.11-3.75), age younger than 18 years of marriage (OR 2.01, CI 1.21-3.32), lower income (OR 3.8, CI 1.88-7.64), pregnancy of four or more (OR 2.25, CI 1.21-4.17) and residence outside Delhi (OR 9.31, CI 4.36-19.90) (CHHABRA et al., 2019). The Nascer no Brasil survey evaluated data on the incidence of maternal Near Miss, identified according to the criteria of the World Health Organization, between February/2011 and October/2012. The results showed an incidence of NMM of 10, 21 per

thousand live births and an NMM mortality ratio of 30.8 cases for each maternal death. Clinical criteria for identifying MNM were the most prevalent and had an incidence of 5.2 per thousand live births. The MNM was associated with maternal age of 35 years or more (RR = 1.6; 95%CI: 1.1-2.5), with a history of previous cesarean section (RR = 1.9; 95%CI: 1.1-3.4) and high-risk pregnancy (RR = 4.5; 95%CI: 2.8-7.0). Hospitals located in capitals (RR = 2.2; 95%CI: 1.3-3.8) and those belonging to the SUS (RR = 3.2; 95%CI: 1.6-6.6) also had a higher incidence of cases of maternal Near Miss (DIAS et al., 2014). The MNM was associated with maternal age of 35 years or more (RR = 1.6; 95%CI: 1.1-2.5), with a history of previous cesarean section (RR = 1.9; 95%CI: 1.1-3.4) and high-risk pregnancy (RR = 4.5; 95%CI: 2.8-7.0). Hospitals located in capitals (RR = 2.2; 95%CI: 1.3-3.8) and those belonging to the SUS (RR = 3.2; 95%CI: 1.6-6.6) also had a higher incidence of cases of maternal Near Miss (DIAS et al., 2014). The MNM was associated with maternal age of 35 years or more (RR = 1.6; 95%CI: 1.1-2.5), with a history of previous cesarean section (RR = 1.9; 95%CI: 1.1-3.4) and high-risk pregnancy (RR = 4.5; 95%CI: 2.8-7.0). Hospitals located in capitals (RR = 2.2; 95%CI: 1.3-3.8) and those belonging to the SUS (RR = 3.2; 95%CI: 1.6-6.6) also had a higher incidence of cases of maternal Near Miss (DIAS et al., 2014).

A prospective cohort study was carried out in a high-risk maternity hospital in northeastern Brazil from June 2015 to May 2016, found an NMM ratio of 54.8 / 1000 Live Births (LB). The MNM distribution by clinical picture identified hypertension during pregnancy (67.2%), hemorrhage (42.2%) and sepsis (12.7%). In the multivariate analysis, factors significantly associated with an increased risk of MNM were fewer than six antenatal visits (OR: 3.13; 95% CI: 1.74-5.64) and cesarean delivery in the current pregnancy (OR: 2.91; CI 95%: 1.45-5.82) (LIMA et al., 2019).

3. Methodology

This is a cross-sectional and analytical study, with a historical series carried out from the analysis of medical records and hospitalization records of women who were hospitalized in three tertiary maternity hospitals in the Metropolitan Region of Fortaleza of obstetric reference between the years 2009 and 2019. A The study population consisted of women admitted to the three reference health centers in Ceará participating in the research, from 2009 to 2019, who presented at least one of the criteria defined by the WHO for Severe Maternal Morbidity non-Near Miss or Near Miss Materno, including those who died or were transferred to other health services. The medical records were reviewed, identifying the women who met the criteria for the diagnosis of MNM according to WHO criteria (WHO, 2011). 3, 147 medical records of women of childbearing age were part of this study. The following inclusion criteria were adopted: being a pregnant woman or a puerperal woman admitted to the participating maternity hospitals as a result of pregnancy. Medical records that were unavailable and those of women who were still hospitalized during the data collection period were excluded. Data collection took place through the analysis of medical records and hospitalization records, with registration in an instrument recommended by the World Health Organization (WHO, 2011), adding information regarding sociodemographic variables, obstetric history and data from the current pregnancy, the namely: prenatal consultations, type of pregnancy, type of delivery, comorbidities, complications and hospitalizations during pregnancy, number of emergency services sought, perinatal outcome. 147 records of women of childbearing age. The following inclusion criteria were adopted: being a pregnant woman or a puerperal woman admitted to the participating maternity hospitals as a result of pregnancy. Medical records that were unavailable and those of women who were still hospitalized during the data collection period were excluded. Data collection took place through the analysis of medical records and hospitalization records, with registration in an instrument recommended by the World Health Organization (WHO, 2011), adding information regarding sociodemographic variables, obstetric history and data from the current pregnancy, the namely: prenatal consultations, type of pregnancy, type of delivery, comorbidities, complications and hospitalizations during pregnancy, number of emergency services sought, perinatal outcome. 147 records of women of childbearing age. The following inclusion criteria were adopted: being a pregnant woman or a puerperal woman admitted to the participating maternity hospitals as a result of pregnancy. Medical records that were unavailable and those of women who were still hospitalized during the data collection period were excluded. Data collection took place through the analysis of medical records and hospitalization records, with registration in an instrument recommended by the World Health Organization (WHO, 2011), adding information regarding sociodemographic variables, obstetric history and data from the current pregnancy, the namely: prenatal consultations, type of pregnancy, type of delivery, comorbidities, complications and hospitalizations during pregnancy, number of emergency services sought, perinatal outcome. The following inclusion criteria were adopted: being a pregnant woman or a puerperal woman admitted to the participating maternity hospitals as a result of pregnancy. Medical records that were unavailable and those of women who were still hospitalized during the data collection period were excluded. Data collection took place through the analysis of medical records and hospitalization records, with registration in an instrument recommended by the World Health Organization (WHO, 2011), adding information regarding sociodemographic variables, obstetric history and data from the current pregnancy, the namely: prenatal consultations, type of pregnancy, type of delivery, comorbidities, complications and hospitalizations during pregnancy, number of emergency services sought, perinatal outcome. The following inclusion criteria were adopted: being a pregnant woman or a puerperal woman admitted to the participating maternity hospitals as a result of pregnancy. Medical records that were unavailable and those of women who were still hospitalized during the data collection period were excluded. Data collection took place through the analysis of medical records and hospitalization records, with registration in an instrument recommended by the World Health Organization (WHO, 2011), adding information regarding sociodemographic variables, obstetric history and data from the current pregnancy, the namely: prenatal consultations, type of pregnancy, type of delivery,

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3.1 Research variables

3.1.1 *Dependent Variables*

- ***near miss*maternal**: a woman who almost died, but survived the complication that occurred during pregnancy, childbirth or up to 42 days after the end of pregnancy, which meets at least one of the criteria recommended by the World Health Organization: clinical, laboratory or management.

3.1.2 *Exposure variables*

- **maternal death**: death of a woman during pregnancy or up to 42 days after its termination, regardless of its duration or location, related to causes originating in the pregnancy, aggravated by it or measures related to it, but not due to accidental or incidental causes. Categorized as: yes or no.
- **Severe Maternal Morbidity**: severe morbid condition present in women during pregnancy, childbirth or the puerperium, categorized in this study as one of the conditions divided into hemorrhagic, hypertensive or management conditions.

3.1.3 *Independent variables*

- **Age group:** lifetime of the woman at the time of hospitalization. Categorized into 4 groups: 12 to 19 years old; 20 to 29 years old; 30 to 39 years old; and 40 to 46 years old.
- **Color:** skin color recorded in the medical record. Categorized as White, Black or Other.
- **Education:** study time according to data obtained from medical records. Categorized into 4 groups: Illiterate, Elementary, Middle or Higher.
- **Marital status:** marital status of the woman, according to the medical record. Categorized into 3 groups: Married/cohabiting, Single or Separated/divorced/widowed.
- **Body mass index:** obtained from medical records, index calculated through the woman's weight divided by the height squared. Categorized into 4 groups: Underweight, Adequate, Overweight and Obesity, classified according to Atalah et al. : underweight, < 25.0 kg/m2; suitable, 25.1 to 29.2 kg/m 2; overweight, 29.3 to 33.2 kg/m2; and obesity, ≥ 33.3kg/m2.
- **Prenatal:** prenatal care was performed at the health service at the time of admission. Categorized into 3 groups: Yes, No and No Prenatal Care.
- **Access to the Health Center:** analyzed according to the woman's access to the hospital, according to data from the medical record. Categorized into 6 groups: Spontaneous search, Transfer by rescue/emergency service, Scheduled inter-hospital transfer, Unscheduled inter-hospital transfer, Referral from another service and Referral from the institution itself.

- **Number of pregnancies:** total number of previous and current pregnancies of the woman, discrete variable, expressed in whole Arabic numbers.
- **Number of births:** total number of previous and current deliveries of the woman, regardless of the vitality of the conceptus, discrete variable, expressed in whole Arabic numbers.
- **Number of abortions:** total number of previous and current abortions of the woman, discrete variable, expressed in Arabic integers.
- **Number of previous cesarean sections:** total number of previous and current cesarean sections of the woman, discrete variable, expressed in whole Arabic numbers.
- **Number of live births:** total number of previous and current live births of the woman, regardless of the mode of delivery, discrete variable, expressed in whole Arabic numbers.
- **Years since last delivery:** total number of years since the last delivery according to what was recorded in the

medical records, discrete variable, expressed in whole Arabic numbers.

- **Prior Uterine Surgery:** presence or absence of a history of previous uterine surgery recorded in the medical record. Categorized as yes or no.
- **Number of prenatal consultations:** total number of prenatal consultations during the current pregnancy, according to the records in the medical records, discrete variable, expressed in whole Arabic numbers.
- **Pregnant at Hospital:** presence or absence of pregnancy during hospitalization. Categorized as yes or no.
- **Gestational age at admission:** gestational age of the woman at the time of admission, calculated using the date of the last menstrual period or the date of a first-trimester ultrasound examination or that is available and recorded in the medical record, expressed in weeks.
- **Form of Beginning of Labor:** way of starting labor. Categorized into 5 groups: Spontaneous, Induced, Without labor, Miscarriage or Still pregnant.
- **Gestational Age at Resolution:** gestational age of the woman at the time of resolution of the pregnancy, calculated using the date of the last menstrual period or the date of a first-trimester ultrasound examination or that is available and recorded in the medical record, expressed in weeks.
- **Gestation Resolution:** form of resolution of the pregnancy, either by delivery, abortion or still pregnant. Categorized into 7 groups: Vaginal delivery, Operative vaginal delivery, Cesarean delivery before the onset of labor, Cesarean delivery after the onset of labor, Abortion, Ectopic pregnancy and Still pregnant.
- **Pre-existing Maternal Conditions:** history or clinical condition pre-existing admission, informed by the patient, recorded in the medical record, such as: Chronic arterial hypertension, Obesity, Low weight, Diabetes Mellitus, Smoking, Heart diseases, Respiratory diseases, Kidney diseases, Sickle cell anemia-thalassemia, HIV/ AIDS, Thyroid Diseases, Neurological Diseases / Epilepsies, Collagenosis, Neoplasms or Other, subcategorized according to the presence or absence in Yes or No.

3.2 Place of research

The collection was carried out in the three public institutions of obstetric reference in the State of Ceará, all at a tertiary level of complexity: Universidade Federal do Ceará, representative of Maternidade Escola Assis Chateubriant (MEAC), Hospital Geral de Fortaleza (HGF) and Hospital Geral Dr. Cesar Cals (HGCC).

3.1.4 *Maternidade Escola Assis Chateaubriant*

It was founded in January 1965, under the leadership of the General Director of Diários Associados, João Calmon, and became the birthplace of tens of thousands of people from Ceará. After its inauguration, it was managed by the Federal University of Ceará, becoming a teaching hospital with research development, in addition to tertiary health care.

It has an infrastructure that meets the most varied demands, with excellence in the service provided. The institution offers outpatient care in several segments, Obstetric Clinic, Surgical Center, Humanized Delivery Center, Urgency and Emergency, Pharmacy, Laboratories, Kangaroo Project, Social Work and Intensive Care Units.

It has a current maximum capacity of 209 beds. Through the results presented to the community for the excellent services provided, the maternity hospital expanded, gaining the trust of the community and other professionals, becoming a reference hospital of medium complexity. The current distribution of obstetric beds at MEAC consists of 85 clinical beds and a Maternal Intensive Care Unit with 4 beds. It also has general clinical, surgical and neonatology beds, resulting in 209 beds.

3.1.5 *Fortaleza General Hospital*

The General Hospital of Fortaleza (HGF), inaugurated on May 23, 1969, as part of the National Institute of Medical, Social Security and Social Assistance - INAMPS, now extinct; it was planned as a Reference Center for the North and Northeast in high complexity care. In 1990, it went through the stateization process, becoming part of the Unified Health System in the care network of the Health Department of the State of Ceará - SESA.

The HGF, a reference in highly complex procedures, is one of the largest health institutions in the state network, performs transplants, orthopedics, high-risk obstetrics, specialized clinical treatments, neurosurgeries and other procedures in neurology, among other activities. It comprises the network of Sentinel Hospitals, Hospital Amigo da Criança, Rede Cegonha, as well as the SOS Emergency Program, of the Ministry of Health. Thus, it is a reference in 63 specialties and subspecialties. In addition, it is one of the largest training centers in the country, certified by interministerial decree of the Ministries of Health and Education as a teaching hospital, qualified in the training of physicians in 26 specialties. It is part of the Brazilian Health Technology Assessment Network (REBRATS), the National Clinical Research Network (RNPC) and the University Telemedicine Network (RUTE). The HGF has 563 beds, which are distributed among elective, emergency, obstetrics and adult and neonatal ICUs. It performs an average of 600 elective surgeries per month, 210, 000 laboratory tests, more than 8, 000 imaging tests, in addition to approximately 19, 000 consultations.

3.1.6 *General Hospital Dr. Caesar Cals*

General Hospital Dr. César Cals de Oliveira (HGCC), has been dedicated to teaching and health care for over 80 years, being the oldest unit to make up the state health network. It is a tertiary hospital of high complexity and teaching, recognized by the Ministry of Education and Ministry of Health (MEC/MS), as a reference in Ceará, in the areas of Internal Medicine, Surgery, Gynecology, Obstetrics and Neonatology. and 4 non-medical: Diagnostic and Therapeutic Support Service (SADT); Specialized Service in Engineering, Safety and Occupational Medicine (SESMT); Epidemiological Surveillance Service; Human Milk Bank; Center for Studies, Improvement and Research (CEAP). It has 276 beds, 12 in an adult ICU, 20 in a neonatal ICU and 36 at medium risk. Approximately 400 births are performed monthly, 20.

3.3 Data Collection

Developed by the National Network for the Vigilance of Severe Maternal Morbidity, the form consists of 80 pre-coded items that contain demographic and economic information, obstetric history, prenatal history, pre-existing co-morbidities, criteria for Severe Maternal Morbidity, Maternal Near Miss and main complications, as well as length of stay, information about the newborn, time until care was provided and final outcome. A team of trained researchers was responsible for collecting data, identifying admissions of pregnant women, period of delivery and puerperium who presented any of the criteria defined by the World Health Organization for Severe Maternal Morbidity. Data were transferred to the OpenClinica Electronic Platform (version 2.5.5, Waltham, MA, US) by the coordinator responsible for each participating center. Data were analyzed using SPSS V.25. The exploratory analysis was described with frequencies and their respective confidence intervals (95%CI). For the bivariate analysis, we analyzed the association of all independent variables with the outcomes characterized Near Miss (=1) and not Near Miss (=0), Death (=1) and non-Death (=0) using the hypothesis test (Fisher's exact test) and Odds Ratio (OR), adopting a confidence level of 95%. Statistically significant variables were considered those that presented $p < 0.05$, being represented through the Odds Ratio (OR) and confidence intervals (95%), and then the multivariate analysis was performed. All variables that remained significant were included in the multivariate analysis based on the theoretical model. After each regression, multicollinearity was checked to ensure that the covariates were not redundant.

3.4 Ethical Aspects

This research was approved by Unifor's Research Ethics Committee (CEP) and by each participating center through Plataforma Brasil, with opinion number 1, 865, 363, with the Fundação Cearense de Apoio ao Desenvolvimento Científico e Tecnológico (FUNCAP) as a sponsor., through Call 01/2017-Research Program for SUS/PPSUS-CE FUNCAP-SESA-Decit/SCTIE/MS-CNPq.

4. Results

3, 351 women of child bearing age, aged 12 to 46, participated in the survey. Most classified themselves as white (46.6%), high school education (58.7%), however, less than 4% managed to reach higher education. The largest proportion did not live with a partner (50.4%). Near Miss was characterized in 6.1% (Table 2).

Table 2: Profile of participants included in the survey, 2009-2019.

Characteristics of the participants	N (3, 351)	CI (95%)	
near miss			
Yes	204 (6.1%)	11.4	15.1
No	3147 (93.9%)	84.9	88.6
Age			
12 to 19	657 (19.6%)	18.3	21
20 to 29	1574 (47%)	45.3	48.7
30 to 39	946 (28.2%)	26.7	29.8
40 to 46	174 (5.2%)	4.5	6
Race/Color			
Black	551 (16.4%)	15.2	17.7
White	1561 (46.6%)	44.9	48.3
Brown	931 (27.8%)	26.3	29.3
Others	308 (9.2%)	8.3	10.2
Schooling (n=2, 836)			
Elementary	1068 (37.70%)	35.9	39.5
Average	1665 (58.70%)	56.9	60.5
Higher	103 (3.60%)	3	4.4
Civil status (n=3, 147)			
With Partner	1561 (49.60%)	57.3	62.6
No partner	1586 (50.40%)	37.4	42.7

Source: author

When we compare the group from 2009 and 2010 (before the implementation of the Stork Network) with the group after the implementation of the Stork Network, we observe that there was no statistically significant reduction. It should be noted that this data should not be analyzed in isolation, requiring a critical analysis perspective. It is noteworthy that the research was carried out in tertiary hospitals, which may, in part, justify this finding. Even so, the lack of significant reduction makes it necessary to analyze the factors associated with Maternal Near Miss, which was carried out in this research based on the proposed model.

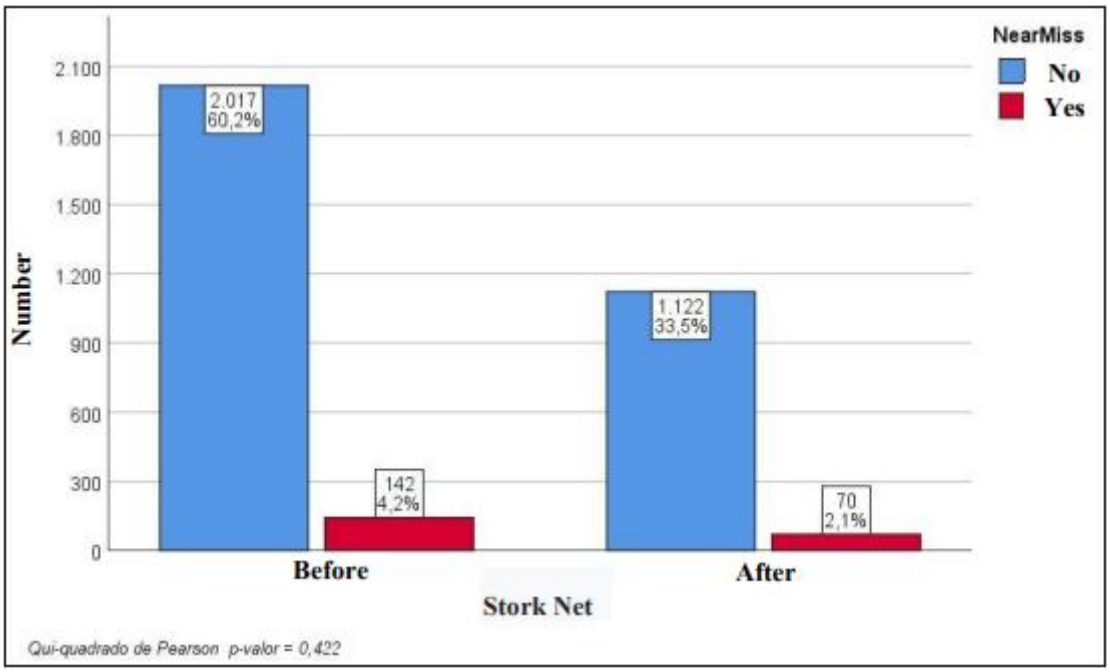

Figure 1: Maternal Near Miss occurrence before and after the implementation of the Stork Network

Table 3 presents the bivariate analysis of socioeconomic factors. The risk of Maternal Near Miss is 10.1 times greater in women self-identified as black (CI 95%= 6.3-16.2) and 7.5 times greater in women self-identified as brown (CI 95%= 4.8-11.9) in relation to women self-identified as white, drawing attention to naturalized and invisible institutional racism. Schooling up to elementary school also constitutes an increased risk (OR=3.2) in relation to those who completed secondary and higher education. Age between 40 and 49 years increased the risk by 2.1 times compared to women aged 20 to 29 years (95% CI =1.3-3.5).

Table 3: Bivariate analysis of socioeconomic factors.

	near miss		OR	CI 95%		p-value
	Yes	No				
Age						
20 - 29	92 (5.8%)	1482 (94.2%)	1			0.036
12 - 19	40 (6.1%)	617 (93.9%)	1	0.7	1.5	
30 - 39	60 (6.3%)	886 (93.7%)	1.1	0.8	1.5	
40 - 49	20 (11.5%)	154 (88.5%)	2.1	1.3	3.5	
Race/ Color						
White	24 (1.5%)	1537 (98.5%)	1			< 0.001
brown	98 (10.5%)	833 (89.5%)	7.5	4.8	11.9	
black	75 (13.6%)	476 (86.4%)	10.1	6.3	16.2	
Others	15 (4.9%)	293 (95.1%)	3.3	1.7	6.3	
Education						
Average	64 (3.8%)	1601 (96.2%)	1			< 0.001
Higher	4 (3.9%)	99 (96.1%)	1	0.4	2.8	
Elementary	120 (11.2%)	948 (88.8%)	3.2	2.3	4.3	
Marital Status						
no partner	75 (4.7%)	1511 (95.3%)	1			< 0.001
With partner	103 (6.6%)	1458 (93.4%)	1.4	1	1.9	

Source: \author

Table 4 shows the descriptive statistics of numerical variables (Gynecological-Obstetric History and Prenatal Consultations of the current pregnancy). The average of 5.4 prenatal consultations stands out. In Brazil, the Ministry of Health recommends that at least six consultations be carried out (one in the first trimester of pregnancy, two in the second and three in the third), ideally that the first consultation should take place in the first trimester and that, by the 34th week, monthly consultations are carried out. Between the 34th and 38th weeks, the appointment would be every two weeks and, from the 38th week, appointments every week until delivery, which usually happens in the 40th week, but can last up to 42 weeks. Thus, the number of prenatal consultations is within the appropriate range.

Table 4: Descriptive statistics of numerical variables (Gynecological-Obstetric History and Prenatal Consultations of the current pregnancy)

	No			Median	Dp	Minimum	Maximum
	Valid	Missing	Average				
Age	3351	0	26.5	26	7.4	12	46
Number of Pregnancies	3346	5	2.3	2	1.8	1	17
Delivery Number of Deliveries	3346	5	1	0	1.5	0	14
Number of Abortions	3346	5	0.3	0	0.7	0	10
On one. of Previous Cesarean Sections	3329	22	0.3	0	0.6	0	7
On one. of Live Births	3309	42	0.9	0	1.4	0	11
On one. Prenatal Care	2573	778	5.4	5	2.5	0	16
Gestational Age at Resolution	3022	329	35.72	37	4.2	10	42

Source: \Author

Bivariate analysis of obstetric history (Table 5) showed that the association with Maternal Near Miss increases by 2.1 times in case of 3 or more pregnancies in relation to the first pregnancy and by 2.2 in case of 3 or more births in relation to a single childbirth.

Table 5: Bivariate analysis of obstetric history

Characteristics	*near miss*		OR	IC95%	P-value
	Yes	No			
Number of Pregnancies					
First	79 (5.1%)	1464 (94.9%)	1		< 0.001
2 - 3	70 (5.8%)	1137 (94.2%)	1.1	0.8-1.6	
3 and+	60 (10.1%)	536 (89.9%)	2.1	1.5-2.9	
Gestation Number					
First	79 (5.1%)	1464 (94.9%)	1		0.013
Monday and +	130 (7.2%)	1673 (92.8%)	1.4	1.1-1.9	
Number of Births					
First	84 (4.8%)	1670 (95.2%)	1		< 0.001
2 - 3	88 (7.2%)	1134 (92.8%)	1.5	1.1-2.1	
3 and+	37 (10%)	333 (90%)	2.2	1.5-3.3	

Source: \Author

Table 6 presents the bivariate analysis of pre-existing conditions. A history of heart disease (OR=2.6), kidney disease (OR=6.0), HIV/AIDS (OR=1.2) and collagenosis (OR=4.6) was significantly associated with the occurrence of Maternal Near Miss. The history of Chronic Arterial Hypertension (OR=1.4) and pre-gestational Diabetes Mellitus (OR=1.6) in an unusual way showed an association tendency, but without statistical significance. These data are paradoxical in relation to the literature.

Table 6: Bivariate analysis of pre-existing conditions

	near miss		OR	IC95%	P-value
	Yes	No			
Chronic Arterial Hypertension					
No	177 (0.1%)	2748 (0.9%)	1		0.086
Yes	35 (0.1%)	391 (0.9%)	1.4	1.0-2.0	
Obesity					
No	204 (0.1%)	2957 (0.9%)	1		0.203
Yes	8 (0%)	182 (1%)	0.6	0.3-1.3	
Low weight					
No	212 (0.1%)	3136 (0.9%)	-		0.652
Yes	0 (0%)	3 (1%)	-	-	
Diabetes Mellitus					
No	205 (0.1%)	3073 (0.9%)	1		0.652
Yes	7 (0.1%)	66 (0.9%)	1.6	0.7-3.5	
Smoking					
No	209 (0.1%)	3101 (0.9%)	1		0.793
Yes	3 (0.1%)	38 (0.9%)	1.2	0.4-3.8	
Heart Diseases					
No	199 (0.1%)	3062 (0.9%)	1		0.001
Yes	13 (0.1%)	77 (0.9%)	2.6	1.4-4.8	
Respiratory Diseases					
No	210 (0.1%)	3116 (0.9%)	1		0.73
Yes	2 (0.1%)	23 (0.9%)	1.3	0.3-5.5	

Kidney Diseases					
No	210 (0.1%)	3134 (0.9%)	1		0.016
Yes	2 (0.3%)	5 (0.7%)	6	1.2-31.0	
Sickle Cell Anemia-Thalassemia					
No	211 (0.1%)	3133 (0.9%)	1		0.387
Yes	1 (0.1%)	6 (0.9%)	2.5	0.3-20.7	
HIV/AIDS					
No	211 (0.1%)	3127 (0.9%)	1		0.041
Yes	1 (0.1%)	12 (0.9%)	1.2	0.2-9.5	
Thyroid Diseases					
No	207 (0.1%)	3119 (0.9%)	1		0.839
Yes	5 (0.2%)	20 (0.8%)	3.8	1.4-10.1	
Neurological Diseases/ Epilepsy					
No	209 (0.1%)	3124 (0.9%)	1		0.071
Yes	3 (0.2%)	15 (0.8%)	3	0.9-10.4	
Collagenosis					
No	208 (0.1%)	3126 (0.9%)	1		0.003
Yes	4 (0.2%)	13 (0.8%)	4.6	1.5-14.3	
Neoplasms					
No	211 (0.1%)	3136 (0.9%)	1		0.125
Yes	1 (0.3%)	3 (0.8%)	5	0.5-47.8	
Others					
No	198 (0.1%)	3095 (0.9%)	1		<0.001
Yes	14 (0.2%)	44 (0.8%)	5	2.7-9.2	

Source: \author

Table 7 shows the bivariate analysis of data related to the current pregnancy. A small number of prenatal appointments (up to 3) presented a 2.3 times increased risk compared to a number of 4 to 7 appointments (95%CI= 1.6-3.3). Attending prenatal care at a reference tertiary service, on the other hand, did not show a significant reduction in the risk of maternal Near Miss compared to receiving prenatal care at another service. The occurrence of premature birth, with resolution in the second trimester of pregnancy, increased the risk of MNM by 2.9 times in relation to pregnancies with resolution in the third trimester (95%CI= 1.5-5.4). The way the pregnancy was resolved was also associated with the risk of MNM. Although both operative vaginal delivery (OR=4.1, CI=0.4-37.8) and cesarean section before the onset of labor (OR=1.1, CI=0.2-0. 9) showed a trend towards increased risk, there was no statistical significance if we consider the confidence intervals. Cesarean section after the onset of labor, on the other hand, proved to be a protective factor (OR=0.4). Pregnancies terminated by miscarriage increased the risk of NMM (OR=4.6). It should be noted that there is no information in the medical records about whether these interruptions were induced or spontaneous.

Table 7: Bivariate analysis of current pregnancy

	Yes	No	OR	CI 95%	p-value
Number of PN queries					
4-7	68 (4.4%)	1471 (95.6%)	1		<0.001
Up to 3	49 (9.6%)	464 (90.4%)	2.3	1.6-3.3	
7 or more	12 (2.3%)	509 (97.7%)	0.5	0.3-0.9	
Prenatal care in the Service					
No	174 (6.5%)	2505 (93.5%)			0, 549
Yes	23 (5.3%)	412 (94.7%)	0.8	0.5-1.3	
No Prenatal	8 (7.6%)	97 (92.4%)	1.2	0.6-2.5	
Gestational Age at Resolution					
Third Quarter	147 (5%)	2766 (95%)	1		0.003
Second Trimester	12 (13.3%)	78 (86.7%)	2.9	1.5-5.4	
First Trimester	1 (5, 3%)	18 (94, 7%)	1	0.1-7.9	
Last Pregnancy					
Vaginal Delivery	25 (5.8%)	407 (94.2%)			<0.001
Operative Vaginal Delivery	1 (20%)	4 (80%)	4.1	0.4-37.8	
Cesarean Delivery before ITP	151 (6.4%)	2207 (93.6%)	1.1	0.7-1.7	
Cesarean Delivery after ITP	7 (2.3%)	292 (97.7%)	0.4	0.2-0.9	
Abortion	7 (21.9%)	25 (78.1%)	4.6	1.8-11.6	
Ectopic Pregnancy	1 (1%)	102 (99%)	0.2	0.0-1.2	
Was discharged or transferred yet pregnant	15 (14.3%)	90 (85.7%)	2.7	1.4-5.4	

Source: \author

In an investigation carried out in the United States, national data were used to classify hospitals by their proportion of deliveries to black women and analyzed cases of Severe Maternal Mortality (SMM). The researchers found that cases of MMG were often among women who gave birth in hospitals with a higher frequency of deliveries to black women compared to those with a lower frequency (29.4 and 19.4 vs 12.2 per 1000 deliveries, respectively). ; p<0.001).

There were more cases of MMG also among black women than non-black women regardless of hospital (25.8 versus 11.8 per 1000 deliveries, respectively; p < 0.001) (HOWELL et al., 2016).

This study corroborates the data presented in Table 3, demonstrating that disciparity among women of different ethnicities is global and not just Brazilian, highlighting the systemic racism that leads to these inequities in health. It should also be noted that even though the access to care systems in the two countries are different, this pattern remains.

In Brazil, a study carried out in 2015 also demonstrated the same trends regarding the sociodemographic variables found in the present study, which covers a time period of one decade, finding a greater risk of developing the maternal Near Miss condition in married patients (OR=7.9; PR=7.1; 95%CI 2.4-26.1), with incomplete secondary education (OR=3.1; PR=2.8; 95%CI 1.6-6.0), from the countryside (OR=4.6; PR=4.0; 95%CI 2.1-10.0) and family income less than one minimum wage (OR=7.0; PR=5.5; 95%CI 3.6-13.6). The authors also showed that non-white women had a 2.5 times greater relative risk of developing Maternal Near Miss (OR 2.5; PR 2.3 and CI 95%) (SOUZA, SOUZA E GONÇALVES, 2015). The significantly highlighted variables were access to the health center, where transferred patients had a higher incidence of MNM, as well as the greater number of pregnancies in patients with MNM. It was observed that the number of prenatal consultations was lower than recommended, both in patients with Severe Maternal Morbidity and Maternal Near Miss, being even lower in the latter.

The results obtained in table 4 follow the pattern found in the literature, as observed in the research carried out by Morse (2011), which presents similar results regarding the number of prenatal consultations, which observes that 60% of the patients had less than 6 prenatal consultations and 10% of them did not have any consultation. In another study carried out between October 2013 and September 2014 with 492 women, it was possible to evidence clinical conditions as a risk factor, number of prenatal consultations lower than recommended (OR=5.0; PR=4.2; CI95 % 2.5-9.7) and the type of cesarean delivery (OR=39.2; PR=31.2; 95%CI 9.3-164.5) (ROSENDO AND RONCALLI, 2016). This finding is corroborated by several other studies that associate the lack of prenatal care with an increased risk of developing maternal Near Miss (HADDAD et al., 2014; SOUZA, SOUZA E GONÇALVES, 2015).

5. Conclusion

After analyzing the data, it can be observed that the epidemiological profile of the patients who presented Maternal Near Miss in the three institutions follows the pattern of the other regions of the country. The highest percentage of women meeting the Near Miss criteria were black or brown, with low education and advanced age.

The main risk factors also corroborate the results presented in the literature so far, namely the inadequate number of prenatal consultations, below the recommended in the country; greater number of previous births in the obstetric history; as well as pre-existing diseases of a cardiac nature, involving the blood clotting and metabolic system.

Thus, it is imperative that the public power carry out planning and mainly actions aimed at the results found. It is clear the disciparity and lack of empathy towards the socially more vulnerable public. Problems that can be mitigated by simple incentives, whether financial, accreditation stamps, specific campaigns or even more imperatively through judicial channels, decrees and laws.

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