# Chapter 40

# Epidemiology of maternal death and the challenge of professional qualification

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**ABSTRACT**
Maternal mortality is an important health indicator that reflects socioeconomic conditions and quality of life in a given location. Most of the time, these deaths can be avoided through quality prenatal care, specialized hospital care and human resources capable of obstetric emergencies. Objective: to describe the reported maternal deaths that occurred in the municipalities covered by the Regional Health Department of Ribeirão Preto, from 2011 to 2016, identifying the main problems of the care provided. Method: descriptive, retrospective study with a quantitative approach, with analysis of secondary data from the Mortality Information System, referring to declared maternal deaths. Results: most maternal deaths occurred in women aged 20 to 29 years (63.9%), with a mean age of 28.1 years, the majority being single (50%), white (66.7 %), primiparous (41.7%), with different occupations. Access to prenatal care was noticeable in early enrollment (72.2%) and in the number of consultations during prenatal care. Maternal death from a direct cause evolved in 77.8% of deaths and the main causes of death were hypertension, infection and hemorrhage. The women's health care network in the pregnancy-puerperal cycle has good coverage of basic care, equivalent in supplementary health coverage and has 20 maternity hospitals in its territory, including two with qualification in high-risk pregnancies. Conclusion: maternal death remains a challenge for obstetric care, and it is essential that good practices become routine. Institutions and professionals need to comply with care protocols based on scientific evidence for fast and accurate care. At the heart of every maternal death is a family tragedy and a devastating social impact.

**Keywords**: Maternal Mortality, Health Assistance, Women's Health.

## 1 INTRODUCTION

### 1.1 DEFINITIONS AND CONCEPTS

Maternal death (MM) is defined as the death of a woman during pregnancy, childbirth or 42 days after delivery, due to any cause related or aggravated by the period, excluding accidental or incidental causes (WHO, 2008).

Maternal deaths are divided into two groups: direct and indirect. The main direct causes are hypertension in pregnancy, hemorrhages, puerperal infection and abortion, these causes are often considered preventable, and this avoidability would be through quality prenatal care (PN), specialized hospital care and human resources capable of obstetric emergencies. Indirect maternal deaths have their causes based on preexisting diseases such as circulatory system diseases, preexisting hypertension, diabetes mellitus, human immunodeficiency virus (HIV) diseases, among other conditions complicated or enhanced by the physiological effects of pregnancy, childbirth or puerperium (MENDES et al., 2013).

## 1.2 MATERNAL MORTALITY RATIO: HEALTH INDICATOR

According to the World Health Organization (WHO), the day of birth can be the most dangerous day for mothers and babies, every year more than 300,000 women die during or after childbirth worldwide, according to the report on the global implementation of surveillance and response to MM, most deaths are limited to malpractice or medical negligence (WHO, 2016).

The maximum Maternal Mortality Ratio (MMR) recommended by the Pan American Health Organization (PAHO) is 20 cases per 100,000 live births (LB). In Brazil, in 2011, this number was 55.3/100,000 LB; but due to underreporting, it would be close to 64.8/100,000 LB, according to the estimate of the Interagency Health Information Network - RIPSA (Portal ODM, 2018).

According to WHO data, while developed countries such as France, Finland, Norway, Japan, Sweden, had MMR equal to 10 in 2010, several developing countries such as Nigeria, India, Indonesia, Bangladesh, Pakistan, had the MMR equal to or greater than 200 for the same year (WHO, 2013).

It is essential that all deaths of women of childbearing age be investigated, and all declared maternal death are verified, identifying the health problems, recommending solutions and quick actions to prevent other deaths *or maternal near miss*. Basic and hospital care should be integrated, ensuring specialized care with qualified professionals to provide the service immediately (MENDES et al., 2013).

Maternal mortality is a very important health indicator that reflects the social, economic and quality of life conditions of people living in a given location, from this indicator it is possible to evaluate health conditions, consequently, creating public policies that guide and regulate government activities, in the case of policies maternal and child care, these measures are essential for the reorganization of the health system and positive effects on the care of women and children (BRASIL, 2014).

## 1.3 PUBLIC POLICIES FOR WOMEN'S HEALTH

Public policies focused on women's health care in Brazil were not significant in the early 20th century until the mid-1970s, where women's care was restricted and based only on reproduction, health actions were fragmented and without integration with other health programs, evidencing gender inequality, this policy favored the high rates of maternal and fetal morbidity and mortality and represented a challenge for obstetric care in Brazil (MOURA, 2004).

With the Alma-Ata Declaration in 1978, formulated during the International Conference on Primary Health Care in the Republic of Kazakhstan, in view of the main health problems, it was established as a priority for maternal and child care care, family planning, immunization, promotion and prevention of diseases (ALMA-ATA, 1978). From this, feminist movements called for issues aimed at assisting women in their entirety, such as gender, work, sexuality, equality, contraception and prevention of sexually transmitted infections (MOURA, 2004).

Following the trend of promoting integrated care with universal access, one of the largest public health systems in the world was created in Brazil: the Unified Health System (SUS), whose objectives are

to change the situation of inequality in health care, ensuring full, universal and free access for the entire population of the country. As determined by the Federal Constitution of 1988 (CF-88), "Health is the right of all and duty of the State", the SUS being regulated by Laws No. 8080/90 (Organic Health Law) and No. 8,142/90, thus highlighting that health is not limited only to the absence of disease, but, above all, to quality of life, resulting from other public policies, that promote the reduction of regional inequalities, economic and social developments (BRASIL, 2004).

And so, following the years in the creation of public policies and guidelines for women's health in Brazil and worldwide, in 1996, the WHO prepared a document recommending good practices during childbirth and birth to conduct the best health care for women and babies, highlighting what should and should not be health practices by professionals during perinatal care, based on scientific evidence, through research conducted in several countries of the world (WHO, 1996).

During the Millennium Summit, representatives from 189 countries met at United Nations Headquarters in New York in 2000, looking at the main problems that would affect the world in the new millennium. This meeting culminated in the agreement of eight objectives and 21 goals to improve the living conditions of the poorest populations on the planet by 2015. Among these Millennium Development Goals (MDGs), the 5th objective proposed improving the health of pregnant women with the reduction of MM by 75% by 2015 for the signatory countries, including Brazil, demonstrating concern about the death of women during their puerperal pregnancy cycle worldwide (NAÇÕES UNIDAS, 2014).

However, in Brazil, the national goal to achieve the 5th MDR was based on actions that ensured universal coverage in sexual and reproductive actions by the SUS, and analysis of health indicators of maternal deaths, according to the cause group, proportion of PRENATAL consultations and number of hospitalizations for abortion in the country. This monitoring is important for the creation of more policies to encourage women's health in the country, such as (Portal ODM, 2018):

- Prenatal and Childbirth Humanization Program (2001): in June 2001, Brazil launched the Prenatal and Birth Humanization Program, considering that the access of pregnant women and newborns to decent and quality care during pregnancy, childbirth, puerperium and neonatal period are inalienable rights of citizenship, establishing principles and guidelines that guide the actions of prenatal care and childbirth, organization of case regulation and new investments for childbirth care (BRASIL, 2001);
- National Policy for Integral Care for Women's Health (2004): the Ministry of Health (MS) created the National Policy for Integral Care for Women's Health (PNAISM), with action plans proposed for quality and integrality of care, based on national policy and strengthened by the precepts of the SUS. A process that became important for the evolution of the Comprehensive Women's Health Care Program (PAISM) created in 1983, which had as guidelines the proposals for decentralization, hierarchization and regionalization of services, as well as the integrality and equity of women's health care(BRASIL, 2013).

- National Pact for the Reduction of Maternal and Neonatal Mortality (2004): the National Seminar on Obstetric and Neonatal Care, held by the Ministry of Health, took place in Brasilia, on February 10 and 11, 2004, to ensure actions and health policies that were really effective based on the commitment made during the International Conferences, highlighting the guarantee of sexual and reproductive rights, and reducing maternal and neonatal death as a priority (BRASIL, 2004).
- National Policy on Sexual and Reproductive Rights (2005): a government priority in 2005, also based on discussions on public health and women's health care at international conferences aimed at guaranteeing the rights of men, women, and adolescents, sexual health and reproductive health, focusing mainly on family planning and prevention of Sexually Transmitted Infection (STIs) and AIDS/HIV (BRASIL, 2005).

## 1.4 INTERNATIONAL AND NATIONAL AGREEMENTS TO REDUCE MATERNAL DEATH

Despite the efforts of all spheres of government, especially in health, to create public policies focused on reducing MM and guidelines for improving care for women in its puerperal pregnancy cycle, Brazil has made little progress in relation to the values expected and agreed upon at the Millennium Summit, leading us to reflect on what actions and care in the area of women's health should be carried out in this way, so that it is possible to change in the current outlook and improve conditions of binomial assistance (RUIZ; WYSOCKI, 2016).

The deadline for meeting the MDDs ended in 2015 and the goal of reducing maternal death was not reached in its entirety, with few states in Brazil reaching the goal. Nevertheless, the fight against maternal death remained the focus of the global health agenda and international development with the new Sustainable Development Goals (SDGs), a strategy that succeeded the MDGs, and proposed the elimination of preventable maternal death, with the universal goal of maternal mortality ratio below 30 deaths per 100,000 LB (SOUZA, 2015).

With the whole overview of the implementation of public policies aimed at women's health care, strengthening the single health system, improving the quality of care, increasing social indicators with income transfer programs and international agreements to improve indicators, some countries showed a gradual improvement in maternal death rates. These political, economic and social transformations reflected in some aspects as a trend of decrease in maternal mortality, and this phenomenon was called "obstetric transition", according to the stagings below (SOUZA, 2015).

**Stage I** (MMR > 1,000 maternal deaths/100,000 LB): characterized by very high maternal mortality, with high fertility and the predominance of direct causes of maternal mortality, along with a large proportion of deaths attributable to communicable diseases. Most women do not receive professional obstetric care or do not have access to health facilities.

**Stage II** (MMR: 999-300 maternal deaths/100,000 LB): mortality and fertility remain very high, with a pattern of causes similar to Stage I. However, a higher proportion of women begin to seek and receive care in health units.

**Stage III** (MMR: 299-50 maternal deaths/100,000 LB): fertility is variable and direct causes of mortality still predominate. This is a complex phase because access remains a problem for a large part of the population, but as a greater proportion of pregnant women arrive at health services, quality of care becomes one of the main determinants of health outcomes, especially with regard to overburdened health services. In addition to primary prevention, secondary and tertiary prevention are essential to improve maternal health outcomes at this stage.

**Stage IV** (MMR < 50 maternal deaths/100,000 LB): maternal mortality is low, there is low fertility and indirect causes of maternal mortality; in particular, chronic-degenerative diseases acquire greater importance. One aspect that emerges at this stage is the increasing role of medicalization as a threat to quality and better health outcomes.

**Stage V** (RMM < 5 maternal deaths/100,000 LB): all preventable maternal deaths are in fact avoided. Maternal mortality is very low, fertility rate is low or very low, and indirect obstetric causes associated with chronic-degenerative diseases are the main causes of maternal mortality. The main challenges of this stage are the consolidation of advances against structural violence (e.g., gender inequality), effective management of vulnerable populations (e.g., immigrant, refugee and displaced people in their own country), and the sustainability of excellence in the quality of care.

Obstetric transition includes decreased fertility, increased aging of the obstetric population, gradual increase in intervention rates during pregnancy and birth, and decreased deaths from direct (preventable) causes and increased maternal deaths from indirect causes (inevitable) (SOUZA, 2013, 2014). A model proposed as a theory to explain the evolution of the maternal mortality profile and guide the formulation of strategies to cope with MM, according to its characteristics (CHAVES, 2015).

And to ensure and continue the process of reorganizing health care for women and children, in 2011 the government launched the Stork Network strategy, under ORDINANCE GM No. 1,459 of the Ministry of Health. The strategy aims at access to a network of care, qualification and costing of bed and indicators, with the woman having the right to reproductive planning, humanized care since the discovery of pregnancy, pregnancy, childbirth and puerperium, also including the assistance and follow-up of the child up to two years of age, with the right to safe care at birth and development in a healthy and humanized way (BRASIL, 2011).

The Stork Network also proposes the monitoring of some health indicators, qualification of components and certification of the strategy in health regions, such monitoring is strategic for evaluating the practices, actions and goals of all care in the pregnancy-puerperal cycle within the Scope of the SUS by the Ministry of Health, in order to reduce MM and children (BRASIL, 2011).

In addition to the responsibility of management and services regarding the structure, logistics and adequate care at the time of delivery and birth, there is concern about the care provided throughout the PN. All this integrality should be incorporated into the work process, qualifying care, identifying and solving health problems and reorganizing primary care for women (SANTOS NETO et al., 2012).

Not focusing on the responsibility of improvements in women's care in the pregnancy-puerperal cycle only to the SUS, the National Agency for Supplementary Health (ANS) in partnership with the Ministry of Health, launched in 2015 an initiative that proposed changes in childbirth care in private hospitals, with the aim of reducing cesarean rates and improving the model of care for childbirth and birth. In the same year, it published Normative Resolution No. 368, which guarantees the access of beneficiaries of health plans to the percentages of cesarean surgeries by physicians and institutions and the use of the delivery chart and the pregnant woman's card in private services. This project was named "Adequate Childbirth", with 42 private maternity hospitals participating in Brazil (ANS, 2015).

## 1.5 HEALTH REGIONALIZATION - HEALTH REGIONS OF THE REGIONAL HEALTH DEPARTMENT OF RIBEIRÃO PRETO

Health care systems are deliberate social responses to the population's health needs. When discussing a proposal for the organization of the SUS, one must first analyze what are the health needs of the population. And this health situation is analyzed in its demographic and epidemiological aspects, considering the transition movement and the triple burden of diseases (MENDES, 2011).

To construct health care networks, knowledge of the territory, public policies of the thematic network in question, the ordinances and guidelines in force, the site's health care model and what operational structure is available for adequacy of flows (MENDES, 2011).

According to Malta and Merhy (2010) care for users should be fully paid, and this attention is only possible if care is network-based. Understanding each service with a fundamental component of the care line so that care is individual and integral, with an appropriate therapeutic project, based on the actions necessary for access, integrating promotion, prevention, surveillance and management.

Decree 7.508/2011, which regulates Law 8.080/1990, emphasizes the implementation of regional health care networks (RRAS), as a strategy to order the different levels of care – basic, medium and high complexity, in order to ensure access for citizens to all actions and services necessary to solve their health problems, optimizing resources. These recent initiatives in the formulation of policy and decentralization of care actions guarantee access and integrality of the different rationalities given by collective health and individual health and agreement among managers (DUARTE, 2015).

The Regional Health Department of Ribeirão Preto - DRS XIII is one of the 17 Regional Health Departments of the State of São Paulo and has an estimated population of 1,327,989 inhabitants (IBGE, 2010), as shown in Figure 1.

The health regions establish general guidelines for the institution of health regions within the Scope of the SUS, according to Resolution No. 1 of September 29, 2011:

> § 1 - The continuous geographic space consisting of a grouping of neighboring municipalities, delimited from cultural, economic and social identities and shared transport networks and infrastructure, is considered, with the purpose of integrating the organization, planning and execution of health actions and services (BRASIL, 2011, p. 1).

Composed of 26 municipalities, DRS XIII is divided into three health regions: Guarani Aquifer (10 municipalities), Horizonte Verde (09 municipalities) and Vale das Cachoeiras (07 municipalities).

The division of health regions in DRS XIII occurred in a way that guaranteed the equation between equity in access and economy of scale, following technical parameters of ordinances and legislations. Considering the planning of health actions and agreements, the objective was to ensure health care for the population with access to primary, medium and high complexity care services, agreed with interregional or macro-regional arrangements according to the potentialities of each geographic region, structuring the decentralization process so that the demands of different locoregional interests can be organized (SÃO PAULO, 2007).

According to the Technical Manual of Prenatal and Puerperium (SÃO PAULO, 2010) the decentralization of health and articulation with the network is important, because:

- Articulation between all units of the regional health care network ensures continuous and quality care in elective or emergency situations during prenatal, childbirth, puerperium and for the newborn, with guarantee of integrality and specialized care, when indicated;
- Effective medical regulation mechanisms ensure access to services, examinations, medications and safety in the possible transportation of patients with vehicles suitable for each case.
- The municipalities should offer quality health care to all pregnant women during the PN, and for the puerpery women and newborns, and the Basic Health Units (UBS) must have qualified professionals, adequate structure and organization of work processes, adjusted in the participatory management model so that difficulties can be overcome and guarantee autonomy in the conducts related to health care.

## 2 STUDY OBJECTIVES

Describe the declared maternal deaths that occurred in the municipalities of the Regional Health Department of Ribeirão Preto and their respective networks of care for women in the pregnancy-puerperal cycle, in the period from 2011 to 2016.

## 3 MATERIALS AND METHODS

### 3.1 STUDY DESIGN

The design of the research is descriptive, retrospective with quantitative approach. Secondary data from the Live Birth Information System (SINASC) and mortality information system (SIM) regarding declared maternal deaths occurred in the municipalities of the drs xiii coverage area were analyzed.

### 3.2 STUDY POPULATION AND PERIOD

The study population consisted of women who died in their pregnancy-puerperal period, living in one of the 26 municipalities in the area covered by DRS XIII, from 2011 to 2016.

### 3.3 DATA COLLECTION PROCEDURES

After authorization by the Center for Strategic Information on Health (CIVS) of the Coordination of Disease Control (CCD) of the São Paulo State Department of Health (SES-SP), data were collected from the Death Certificates and research summary form that are under the domain of the Mortality Information System (SIM).

A data collection instrument was created to analyze sociodemographic variables, variables related to maternal death, care, obstetric history and structure of health care networks.

### 3.4 DATA ANALYSIS

The SIM data were authorized and sent by the CIVS of the SESSP CCD, made *available on the USB stick* in spreadsheets formatted in excel software. The completed instruments were numbered according to the order of data collection and to ensure the quality and reliability of the typing process, the data underwent validation via double typing in subsequent worksheets.

The data were analyzed descriptively with univariate analysis. The qualitative variables were presented in the form of distribution of absolute (n) and relative () frequencies; and for the quantitative variables, mean and median values, standard deviations and maximum and minimum values were calculated.

### 3.5 ETHICAL CONSIDERATIONS

The research project was approved by the Research Ethics Committee of the Ribeirão Preto School of Nursing of the University of São Paulo under the number CAAE 79532617.0.0000.5393 and forwarded to the Center for Strategic Health Information (CIVS) of the Coordination of Disease Control (CCD) of the São Paulo State Department of Health (SES SP), in order to comply with the recommendations contained in Resolution 466/12 of the National Health Council and the Guidelines and Regulatory Standards for Research involving Human Beings.

Because it is a research that used secondary data, the Waiver of the Free and Informed Consent Form (TCLE) was requested.

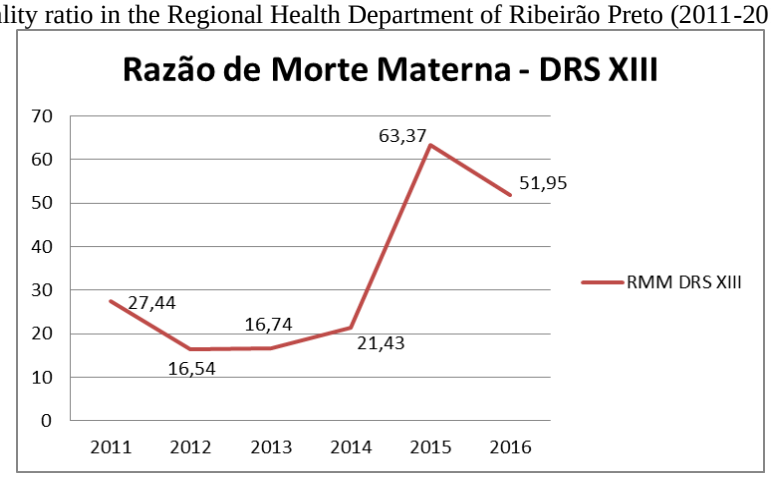
## 4 FINDINGS

### 4.1 DISTRIBUTION OF MATERNAL MORTALITY IN THE REGIONAL HEALTH DEPARTMENT OF RIBEIRÃO PRETO BY HEALTH REGION

Through the analysis of secondary data obtained through the Mortality Information System (SIM), we found the records of 36 maternal deaths of women living in the municipalities of the area covered by DRS XIII, in the period from 2011 to 2016, with emphasis on the Guarani Aquifer region with a total of 20 deaths (55.5%), followed by nine deaths (25%) in the Horizonte Verde region and seven (19.5%) in the Cachoeiras Valley region.

The distribution of the MMR of DRS XIII is represented in Chart 1, observing an increase in deaths from 2015.

Chart 1 - Maternal mortality ratio in the Regional Health Department of Ribeirão Preto (2011-2016). Ribeirão Preto, 2018.




Source: DATASUS, 2018.

### 4.2 MATERNAL MORTALITY ACCORDING TO EPIDEMIOLOGICAL PROFILE

Observing the death profile of these women, 23 deaths (63.9%) occurred in women aged 20 to 29 years, followed by 11 deaths (30.6%) in the age group 30 to 39 years, and two deaths (5.6%) in women under 20 years of age, no deaths were found in women over 40 years and the mean age of these women was 28.1 years.

Analyzing the marital status variable, 18 women (50%) were single and 12 (33.4%) were married or had a stable union, while in the analysis of race/color, 24 women (66.7%) were white, followed by five (13.9%) brown and five (13.9%) black women. The education profile showed that 19 women (52.8%) had eight years or more of schooling, of which five (13.9%) had completed higher education (Table 1).

Table 1 - Distribution of women who died in their pregnancy-puerperal cycle, according to sociodemographic variables, in DRS XIII (2011-2016). Ribeirão Preto, 2018.

| | N (absolute no.) | RS Horizonte Verde | RS Aquífero Guarani | RS Vale das Cachoeiras | % MM DRS XIII |
|---|---|---|---|---|---|
| **Age group** | | | | | |
| < 20 years | 2 | - | 1 | 1 | 5,6 |
| 20 to 29 years old | 23 | 6 | 12 | 5 | 63,9 |
| 30 to 39 years old | 11 | 3 | 7 | 1 | 30,6 |
| **Marital status** | | | | | |
| Married woman | 10 | 3 | 5 | 2 | 27,8 |
| Single | 18 | 3 | 12 | 3 | 50,0 |
| Stable union | 2 | 1 | - | 1 | 5,6 |
| Other | 1 | - | 1 | - | 2,8 |
| Ignored | 5 | 2 | 2 | 1 | 13,9 |
| **Race/Color** | | | | | |
| White | 24 | 6 | 12 | 6 | 66,7 |
| Black | 5 | 1 | 4 | - | 13,9 |
| Brown | 5 | 2 | 2 | 1 | 13,9 |
| Ignored | 2 | - | 2 | - | 5,6 |
| **Schooling** | | | | | |
| No | 1 | - | 1 | - | 2,8 |
| Fundamental | 5 | 1 | 3 | 1 | 13,9 |
| Middle school | 8 | 2 | 3 | 3 | 22,2 |
| Full top | 5 | 1 | 3 | 1 | 13,9 |
| Incomplete superior | 6 | 2 | 3 | 1 | 16,7 |
| Ignored | 11 | 3 | 7 | 1 | 30,6 |
| **Occupation** | | | | | |
| With income | 11 | 2 | 6 | 3 | 30,6 |
| White | 5 | 1 | 3 | 1 | 13,9 |
| Ignored | 20 | 6 | 11 | 3 | 55,6 |

Source: SESSP/CCD/CVIS, 2018

## 4.3 MATERNAL MORTALITY ACCORDING TO PRENATAL AND CHILDBIRTH CARE

Regarding the place of performance of the PN, 13 women (36.1%) followed their pregnancies in primary care, i.e., habitual risk PN, followed by the doctor and nurse in the basic health units of their respective municipalities, followed by nine women (19.4%) who were inserted in high-risk follow-up and five (13.9%) who performed the PN in supplementary health. Of the 36 women who died, 15 were in their first pregnancy (41.7%), 10 (27.8%) were secondary and 11 (30.6%) were multiparous.

When verifying the onset of PN in relation to gestational age, 26 women (72.2%) started follow-up before the 12th week, and in relation to the number of consultations, 18 women (50%) had seven or more

consultations, followed by seven pregnant women (19.4%) with four to six consultations and five (13.9%) with one to three consultations.

The main route of delivery was cesarean section, 19 women (52.8%) submitted to the surgical procedure (Table 2).

Table 2 - Characterization of obstetric variables of the pregnancy-puerperal cycle in DRS XIII (2011-2016). Ribeirão Preto, 2018.

| | N | % |
|---|---|---|
| **Place where he performed prenatal care** | | |
| Primary care | 13 | 36,1 |
| Secondary care - outpatient clinic | 2 | 5,6 |
| Secondary care - GAR | 7 | 19,4 |
| Particular | 5 | 13,9 |
| Ignored | 9 | 25,0 |
| **Number of pregnancies** | | |
| 1 (primigesta) | 15 | 41,7 |
| 2 (secundigesta) | 10 | 27,8 |
| 3 or more (multigesta) | 11 | 30,6 |
| **Early prenatal care** | | |
| Gestational age < 12 weeks | 26 | 72,2 |
| Gestational age > 12 weeks | 2 | 5,6 |
| Ignored | 8 | 22,2 |
| **Number of prenatal consultations** | | |
| 1 to 3 queries | 5 | 13,9 |
| 4 to 6 consultations | 7 | 19,4 |
| 7 or more queries | 18 | 50,0 |
| no query | 6 | 16,7 |
| Ignored | 0 | 0,0 |
| **Delivery route** | | |
| Vaginal | 9 | 25,0 |
| Cesarean | 19 | 52,8 |
| Ignored | 8 | 22,2 |

Source: SES SP/ CCD/ CIVS, 2018.

According to data analyzed, 33 women (91.7%) died in a hospital environment, 28 (77.8%) had medical care declared at the time of death and 20 women (55.6%) were referred for necropsy. The period of greatest risk, which culminated in the death of these women in the pregnancy-puerperal cycle was the puerperium with 25 deaths (69.5%), followed by pregnancy with eight (22.2%) (Table 3).

Table 3 - Characterization of deaths by place of occurrence and condition of care, in DRS XIII (2011-2016). Ribeirão Preto, 2018.

| | N | % |
|---|---|---|
| **Place of death** | | |
| Hospital | 33 | 91,7 |
| Another health facility | 1 | 2,8 |
| Domicile | 2 | 5,6 |
| **Moment of death** | | |
| In pregnancy | 8 | 22,2 |
| In childbirth | 2 | 5,5 |
| In abortion | 1 | 2,8 |
| In the puerperium up to 42 days | 25 | 69,5 |
| **Received medical assistance** | | |
| Yes | 28 | 77,8 |
| No | 3 | 8,3 |
| Ignored | 5 | 13,9 |
| **Referred for necropsy** | | |
| Yes | 20 | 55,6 |
| No | 15 | 41,7 |
| Ignored | 1 | 2,8 |

Source: SES SP/ CCD/ CIVS, 2018.

## 4.4 MATERNAL MORTALITY ACCORDING TO TYPE AND OBSTETRIC CAUSE

For the grouping of causes of direct maternal death, the following codes were considered: Hypertension - CID10, chapter XV, codes O11, O13, O14, O15 and O16; Hemorrhages - CID10, chapter XV, codes O45 and O72; Infection - CID10, chapter XV, codes O23, O85 and O86 and other causes - ICD 10, chapter XV, codes O43, O73, O75 and O90. For indirect obstetric causes, the following codes were grouped: HIV disease - ICD 10, chapter XV, code B20; Complications in the puerperium - ICD 10, chapter XV, codes O98 and O99 and Preexisting hypertension - ICD 10, chapter XV, code O10, as shown in table 4, and 28 women (77.7%) died from direct causes.

Table 4 - Distribution of maternal deaths by type and obstetric cause (ICD 10) in DRS XIII (2011-2016). Ribeirão Preto, 2018.

| Underlying Cause of Death - ICD 10 | n | % |
|---|---|---|
| **Indirect obstetric maternal death** | 7 | 19,5 |
| Pre-existing hypertension (O10) | 1 | 2,8 |
| Complications in the puerperium (O98-O99) | 5 | 13,9 |
| HIV disease (B20) | 1 | 2,8 |
| **Direct obstetric maternal death** | 28 | 77,7% |
| Hypertensive disorders in pregnancy, childbirth and puerperium (O11-O16) | 7 | 19,4 |
| Infection in pregnancy and puerperium (O23-O85-O86) | 7 | 19,4 |
| Bleeding (O45-O72) | 7 | 19,4 |
| Other causes (O43-O73-O75-O90) | 7 | 19,4 |
| **Unspecified obstetric maternal death** | 1 | 2,8 |
| Obstetric death of NE cause*(O95) | 1 | 2,8 |
| **Total** | **36** | **100** |

Source: MS/ Mortality Information System - YES, 2018.
* unspecified

## 4.5 STRUCTURE OF HEALTH CARE NETWORKS THAT PROVIDE CARE TO WOMEN IN THE PREGNANCY-PUERPERAL CYCLE IN DRS XIII

The study of the health care network was necessary to assess the comprehensiveness, coverage and access of these women to services and professionals providing care in regional obstetric care. The analyses are divided by health region due to the division of the network structure itself, by collegiate, within the regional maternal network, as recommended by the Stork Network.

### 4.5.1 Supplementary health and primary care coverage

Analyzing the coverage of primary health care and supplementary health, respectively in the health regions of DRS XIII, we have: Horizonte Verde with 81.14% and 43.16%, Aquifero Guarani with 94.77% and 40.29% and Vale das Cachoeiras with 121.16% and 21.2%..

### 4.5.2 Maternity and beds enabled in the Stork Network

In the DRS XIII region there are 20 maternity hospitals, 13 public and seven private. The distribution of public and private maternity hospitals in the region is shown in Figure 4, with the health region of the Guarani Aquifer with the highest number of maternity hospitals (n=10), followed by The Green Horizon (n=8) and Vale das Cachoeiras (n=2).

Figure 4 - Map of maternity hospitals of DRS XIII, Ribeirão Preto, 2018.


Source: The author.

The total number of obstetric beds of public health and supplementary health guarantee maternal and child care, especially childbirth, and total 196 public obstetric beds and 46 private obstetric beds (CNES, 2018).

Among the public maternity hospitals, two are qualified for high risk, responsible for high complexity care, both maternal and fetal, they are located in the health region of the Guarani Aquifer, in Ribeirão Preto. These two maternity hospitals total 12 obstetric beds type GAR and nine adult ICU beds for this network.

The other maternity hospitals that make up the regional Stork Network total 39 neonatal ICU beds (NICU), 32 conventional unit beds (UCINCo) and one NICC bed. Private institutions total 34 NICU beds and eight NICC beds (CNES, 2018).

## 5 DISCUSSION

In the present study, 36 deaths of women in the pregnancy-puerperal cycle were recorded and reported, from 2011 to 2016. These figures draw attention to the increase in the occurrence of deaths from 2015 and to be maintained in 2016, demonstrating a line of ancestry.

Making a cut out of the studied history series, the DRS XIII MMR from 2011 to 2014 presented indexes below the MM ratio of the state of São Paulo. However, in 2015 the number of maternal deaths in DRS XIII tripled, reaching a MMR of 63.37 per 100,000 LB, surpassing the state of São Paulo by 25%, which in the same year had MMR of 47.53 per 100,000 LB (DATASUS, 2018). We are concerned about this information, because in the years following the study, 2017 and 2018, this plateau remained in DRS XIII with MMR of 55.56 per 100,000 LB and 60.69 per 100,000 LB, respectively, with no prospect of a fall (SÃO PAULO, 2019).

A study conducted in the Southern region of the country evaluated the trend of maternal mortality in Brazil and in the five Brazilian regions, from 2001 to 2012, where no significant trends were found to increase or decrease the MMR for the north, southeast and brazil. In 2005, the northeast region had the highest proportion, 118 per 100,000 LB. The southern region recorded the lowest number in 2011, with 49 per 100,000 LB (SILVA et al., 2016).

The WHO warns of the parameters of the high rates (MMR 50 - 149/100,000 LB) of maternal death (BRASIL, 2010), and the results found in DRS XIII, places the region with high and worrying classification, also like Colombia and Ecuador. The region was also classified in stage III of obstetric transition, evidencing difficulty in accessing health services and the quality of care for women who arrive at the services (SOUZA, 2015). This indicator shows little access, low socio-cultural-educational conditions and poor quality of care (RUIZ-RODRIGUEZ, 2009).

In this study, the majority of maternal deaths occurred in young women, aged 20 to 29 years, with the majority being single, white and with eight or more years of schooling. The characterization of deaths

corroborates other studies considering age, marital status, occupation and schooling (MARTINS, SILVA, 2018; MENDES, 2018; OLIVEIRA, 2016; RESENDE et al., 2015).

However, according to other evidences, maternal mortality is more frequent among black women, a condition explained by the association of the difficult pressure control of hypertensive diseases in this population, difficulty in accessing health services and the low quality of care (MARTINS, SILVA, 2018; DIAS et al., 2015).

A retrospective American study concluded that African-American women have a maternal mortality ratio four times higher than white American women (BERG et al., 2010) and Leite et al. (2011) assessed that the risk of maternal death is twice as high in women with low schooling.

Regarding marital status, researchers agree that the presence of a partner has been interpreted as the possibility of greater emotional support during pregnancy and delivery (VIANA et al., 2011), single women may cause problems related to care in maternity hospitals, due to the absence of companions (LEITE et al., 2011).

However, in the region of Ribeirão Preto, most of the women who died from maternal causes were white, with a good level of education, including complete or incomplete higher education. Fernandes (2019) observed in his study that white women had higher occurrences of severe maternal outcome, and these complications settled more severely than in non-white women, but the cases of greater severity that resulted in maternal death were analyzed in black and brown women. Low schooling was also associated with increased severe maternal morbidity, concluding that ethnic, economic and social factors influence access to quality health services. Factors with direct association for the increase of the MMR (BRASIL, 2009).

Another aspect identified in the present study is that most women had access to prenatal follow-up, starting in the first trimester, making up six or more consultations, as recommended by the guidelines of the Stork Network.

According to Viellas et al. (2014), in the Birth in Brazil study, 98.7% of the pregnant women had high coverage of prenatal care, with 75.8% of women starting prenatal care early and 73.1% attended six or more visits. The research also emphasized that prenatal care should be welcoming in order to provide confidence and bond ing of pregnant women with the unit, promoting educational and preventive actions, without unnecessary interventions, and is the ideal time to detect the development of pathologies and rapid management of the health of the binomial, as well as the rear of specific examinations of pregnancy and other technologies, and should be forwarded to other levels of complexity for gestational follow-up as soon as gestational risks are detected (OLIVEIRA, 2016).

Regarding the outcome, almost all of the women in this study died in a hospital institution, had medical care at the time of death, and were referred for necropsy. The referral of these women for necropsy is of paramount importance, according to GM Ordinance No. 1,119, all maternal deaths and deaths of women of childbearing age, regardless of the declared cause, should be mandatory investigation events

(BRASIL, 2008), thus contributing to the identification of possible causes and subsidizing the adoption of measures that can prevent their recurrence.

The period of greatest risk that culminated in the majority of deaths of these women was the puerperium, followed by pregnancy. Corroborating the study conducted in Bangladesh, which warns of high mortality on the first and second day after birth, the study indicated that the risk of death dand a woman was 100 times higher on the first day after birth and 30 times higher on the second day after birth (RONNSMANS, GRAHAM, 2006). In this context, it is essential to qualify the team for the recognition of emergencies and immediate intervention to complications (LIMA et al., 2017; VIANA et al., 2011).

Analyzing the types of delivery, the present study observed that more than half of the women underwent cesarean section, an important information that deserves to be widely discussed. Although in this study, due to a limitation of the method employed, access to the reason for the medical indication for performing the surgical procedure cannot be investigated, due to the analysis of closed variables.

A recent study conducted in Campinas concluded that women who underwent cesarean section were 2.51 times more likely to die than those who had a normal delivery (OLIVEIRA, 2016). Cesarean section can contribute to the increase in maternal deaths and severe maternal morbidity, due to the woman's exposure to inherent risks of surgery, such as hemorrhages, infections, anesthetic reactions, embolisms, among others (LEITE et al., 2011; CARNIEL et al., 2007), should only be indicated in situations of proven obstetric morbidity and fetal risks (RIQUINHO; CORREIA, 2006). Since the 1980s, the WHO warns that there is no justification for indications of cesarean sections greater than 10%–15% of all deliveries performed in a given territory.

Regarding parity, the deaths occurred more among primiparous women. According to Oliveira (2016), the majority of deaths in primiparous women do not correspond to the findings in the literature, which point to multiparity as a risk factor, mainly due to higher chances of hemorrhages, considering that the increase in deaths in primiparous women may be associated with preexisting comorbidities (FERNANDES et al., 2015; RIQUINHO, 2006).

Regarding the causes of maternal deaths, the majority of deaths were due to direct obstetric scare, and the causes were distributed in complications of hypertension, hemorrhage, infection and other causes that complicate pregnancy, childbirth and the puerperium.

A study conducted in the state of São Paulo showed the transition from the main cause of maternal death in the state between 2010 and 2015, reducing deaths from hypertensive disorders and increasing the death of women from hemorrhages. These causes drew attention, as they could be avoided through the integration of health care networks and hospital environments primarily organized, ready and qualified to these demands (MENDES, 2018). Another descriptive population study of maternal death conducted in Brazil pointed to postpartum uterine atony as the main cause of death from hemorrhage. This analysis reveals many opportunities to improve the care provided to women in the perinatal period, being essential the establishment of protocols, training of teams and access to blood transfusions (SOUZA et al., 2013).

The prioritization of strategies to prevent these deaths is fundamental, since actions for the care process in the intrapartum and postpartum are made through updating and qualification of professionals and guidance to family members.

In an American systematic review, more than 60,000 maternal deaths were analyzed, 73% of deaths were also related to direct obstetric cause, and hemorrhage was the leading cause of death, preceded by hypertension during pregnancy and sepsis. Failure to comply with the main clinical approaches to prevent and treat postpartum hemorrhage, such as active management of the third stage, compliance with protocols and rapid therapies to emergencies, has as response to death by hemorrhage (SAY et al., 2014).

As a strategic plan to accelerate the reduction of severe morbidity and mortality to PAHO/WHO in Brazil, in partnership with the Ministry of Health launched the Zero Maternal Death by Hemorrhage Strategy, this action aims at the collective effort of managers and health professionals to prevent maternal mortality from post-obstetric hemorrhage and preserve the life and health of women (OPAS, 2018).

Deaths caused by hypertensive disorders also deserve analysis, in Brazil preeclampsia occurs between 2% and 8% of all pregnancies and constitutes the leading cause of maternal death, especially when it settles in its most severe forms, such as eclampsia and HELLP syndrome. Prophylaxis can be performed through aspirin at the daily dosage of 100mg and this therapy is safe for the fetus, even in the first trimester. Once the disease is diagnosed, the goal of treatment is the prevention of maternal-fetal complications. For the treatment of hypertension during pregnancy, methyldopa is still the most used, followed by intravenous hydralazine in the emergency room. Magnesium sulfate remains the drug of choice in emergencies and for the control of seizures by eclâmpsia (KAHHALE; FRANCIS; ZUGAIB, 2018).

An example of this, a retrospective study of 75 years in a maternity school in Juiz de Fora - MG, analyzed, and the main direct obstetric causes observed showed that death by eclampsia had a significant reduction in the last 25 years due to judicious and extensive use of magnesium sulfate and more frequent obstetric interventions in the question of termination of pregnancy in the cases indicated (ANDRADE et al., 2006).

Maternal mortality due to hypertension was strongly associated with stroke, and one of the alternatives to reduce these deaths mentioned in the article is in the control of blood pressure levels, keeping them below 160/110 mmHg (LO et al., 2013).

Regarding direct obstetric death from infection, the study by Juiz de Fora - MG showed a strong reduction in the last 50 years, and showed that the occurrence of these infections was associated with infectious processes initiated in the prepartum, such as amniotitis and puerperal infections (ANDRADE et al., 2006). Soares et al. (2012) pointed out that the direct obstetric causes of lethality due to urinary infection during pregnancy were higher in the high-risk hospital than in the low-risk hospital, another example was puerperal infection, three times higher in high-risk hospitals, being associated with high cesarean rates.

Analyzing indirect obstetric deaths, complicated by preexisting diseases of pregnancy or that developed during pregnancy, the present study found as causes: other diseases of the mother classified

elsewhere (which may be by anemia, circulatory system, immunological, respiratory), followed by chronic hypertension, infectious and parasitic diseases and human immunodeficiency virus (HIV) disease. In the literature, the number of indirect death is higher in reference hospitals for high-risk pregnancy (SOARES et al., 2012). Other studies have shown that the most frequent causes of indirect maternal death were heart disease, acute renal failure, stroke, thromboembolism and septic shock (ANDRADE et al., 2006; LIMA et al., 2017; VIANA et al., 2011). Indirect obstetric deaths could be avoided with quality family and reproductive planning.

For a quality NP, a woman's obstetric history should be used as a predictive risk tool in the avoidability of maternal morbidity and mortality. Specialized and qualified care for obstetric emergencies should consider this information, and through them outline appropriate conducts of reproductive planning and proper management of prenatal care and delivery. Health professionals are also important figures to recognize signs and symptoms at all stages of the cycle, and should not, however, devalue women's complaints (RESENDE et al., 2015). Other authors reinforce this alert, highlighting important return pathologies for attention in the conduction of current pregnancy and delivery, such as eclampsia, diabetes, obesity and multiple pregnancy, because these causes are more associated with indirect maternal death (QUEIROZ; DINIZ, 2014).

Several studies have shown that maternal mortality is directly related to the quality of medical and obstetric care offered during pregnancy, childbirth and puerperium. Regardless of other factors, it is essential to guarantee humanized obstetric care, specialized, with a qualified team prepared for identification and management of emergency situations, all these actions should be aligned with a management focused on reducing maternal morbidity and mortality. (SOUZA, 2015; VIEIRA et al., 2015; RESENDE et al., 2015; FERNANDES et al., 2015).

In the context of care networks as organizational arrangements of health actions and services and with regionalization as a guideline of the SUS, focused on women's health, care for users should be integral, universal, resolutive and decentralized (MENDES, 2011).

Thus, the DRS of Ribeirão Preto, based on the recommendations of the Stork Network, created the Regional Maternal Network (Ordinance G - DRS XIII, 2018), which consolidated through spaces for discussion and proposition of actions, agreed in collegiate instances for evaluation and construction of the same. Pasche et al. (2015) concluded that the creation of collegiate, collective management and mobilization spaces has been one of the main offerings of the Stork Network for technical and political discussions based on women's health.

In a research conducted in Rio Grande do Sul with the purpose of implementing the good practices of delivery and birth care recommended by the WHO, the rescue of the obstetric model developed was important to organize the maternal health care network, in order to ensure access, reception and resolution, bringing the role of women in its multiple dimensions. In addition to government initiatives, health

professionals need to co-blame and appropriate references that support unique and multidimensional practices in the obstetric field (PEREIRA et al., 2018).

Studies refer to primary care as a guarantee of implementation of strategies for promoting reproductive and sexual health, educational activities related to prenatal care, puerperium and family planning. Any failure of care in this structure can cause the appearance of complications, consequently contributing to the emergence of maternal morbidity and mortality (FERNANDES et al., 2015).

This fact draws attention that even by ensuring the indicators of the Ministry of Health, such as early capture, number of consultations and access, which are quantitative indicators, quality is not measured by these data in obstetric care, corroborating the present study that verified the guaranteed access of pregnant women to the NP, either through primary care or supplementary health, but with unfavorable outcome.

DRS XIII also has a hospital network of 20 maternity hospitals to care for the usual and high-risk pregnancy, and has in its territory two public maternity hospitals for high complexity care. In Paraná, when investigating the hospital network of childbirth care with extensive regional care and state coverage, a high rate of avoidability of maternal deaths was verified, which allowed us to infer that probable failures occurred in institutions, such as: deficiency of adequate infrastructure, training of professionals, and deficiency of adoption of practices based on scientific evidence recommended by international and national organizations (SOARES et al., 2012).

Mazoco et al. (2015) mentioned that some hospitals were prepared only to treat people's pathologies, with technical profiles and focused on the biomedical model, offering poorly humanized contact to pregnant women and their families. Therefore, it is essential that professionals are trained and updated for better care, self-control and empathy.

The health region of Balsas, in Maranhão, was highlighted in 2018 when it conquered the mark of zeroing maternal death in the territory. PAHO provided support through a cooperation agreement, where it was necessary to restructure the entire maternal-child network and qualify the care of women and children through a care line (MARANHÃO, 2019).

Ensuring quality care requires strengthening the policies achieved and consolidating humanization practices and effective care of obstetric care, ensuring women appropriate pregnancies and deliveries from the perspective of human rights and citizenship.

## 6 CONCLUSION

The results summarize that maternal death remains a challenge for obstetric care in the region, and warns that adequate care can contribute to avoid a significant proportion of these deaths.

A better organization and provision of care to pregnant women and puerperal women become priorities considering that paradoxically the DRS of Ribeirão Preto is in a rich region, with a high degree of development and reference of good universities that trainer sane health professionals.

It is essential that good practices become routine sand that professionals and institutions are adequate, committed and based on scientific evidence, making urgent and necessary the change of behavior and care model provided to these women and their families.

It is of paramount importance for epidemiological studies and identification of cases of maternal death, adequate completion of death certificates and that all death be referred for investigation and education actions by maternal death surveillance committees.

It can be concluded that the death of a woman during her pregnancy-puerperal cycle is a public health problem and a human rights problem against women, highlighting that not only technical alignments are necessary, but also political, for a strengthened health system.

Strategies to reduce maternal death have been shared since 2015 in DRS XIII, including:

Training to medical professionals (2015-2018) who perform PN in the primary care network, the chosen themes were focused on obstetric care based on the main causes of maternal death in the region;

Discussion and investigation of all maternal deaths in the region by the members of the Regional Committee for The Investigation of Maternal, Infant and Fetal Death of DRS XIII;

The failures of care in health care observed by the members of the committee are aimed at managers and institutions with recommendations and purpose of health education and necessary adaptations to those involved in the process;

Creation of technical groups with committee professionals, professors, representatives of SOGESP, COREN, physicians and nurses invited to build regional protocols, in order to qualify and standardize care, through the dissemination of scientific evidence to primary, emergency and hospital network professionals. These protocols are agreed in meetings with health managers with wide dissemination to municipalities and reviewed every two years;

Periodic meetings with representatives of the 13 maternity hospitals in the region in DRS XIII with guidelines on humanization, good delivery and birth practices, recommendations and guidelines of the Stork Network and WHO.

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**CATEGORY D -** PRACTICES COMMONLY USED INAPPROPRIATELY: • Water and food restriction during labor • Systemic agent pain control • Epidural analgesia pain control • Fetal electronic monitoring • Use of sterile masks and aprons during labor care • Repeated or frequent vaginal examinations, especially by more than one service provider • Correction of dynamics using oxytocin • Routine transfer of oxytocin parturient to another room at the beginning of the second stage of labor • Catheterization of the bladder • Stimulation for the pull when a complete or almost complete cervical dilation is diagnosed, before the woman feels the involuntary pull • Rigid support to a stipulated duration of the 2nd stage of labor, such as one hour, if the conditions of the mother and fetus are good and if there is progression of labor • Operative delivery • Operative delivery • Liberal and routine use of episiotomy • Manual exploration of the uterus after delivery.