MATERNAL MORTALITY IN THE STATE OF AMAZONAS: AN EPIDEMIOLOGICAL STUDY

MORTALIDADE MATERNA NO ESTADO DO AMAZONAS: ESTUDO EPIDEMIOLÓGICO

MORTALIDAD MATERNA EN EL ESTADO DE AMAZONAS: ESTUDIO EPIDEMIOLÓGICO

Lidiane Tavares Medeiros[1]
António Manuel Sousa[2]
Leudson Oliveira Arinana[1]
Antônio Sávio Inácio[1]
Maria do Livramento Coelho Prata[3]
Milaine Nunes Gomes Vasconcelos[3]

Objective: to analyze the epidemiological profile of maternal mortality in the state of Amazonas, Brazil. Method: a descriptive and ecological epidemiological study was carried out based on secondary data from the Mortality Information System Database and Live Births Information System of the Brazilian Ministry of Health, generated by the Department of Data Analysis and Tabulation of the Brazilian Unified Health System. Data collection was carried out in 2017, using data from maternal deaths and their causes, in addition to data from live births of the state of Amazonas, Brazil, from 2006 to 2015. Results: the total number of maternal deaths was 564, being 329 in the capital city and 235 in the countryside, resulting in a maternal mortality ratio of 73.45 deaths per 100,000 live births. The main causes of maternal deaths were, as follows: puerperal infection, eclampsia, and postpartum hemorrhage. Conclusion: s ingle women aged between 20 and 29 years, brown, and with a low education level presented a higher prevalence of maternal death. Puerperal infection stood out among the direct obstetric causes.

Descriptors: Maternal Mortality. Health Profile. Puerperal Infection. Eclampsia. Postpartum Hemorrhage.

Objetivo: analisar o perfil epidemiológico da mortalidade materna no estado do Amazonas, Brasil. Método: estudo epidemiológico, descritivo e ecológico, baseado em dados secundários do Sistema de Informação Sobre Mortalidade e Sistema de Informação Sobre Nascidos Vivos do Ministério da Saúde, gerados pelo Departamento de Análise e Tabulação de Dados do Sistema Único de Saúde. Utilizou-se os dados dos óbitos maternos e suas causas, além dos dados dos nascidos vivos do Amazonas, Brasil, do período de 2006-2015, sendo estes coletados em 2017. Resultados: ocorreram 564 óbitos maternos, sendo 329 na capital e 235 no interior, resultando um coeficiente de mortalidade materna de 73,45 óbitos/100.000 nascidos vivos. As principais causas de óbitos maternos foram: infecção puerperal, eclâmpsia e hemorragia pós-parto. Conclusão: as mulheres solteiras, entre 20-29 anos, pardas e baixa escolaridade apresentaram maior prevalência de óbito materno. Entre os óbitos, a infecção puerperal foi a mais evidenciada entre as causas obstétricas diretas.

Descritores: Mortalidade Materna. Perfil de Saúde. Infecção Puerperal. Eclâmpsia. Hemorragia Pós-parto.

[1] Nursing undergraduate student, Universidade Estadual do Amazonas. Manaus. Amazonas. Brazil. ltm.enf@uea.edu.br
[2] Biologist. PhD in Public Health. Professor at the Universidade Estadual do Amazonas. Manaus. Amazonas. Brazil. amzsouza@uea.edu.br
[3] Midwife nurse. Professor at the Universidade Estadual do Amazonas. Manaus. Amazonas. Brazil.

Objetivo: analizar el perfil epidemiológico de la mortalidad materna en el estado de Amazonas, Brasil. Método: estudio epidemiológico, descriptivo y ecológico, basado en datos secundarios del Sistema de Información sobre Mortalidad y sistema de Información sobre Nacidos Vivos del Ministerio de Salud, generados por el Departamento de Análisis y Tabulación de Datos del Sistema Único de Salud. Se utilizaron datos de óbitos maternos y sus causas, datos de nacidos vivos en Amazonas, Brasil de 2006-2015, recolectados en 2017. Resultados: hubo 564 óbitos maternos; 329 en la capital y 235 en el interior, determinando un coeficiente de 73,45 óbitos maternos/100.000 nacidos vivos. Las principales causas de óbito fueron: infección puerperal, eclampsia y hemorragia posparto. Conclusión: las mujeres solteras, de entre 20-29 años, mestizas y de baja escolarización expresaron mayor prevalencia de óbito materno. La infección puerperal fue la causa obstétrica directa más evidenciada entre los óbitos.

Descriptores: Mortalidad Materna. Perfil de Salud. Infección Puerperal. Eclampsia. Hemorragia Posparto.

Introduction

The World Health Organization (WHO) defines maternal mortality (MM) as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy. It also considers any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes, represented by violent deaths occurred during the puerperal period[1].

Maternal deaths may be categorized into direct, indirect, and not unspecified obstetric causes. Direct maternal mortality is that related to complications specifically linked to the pregnancy-postpartum cycle, and may be associated with poor quality of care provided to women's health in gestation, childbirth, or puerperium, which is often found in developing countries[2]. Maternal mortality due to indirect obstetric causes results from pre-existing conditions, that is, pathologies prior to gestation that aggravate with pregnancy. In both types of maternal mortality classification, it is clear that poor care provided to pregnant women leads to unfavorable outcomes. This type of death could be prevented with the development of quality actions and early and effective treatment[3].

Direct maternal mortality causes are codified by the ICD-10 as: 000.0 to 008.9; 011 to 023.9; 024.4; 026.0 to 092.7; D39.2; E23.0; F53; and M83.0. The indirect obstetric mortality is codified as: 010.0 to 010.9; 024.0 to 024.3; 024.9; 025; 098.0 to 099.8; A34; and B20 to B24 (these last after careful investigation). Finally, unspecified obstetric mortality causes correspond to code 0.95[4].

Maternal mortality ratio (MMR) is used as a health indicator to measure maternal mortality, its extension, and predisposition in space and time. This indicator is evaluated by the number of maternal deaths per 100,000 live births (LB), and the limit of 20 deaths per 100,000 live births is accepted by the WHO[5].

The MMR may be classified as low for up to 20 deaths per 100,000 LB; medium, when the number of deaths is between 20 and 49; high for 50 to 149 deaths; and very high when the number is higher than 150 per 100,000 LB[6]. It is worth mentioning that the result of this calculation is not completely reliable because there is a high rate of death underreport, as well as death causes, making it impossible to know the real magnitude of this indicator[7].

In Brazil, maternal mortality presented a drop from 120 deaths per 100,000 LB in 1990 to 69 deaths per 100,000 LB in 2013, showing a 43% reduction in MMR. In spite of the change, Brazil has not yet reached the fifth-millennium goal, where the MMR would be around 35 deaths per 100,000 LB, a level approximately twice higher than the goal established[8].

In the state of Amazonas, Brazil, one study carried out to evaluate mortality in the period from 2001 to 2010 showed the occurrence of 6,932 deaths of women of reproductive age. Of these, 241 deaths were classified as obstetric maternal death, characterizing an MMR of 63.2 per each 100,000 LV. Direct obstetric maternal

Lidiane Tavares Medeiros, Antônio Manuel Sousa, Leudson Oliveira Arinana,
Antônio Sávio Inácio, Maria do Livramento Coelho Prata, Milaine Nunes Gomes Vasconcelos

deaths reflected 162 (67.2%) cases, at the same time that indirect obstetric maternal recorded 62 (25.7%) cases[9].

The state of Amazonas has 62 cities to which access is mostly possible by inland waterways. Distances present great relevance, especially when comparing Manaus (capital city) with the countryside. As an example, the distance by inland waterways between Manaus and Lábrea, a city in the countryside, is 7,495 km, which is almost the same as that between Rio de Janeiro, Brazil, up to Lisbon, Portugal, totalizing 7.711 km[10]. Due to geographic conditions, difficulty of access to healthcare services and notifications, especially from the population in the countryside, information on maternal mortality may be underreported, which may imply the lack of knowledge of the real number of deaths.

Therefore, the present study may contribute to the academic community, with the increase in scientific production on the theme, which is scarce. It will also be important to awake the need for a more critical analysis of the care provided to women, which could be focused on the prevention and reduction of maternal mortality rates. In order to carry out the analysis proposed, the maternal mortality ratio of the mesoregions of the state will be identified, with a description of the sociodemographic profile of the women who suffered maternal death, in addition to identifying the main death causes in the state.

The objective of the present study was to analyze the epidemiological profile of maternal mortality in the state of Amazonas, Brazil.

Method

This was a descriptive and ecological epidemiological study based on secondary data from the Mortality Information System Database and Live Births Information System of the Brazilian Ministry of Health, generated by the Department of Data Analysis and Tabulation of the Brazilian Unified Health System[11].

Data collection occurred in 2017 with the use of data from all maternal deaths in the state of Amazonas from 2006 to 2015, enabling analysis of the maternal mortality behavior throughout a historical series of 10 years. The following variables were used to characterize the sociodemographic profile: age group, education level, race/skin color, marital status, and place of occurrence. Regarding the death cause, the outcome variable of the study, this study used the 10th revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10), with inclusion of the Chapter XV (pregnancy, childbirth, and puerperium), and specific categories related to the direct, indirect, and unspecified obstetric causes (B20-B24 and O00-O99). In the construction of the historical series of maternal deaths (Manaus/countryside) and maternal mortality ratio of each mesoregion, the absolute values of the number of maternal deaths, number of live births, and mesoregions of Amazonas (North, Center, South, and Southwest) were used as variables.

For organization, the data were entered into an Excel spreadsheet and then described in tables, charts, and numerical measures such as mean values. In the tables and charts, the values were presented in absolute and relative frequencies and by descriptive levels. The number of maternal deaths was used for calculation of the maternal mortality ratio, divided by the total number of live births of mothers residing in the same place and period x 10^5. MMR parameters of the WHO were used for classification as low, medium, high, or very high.

In compliance with resolution 466/2012 of the Brazilian National Health Council, the project was not required to be submitted to a research ethics committee for using secondary data, of public domain, where the identity of the investigation subject is not determined.

According to the Brazilian Institute of Geography and Statistics (IBGE, as per its acronym in Portuguese), the population in the state of Amazonas was 3,483,985 inhabitants in 2010, divided into four mesoregions and 62 cities: the central mesoregion with 30 cities, the greatest of all the regions; the southwestern mesoregion with 16 cities; the southern mesoregion with

10 cities; and the northern mesoregion with six cities[12].

Results

From 2006 to 2015, 564 maternal deaths were recorded in the state of Amazonas. Of these, 329 (58.33%) occurred in Manaus, the capital city of the state of Amazonas, and 235 (41.67%) in other cities of the countryside, represented by the historical series in Graph 1.

Graph 1 – Number of maternal deaths occurred in Manaus and other cities. Amazonas, Brazil – 2006-2015 (N=564)
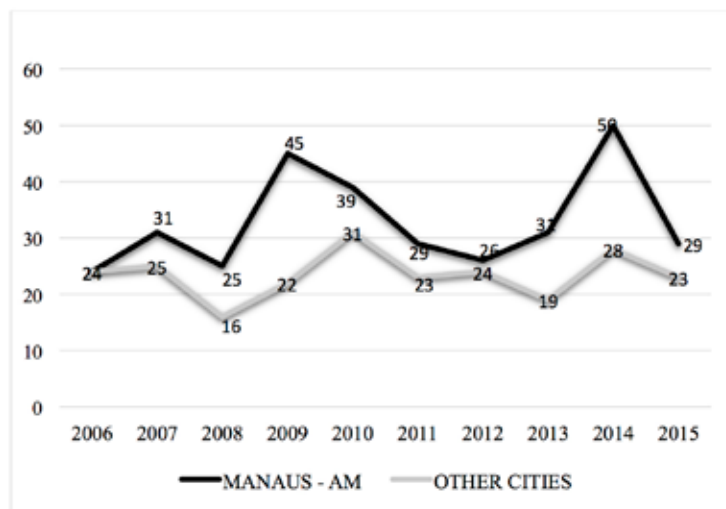
Source: Created by the authors.

From 2006 to 2015, 767,919 live births were recorded in the state of Amazonas. The maternal mortality ratio in this period was 73.45 deaths/100.000 LB, classified as high by the WHO. The number of deaths, LB, and MMR are presented in Table 1.

Table 1 – Distribution of the number of maternal deaths, live births, and maternal mortality ratio. Amazonas, Brazil – 2006-2015 (N=564)

Year	n	%	Live Births	Maternal Mortality Ratio per 10^5
2006	48	8.51	75,584	63.51
2007	56	9.93	73,469	76.22
2008	41	7.30	75,030	54.64
2009	67	11.87	75,729	88.47
2010	70	12.41	74,188	94.35
2011	52	9.22	76,202	68.24
2012	50	8.86	77,434	64.57
2013	50	8.86	79,041	63.26
2014	78	13.82	81,145	96.12
2015	52	9.22	80,097	64.92
Total	564	100.00	767,919	73.45

Source: Created by the authors.

Lidiane Tavares Medeiros, Antônio Manuel Sousa, Leudson Oliveira Arinana,
Antônio Sávio Inácio, Maria do Livramento Coelho Prata, Milaine Nunes Gomes Vasconcelos
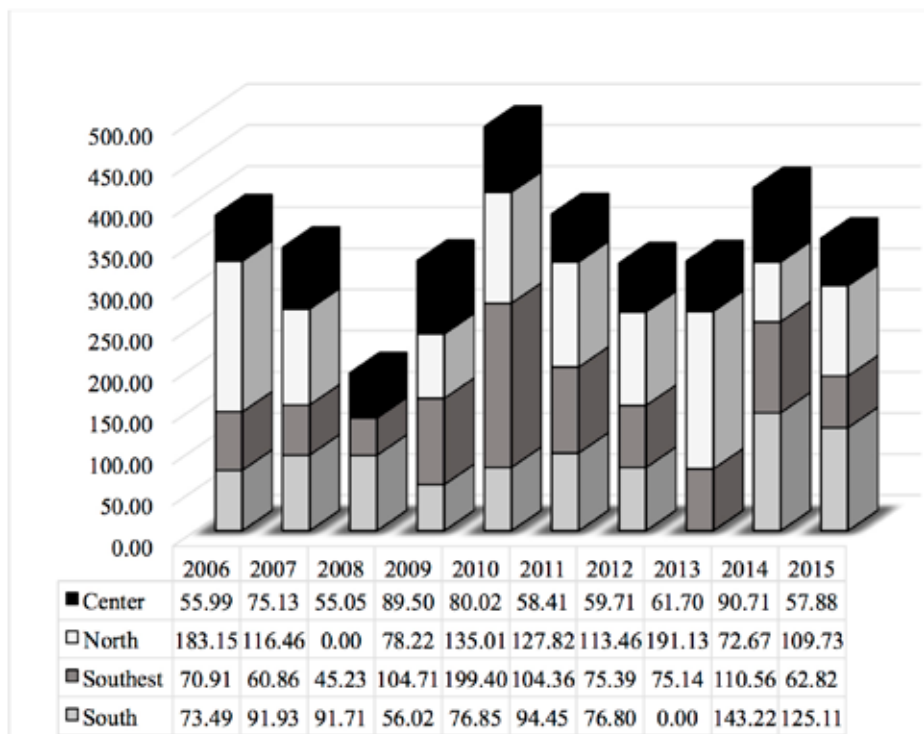
The MMR mean of each mesoregion of the state in 10 years remained high. The mesoregion with the highest MMR mean was the northern mesoregion (112.77 deaths/100,000 LB), followed by the southwestern mesoregion (90.94 deaths/100,000 LB), southern mesoregion (82.96 deaths/100,000 LB), and central mesoregion (68.41 deaths/100,000 LB).

Graph 2 presents the MMR historical series per each mesoregion of the state of Amazonas. The highest MMR occurred in the central, northern, southwestern, and southern mesoregions in the respective years of 2014 (90.71 deaths/100,000 LB), 2013 (191.13 deaths/100.000 LB), 2010 (199.40 deaths/100,000 LB), and 2014 (143.22

deaths/100,000 LB). The lowest MMR was found in 2008 in the northern mesoregion (0 deaths/100,000 LB), southern mesoregion (45.23 deaths/100,000 LB), and central mesoregion (55.04 deaths/100,000 LB); and in 2013 in the southern mesoregion (0 deaths/100,000 LB). Even with these lower values found, when compared in the historical series, the southwestern and central mesoregions remain with an MMR classified as medium and high, respectively. In addition, the data show that even though most of the mesoregions presented a high MMR, the northern mesoregion stands out, presenting the highest ratios in the period studied.

Graph 2 – Maternal mortality rate of the mesoregions. Amazonas, Brazil – 2006-2015

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
■ Center	55.99	75.13	55.05	89.50	80.02	58.41	59.71	61.70	90.71	57.88
□ North	183.15	116.46	0.00	78.22	135.01	127.82	113.46	191.13	72.67	109.73
▨ Southest	70.91	60.86	45.23	104.71	199.40	104.36	75.39	75.14	110.56	62.82
□ South	73.49	91.93	91.71	56.02	76.85	94.45	76.80	0.00	143.22	125.11

Source: Created by the authors.

Table 2 describes the sociodemographic profile of maternal mortality. The age group prevalent for maternal deaths, both in the capital city (n=138/41.95%) and in the countryside (n=93/39.57%), was from 20 to 29 years. A length of education from four to seven years and from eight to 11 years was found in the same quantitative for the capital city: 107 (32.52%)

deaths. However, in the countryside, for the same length, from four to seven years of study, the number of deaths was 65 (27.66%). The most prevalent marital status, both for the capital city [208 (63.22%)] and the countryside [130 (55.32%)], was single. The race/skin color with the highest rate in the capital city [236 (71.73%)] and the countryside [146 (62.13%)] was brown. The place

with the highest occurrence of maternal deaths, both for the capital city [308 (93.62%)] and the countryside [194 (82.55%)] was the hospital environment.

Table 2 – Characteristics of the maternal deaths occurred in the capital city and the countryside. Amazonas, Brazil – 2006-2015 (N=564)

Variables	Capital city		Countryside	
	N=329	**%**	**N=235**	**%**
Age group				
10 to 14 years	5	1.52	4	1.70
15 to 19 years	56	17.02	52	22.13
20 to 29 years	138	41.95	93	39.57
30 to 39 years	113	34,35	65	27.66
40 to 49 years	17	5.17	21	8.94
Education level				
None	9	2.74	36	15.32
1 to 3 years	31	9.42	34	14.47
4 to 7 years	107	32.52	65	27.66
8 to 11 years	107	32.52	53	22.55
12 or more	35	10.64	17	7.23
Ignored	40	12.16	30	12.77
Marital status				
Single	208	63.22	130	55.32
Married	69	20.99	45	19.15
Widowed	1	0.30	1	0.43
Divorced	1	0.30	-	-
Other	16	4.86	42	17.87
Ignored	34	10.33	17	7.23
Race				
White	64	19.45	22	9.36
Black	05	1.52	04	1.70
Yellow	01	0.30	-	-
Brown	236	71.73	146	62.13
Indigenous	05	1.52	60	25.53
Ignored	18	5.48	03	1.28
Place of occurrence				
Hospital	308	93.62	194	82.55
Home	16	4. 86	33	14.04
Public road	03	0.91	-	-
Other	02	0.61	08	3.40

Source: Created by the authors.

Note: Conventional signal used:
  - Numerical data equal to zero not resulting from rounding up.

Deaths from direct (379), indirect (150), and unspecified (35) obstetric causes represented, respectively, 67.19%, 26.59%, and 6.20% of the total maternal deaths (564 – 100%) recorded in the state.

Among maternal deaths, the most prevalent direct (379 – 100%), indirect (150 – 100%), and

Lidiane Tavares Medeiros, Antônio Manuel Sousa, Leudson Oliveira Arinana,
Antônio Sávio Inácio, Maria do Livramento Coelho Prata, Milaine Nunes Gomes Vasconcelos

unspecified (35 – 100%) obstetric causes in this study were, respectively: puerperal infection (86 – 22.69%); other maternal diseases classifiable elsewhere but complicating pregnancy, childbirth, and the puerperium (104 – 69.33%); and obstetric death of unspecified cause (35 – 100%), as described in Table 3.

Table 3 – Main causes of maternal deaths by ICD-10 category. Amazonas, Brazil – 2006-2015 (N=564)

ICD-10/Main causes of maternal deaths	n	%
Direct obstetric causes (N=379)		
O85 – Puerperal infection	86	22.69
O15 – Eclampsia	51	13.46
O72 – Postpartum hemorrhage	29	7.65
O14 – Gestational hypertension with significant proteinuria	21	5.54
O62 – Abnormalities of forces of labor	19	5.01
O45 – Premature separation of placenta (abruptio placentae)	15	3.96
O75 – Other specified complications of labor and delivery, not elsewhere classified	13	3.43
O88 – Obstetric embolism	13	3.43
O06 – Unspecified abortion	12	3.17
Others	150	39.57
Indirect obstetric causes (N=150)		
O99 – Other maternal diseases classifiable elsewhere but complicating pregnancy, childbirth, and the puerperium	104	69.33
O98 – Maternal infectious and parasitic diseases classifiable elsewhere but complicating pregnancy, childbirth, and the puerperium	27	18.00
B24 – Unspecified human immunodeficiency virus (HIV)	8	5.33
B20 – Human immunodeficiency virus (HIV) resulting in infectious and parasitic diseases	6	4.00
O10 – Pre-existing hypertension complicating pregnancy, childbirth, and the puerperium	3	2.00
O24 – Diabetes Mellitus in pregnancy, childbirth, and the puerperium	1	0.67
O25 – Malnutrition in pregnancy, childbirth, and the puerperium	1	0.67
Unspecified causes (N=35)		
O95 – Obstetric death of unspecified cause	35	100

Source: Created by the authors.

The categories B20 [Human immunodeficiency virus (HIV) resulting in infectious and parasitic diseases] and B24 [Unspecified human immunodeficiency virus (HIV)] are not included in chapter XV (pregnancy, childbirth, and puerperium). They were analyzed as indirect obstetric causes of maternal deaths.

Observing all maternal deaths of the historical series studied (2006 to 2015), puerperal infection stood out, presenting the highest rate among direct obstetric causes. In the annual distribution of these deaths, the highest rates were found in 2006 (20.00%), 2007 (26.83%), 2008 (38.46%), 2009 (34.69%), 2010 (38.30%), and 2011 (29.03%) for puerperal infection; in 2012 (24.14%), 2013 (19.44%), and 2015 (18.75%) for eclampsia; and in 2014 (14.58%) for postpartum hemorrhage.

Regarding maternal deaths from indirect causes, the highest rates were found between 2006 and 2012, representing 74 (72.5%) of the deaths for other maternal diseases classifiable elsewhere but complicating pregnancy, childbirth, and the puerperium (O99), as well as 16 (69.57%) of the deaths in 2014, and 11 (64.71%) of the deaths in 2015. In 2013, the highest rate observed was 4 (50.00%) for maternal infectious and parasitic

diseases classifiable elsewhere but complicating pregnancy, childbirth, and the puerperium (O98).

Discussion

The present study found an MMR of 73.45 deaths/100,000 LB in the state of Amazonas, from 2006 to 2015, which was considered high according to the WHO classification. The MMR of the mesoregions (Central, Southwest, North, and South) in the period mentioned did not vary much, remaining between very high and high. However, there was a prevalence of the high classification, that is, MMR between 50 and 149 deaths per 100,000 LB[6]. One study carried out in the state of Pará between 2006 and 2010 corroborates these results, showing an MMR of 51.9 deaths per 100,000 LB, also high, with no significant reduction in the period[5].

These high mortality rates may be prevented by providing and ensuring access to healthcare services, care provided by qualified professionals, work infrastructure, and strengthening of public healthcare policies. The deep lack of knowledge of this reality, in addition to the impact of maternal mortality, especially due to the underreport of deaths, make it difficult to undertake actions to reduce mortality[13]. This fact is even more worrying regarding the state of Amazonas, because of its geographic complexity when considering its territorial extension and displacement often by inland waterways. This is reflected in the access conditions to healthcare services, contributing as a vulnerability factor for specific populations, in addition to the possibility of leading to unfavorable outcomes such as maternal deaths. This reality may be observed in the MMR of each mesoregion of the state described in this study.

In the description of the sociodemographic profile of the maternal deaths of this study, it was observed that both in the capital city and in the countryside, the women were young, with a low education level, single, and brown. Studies in some states of Brazil presented different profiles, but the data are similar with regard to the age group, showing that maternal mortality occurs among young women (20 to 29 years)[14-16]. The sociodemographic characteristics found in one study carried out in Fortaleza, capital city of the state of Ceará, indicated that deaths occurred with a greater proportion in women with a low education level – incomplete elementary school – (24 – 42.90%), brown (35 – 62.50%), and who lived with their partners (30 – 53.60%)[16]. In the state of Rio Grande do Sul, it was observed that the higher the age group, the higher the possibilities of maternal death[17], which contradicts the results of the presented study.

Regarding education level, current studies presented similar results to those in this study, when showing the prevalence of women with less education time, especially those who had less than seven years, among cases of maternal deaths[18]. One study showed that in cases of a higher education level, the MMR was lower, and having a low education level was considered a risk factor[3].

According to the IBGE, in 2015, the Brazilian population self-reported having five races/skin colors: white (45.2%), brown (41.1%), black (8.9%), yellow (0.5%), and indigenous (0.4%)[19].

In the present study, the prevalent race/skin color of the maternal deaths was brown. The same result was found in one study carried out in Brazil in 2012, in which women with brown skin color represented 42.74% of the maternal deaths[18]. One study carried out in the state of Mato Grosso showed that black and brown women are more subjected to maternal deaths, not because skin color/race is a risk factor, but because social inequality and access to healthcare services became a vulnerability[14]. It is worth mentioning that race/skin color categorization is complex because of the great existing miscegenation in the country.

Marital status was another important characteristic of the sociodemographic profile. Among the maternal deaths found, the highest rate was among single women, a common characteristic found in other studies on the theme[3]. Studies showed a higher frequency of single women, which may be related to family disruption, break of the bond between the child's

Lidiane Tavares Medeiros, Antônio Manuel Sousa, Leudson Oliveira Arinana,
Antônio Sávio Inácio, Maria do Livramento Coelbo Prata, Milaine Nunes Gomes Vasconcelos

mother and father, as well as the lack of support from families. In the state of Pernambuco, for example, sociodemographic data show that 68.2% of the maternal deaths were of single women, and they presented a greater death probability, assuming that abandonment of the partner or lack of social support favors the high number of maternal deaths[17,20].

The place of higher occurrence of maternal deaths, similarly observed in the capital city and the countryside, was the hospital environment. A similar result was found in a study carried out in the state of São Paulo, where 98.5% of the maternal deaths occurred in the hospital environment, indicating the need for evaluating the reason of these outcomes, either for failure in care or absence of early diagnosis of diseases that emerged or were aggravated by the gestation[21].

Maternal mortality is still a public healthcare problem in developing countries, including Brazil. Elements such as failures in planning and policy strategies of healthcare professionals prevented Brazil from achieving the millennium goal of MMR reduction in three quarters[13]. Sociodemographic characteristics have been indicated as possible risk factors for this grievance, leading to the need for rethinking strategies to reduce the number of maternal deaths[16].

The present study showed that between 2006 and 2015, direct obstetric causes were responsible for more than half of maternal deaths in the state of Amazonas. Studies carried out in Ribeirão Preto - a city in the state of São Paulo, and Bahia corroborated this result, showing the prevalence of high rates for deaths from direct obstetric causes[15,22].

In Brazil, maternal deaths with a higher incidence result from direct obstetric causes, characterizing important data because they are considered preventable. Indirect obstetric causes presented lower rates and are difficult to monitor due to serious illnesses, often unavoidable, associated with gestation[23].

The most frequent direct obstetric causes in this study were: puerperal infection, eclampsia, and postpartum hemorrhage. One study carried in the city of Ribeirão Preto showed that in the distribution of maternal deaths from direct obstetric causes, hypertension represented 44.8% of the deaths evaluated. In the state of Pará, the first cause of maternal death was hypertension with 34.6%, followed by hemorrhage with 22.2% of the cases[5,15].

The following causes were identified in the indirect obstetric causes: Other maternal diseases classifiable elsewhere but complicating pregnancy, childbirth, and the puerperium, and maternal infectious and parasitic diseases classifiable elsewhere but complicating pregnancy, childbirth, and the puerperium. The following distribution of indirect causes was identified in Pará: 20% for pre-existing hypertension to gestation and 20% for circulatory system diseases[5]. In Ribeirão Preto, respiratory system diseases (12.1%) stood out as indirect obstetric causes[15].

Among the studies analyzed, infection (not specifically the puerperal) was mentioned as a result in only one study carried out in the city of Aracaju on the temporal evolution of maternal mortality from 2000 to 2010. It showed that the most prevalent causes of maternal deaths were hypertensive disorders (20.7%), hemorrhages (17.2%), and infections (17.2%)[24]. When compared with the present study, the divergence of results is evident because the highest prevalence found in maternal deaths from direct obstetric causes in this study was for puerperal infection, followed by eclampsia and postpartum hemorrhage.

A limitation of the present study resulted from the difficulty in correlating the data obtained from the Mortality Information System Database with the local reality, considering the difficulty of access and care in the healthcare services, especially in more distant and remote cities of the state of Amazonas. However, the articles found were satisfactory for the analysis of the results of the present study.

Conclusion

The results of the present study allowed to conclude that single women aged between 20

and 29 years, brown, and with 4 to 7 years of education presented a higher prevalence of maternal death, both for the population of the capital city and the countryside. According to the WHO, the MMR in the state of Amazonas was classified as high. In the number of maternal deaths found in the historical series, there was a prevalence of direct obstetric causes, and puerperal infection stood out in the present study. Deaths from direct obstetric causes may be prevented by improving the care provided to women. However, a scenario of social and economic inequality is still present in developing countries, becoming even more significant when added to the geographic complexity, as occurs in the state of Amazonas.

Collaboration

1. conception, design, analysis, and interpretation of data: Lidiane Tavares Medeiros and Milaine Nunes Gomes Vasconcelos;

2. writing of the article and relevant critical review of the intellectual content: Lidiane Tavares Medeiros, Antonio Sávio Inácio and Milaine Nunes Gomes Vasconcelos;

3. final approval of the version to be published: Lidiane Tavares Medeiros, António Manuel Sousa, Leudson Oliveira Arinana, Antonio Sávio Inácio, Maria do Livramento Coelho Prata and Milaine Nunes Gomes Vasconcelos.

References

1. Alves MMR, Alves SV, Antunes MBC, Santos DLP. Causas externas e mortalidade materna: proposta de classificação. Rev Saúde Pública [Internet]. 2013 [cited 2017 Aug 10];47(2):283-91. Available from: DOI:10.1590/S0034-8910.2013047003642

2. Tognini S. Tendência da mortalidade materna na região do Grande ABC Paulista de 1997 a 2011 [dissertação]. São Paulo (SP): Universidade de São Paulo; 2014.

3. Sousa DMN, Mendes IC, Oliveira ET, Chagas ACMA, Catunda HLO, Oriá MOB. Mortalidade materna por causas hipertensivas e hemorrágicas: análise epidemiológica de uma década. Rev Enferm UERJ [Internet]. 2014 [cited 2017 Aug 10];22(4):500-6. Available from: http://www.e-publicacoes.uerj.br/index.php/enfermagemuerj/article/view/15314/11598

4. Brasil. Ministério da Saúde. Secretaria de Políticas de Saúde. Área Técnica de Saúde da Mulher. Manual dos Comitês de Mortalidade Materna. 2a ed. Brasília; 2002.

5. Botelho NM, Silva IFMM, Tavares JR, Lima LO. Causas de morte materna no estado do Pará, Brasil. Rev Bras Ginecol Obstet [online]. 2014 [cited 2017 Aug 10];36(7):290-5. Available from: DOI:10.1590/SO100-720320140004892

6. Brasil. Ministério da Saúde. Superintendência de Políticas de Saúde. Coordenadoria de Gestão da Informação em Saúde. Manual de indicadores e parâmetros da saúde [Internet]. Brasília; 2010 [cited 2017 Ago 22]. Available from: www.saude.mt.gov.br/arquivo/2901

7. Szwarcwald CL, Escalante JJC, Rabello Neto DL, Souza Junior PRB, Victora CG. Estimação da razão de mortalidade materna no Brasil, 2008-2011. Cad Saúde Pública [online]. 2014 [cited 2017 Aug 25];30(suppl1):S71-S83. Available from: DOI: http://dx.doi.org/10.1590/0102-311X00125313

8. Resende LV, Rodrigues RN, Fonseca MC. Mortes maternas em Belo Horizonte, Brasil: percepções sobre qualidade da assistência e evitabilidade. Rev Panam Salud Publica [Internet]. 2015 [cited 2017 Sep 4];37(4):218-24. Available from: https://scielosp.org/pdf/rpsp/v37n4-5/v37n4-5a05.pdf

9. Ramos SCS. Análise de casos de mortes maternas em Manaus nos anos de 2001 a 2010 [dissertação]. [Internet]. São Paulo (SP): Universidade Estadual Paulista; 2013 [cited 2017 Sep 13]. Available from: https://repositorio.unesp.br/handle/11449/106369

10. Simas DCS, Lima JS. Desafios da inclusão digital no interior do Amazonas e a internet como ferramenta de redução das desigualdades sociais e regionais. Trabalho apresentado no 2º Congresso Internacional de Direito e Contemporaneidade: mídias e direitos da sociedade em rede. Santa Maria (RS); 2013. Anais (online). Santa Maria: UFSM, CCSH; 2013 [cited 2017 Sep 13]. Available from: http://www.ufsm.br/congressodireito/anais

11. Brasil. Ministério da Saúde. Portal da Saúde. Departamento de Informática do Sistema Único de Saúde. DATASUS. Informações de Saúde (TABNET). Mortalidade materna [Internet]. Brasília; 2016 [cited 2017 Sep 15]. Available from:

Lidiane Tavares Medeiros, Antônio Manuel Sousa, Leudson Oliveira Arinana,
Antônio Sávio Inácio, Maria do Livramento Coelho Prata, Milaine Nunes Gomes Vasconcelos

http://www2.datasus.gov.br/DATASUS/index.php?area=02

12. Instituto Brasileiro de Geografia e Estatística. Brasil/Amazonas. Panorama [Internet]. Rio de Janeiro; 2010 [cited 2017 Sep 15]. Available from: https://cidades.ibge.gov.br/brasil/am/panorama

13. Dias JMG, Oliveira APS, Cipolotti R, Monteiro BKSM, Pereira RO. Mortalidade materna. Rev Med Minas Gerais [Internet]. 2015 [cited 2017 Sep 15];25(2):173-9. Available from: DOI: 10.5935/2238-3182.20150034

14. Teixeira NZF, Pereira WR, Barbosa DA, Vianna LAC. Mortalidade materna e interface com a raça em Mato Grosso. Rev Bras Saúde Matern Infant [Internet]. 2012 [cited 2017 Sep 28];12(1):27-35. Available from: DOI: http://dx.doi.org/10.1590/S1519-38292012000100003

15. Fernandes BB, Nunes FBBF, Prudêncio PS, Mamede FV. Pesquisa epidemiológica dos óbitos maternos e o cumprimento do quinto objetivo de desenvolvimento do milênio. Rev Gaúcha Enferm [Internet]. 2015 [cited 2017 Oct 6];36(esp):192-9. Available from: DOI: http://dx.doi.org/10.1590/1983-1447.2015.esp.56792

16. Áfio ACE, Araújo MAL, Rocha AFB, Andrade RFV, Melo SP. Óbitos maternos: necessidade de repensar estratégias de enfrentamento. Rev Rene [Internet]. 2014 [cited 2017 Oct 6];15(4):631-8. Available from: DOI: 10.15253/2175-6783.2014000400010

17. Carreno I, Bonilha ALL, Costa JSD. Perfil epidemiológico das mortes maternas ocorridas no Rio Grande do Sul, Brasil: 2004-2007. Rev Bras Epidemiol [Internet]. 2012 [cited 2017 Oct 18];15(2):396-406. Available from: DOI: http://dx.doi.org/10.1590/S1415-790X2012000200017

18. Ferraza L, Bordignonb M. Mortalidade materna uma realidade que precisa melhorar. Rev baiana saúde pública [Internet]. 2012 [cited 2017 Oct 27];36(2):527-38. Available from: http://files.bvs.br/upload/S/0100-0233/2012/v36n2/a3253.pdf

19. Instituto Brasileiro de Geografia e Estatística. Cor ou raça (Brasil, 2015) [Internet]. Rio de Janeiro; 2015 [cited 2017 Oct 20]. Available from: https://teen.ibge.gov.br/sobre-o-brasil/populacoa/cor-ou-raca.html

20. Wanderley RMM, Vasconcelos Neto PJA, Pinheiro HDM. Perfil da mortalidade materna. Rev enferm UFPE on line. 2017 [cited 2017 Out 20];11(Supl. 4):1616-24. Available from: DOI: 10.5205/reuol.10438-93070-1-

21. Vega CEP, Soares VMN, Nasr AMLF. Mortalidade materna tardia: comparação de dois comitês de mortalidade materna no Brasil. Cad Saúde Pública [online]. 2017 [cited 2017 Nov 3];33(3):e00197315. Available from: DOI: 10.1590/0102-311X00197315

22. Coelho VC, Andrade MS, Sena CD, Costa LEL, Bittencourt IS. Caracterização dos óbitos maternos em três regiões de saúde do centro-norte baiano. Cogitare Enferm [Internet]. 2016 [cited 2017 Nov 3];21(1):1-8. Available from: DOI: http://dx.doi.org/10.5380/ce.v21i1.42475

23. Castro BMC, Ramos SCS. Perfil de mortalidade materna em uma maternidade pública da cidade de Manaus-Am. Rev Saúde (Santa Maria) [Internet]. 2016 [cited 2017 Nov 5];42(1):103-12. Available from: https://periodicos.ufsm.br/revistasaude/article/view/20953

24. Borges CLMS, Costa MCN, Mota ELA, Menezes GMS. Evolução temporal e diferenciais intra-urbanos da mortalidade materna em Aracaju, Sergipe, 2000-2010. Epidemiol Serv Saúde [Internet]. 2013 [cited 2017 Nov 5];22(2):307-16. Available from: DOI: 10.5123/S1679-49742013000200012