DOI: https://doi.org/10.11144/Javeriana.umed62-4.mmia

The risk of Newborn Exposed to Maternal Near Miss Events in a High-Risk Pregnancy Center (Colombia)

El riesgo de recién nacidos expuestos a eventos de morbilidad materna extrema en un centro de alto riesgo obstétrico (Colombia)

Received: 17 June 2021 | Accepted: 17 August 2021

Antonio Carlos Puello Ávila
Neonatologist, Universidad El Bosque, Bogotá, Colombia. Pediatrician, Universidad de Cartagena, Cartagena, Colombia. Clinical Epidemiologist, Universidad del Área Andina, Colombia. Physician, Universidad de Santander, Bucaramanga, Colombia. Pediatrician, Subred Integrada de Servicios de Salud Norte, Bucaramanga, Colombia, ESE Hospital Simón Bolívar, Bogotá, Colombia
ORCID: https://orcid.org/0000-0001-7079-5345

Jorge Augusto Rodríguez Ortiz
Obstetrician-gynecologist, Universidad El Bosque, Bogotá, Colombia. Clinical Epidemiologist, Universidad El Bosque. Master in Epidemiology, Universidad El Bosque. Coordinator of the research group of the Subred Integrada de Servicios de Salud Norte, Bogotá, Colombia
ORCID: https://orcid.org/0000-0001-7929-2971

Néstor Giraldo Méndez
Obstetrician-gynecologist, Universidad Nacional de Colombia. Referent of Obstetrics and Gynecology at the Subredada Integrada de Servicios de Salud Norte, Bogotá, Colombia
ORCID: https://orcid.org/0000-0002-7147-7725

Lina María Castro Herrera[a]
General Practitioner, Universidad El Bosque, Bogotá, Colombia
ORCID: https://orcid.org/0000-0001-5446-1089

[a] Corresponding author: linamcastroh@hotmail.com

How to cite: Puello Ávila AC, Rodríguez Ortiz JA, Giraldo Méndez N, Castro Herrera LM. El riesgo de recién nacidos expuestos a eventos de morbilidad materna extrema en un centro de alto riesgo obstétrico (Colombia). Univ. Med. 2021;62(4). https://doi.org/10.11144/Javeriana.umed62-4.mmia

ABSTRACT

Background: Timely and quality care in a woman with a severe obstetric complication can prevent a fatal outcome. It is estimated that two out of three neonatal deaths are preventable with effective measures in childbirth care. **Objective:** To determine the risk of exposure of children of mothers with extreme maternal morbidity events. **Materials and methods:** Secondary data analysis study. The study population included 2197 live births records and 103 records of notification of extreme maternal morbidity. **Results:** The prevalence of extreme maternal morbidity was 5.3%. Neonates weighing between 3500 and 4000 g and >4000 g had a lower risk in relation to exposure to extreme maternal morbidity compared to weight <2500 g. Likewise, the risk of exposure was lower in term deliveries. **Conclusions:** There is an association between maternal morbidity and adverse perinatal outcomes; with a significantly higher risk of premature birth, low birth weight, and more cesarean section rates.

Keywords
severe maternal morbidity; neonates; perinatal mortality; pregnancy; risk.

RESUMEN

Introducción: Una atención oportuna y de calidad en una mujer con una complicación obstétrica severa puede prevenir un desenlace fatal. Se estima que dos de cada tres defunciones neonatales son evitables con medidas eficaces en la atención del parto. **Objetivo:** Determinar el riesgo de exposición de los hijos de madres con eventos de morbilidad materna extrema. **Materiales y métodos**: Estudio de análisis secundario de datos. La población de estudio incluyó los 2197 registros de nacidos vivos y 103 registros de notificación de morbilidad materna extrema. **Resultados:** La prevalencia de morbilidad materna extrema fue del 5,3 %. Los neonatos con un peso entre 3500 y 4000 g y más de 4000 g tenían menor riesgo con relación a exposición a morbilidad materna extrema en comparación con un peso inferior a 2500 g. Así mismo, el riesgo de exposición fue menor en los partos a término, en comparación con los pretérmino. **Conclusiones:** Existe asociación entre morbilidad materna y resultados perinatales adversos; con un riesgo significativamente mayor de parto prematuro, bajo peso al nacer y más tasas de cesárea.

Palabras clave

morbilidad materna severa; neonatos; mortalidad perinatal; embarazo; riesgo.

Introduction

Despite advances in maternal and perinatal health, statistics related to neonatal mortality and morbidity have not shown significant changes and remain a concern. Deaths in the neonatal period account for 60% in developing countries (1), and maternal health is a common factor. It is estimated that two out of three adverse neonatal outcomes are preventable with effective measures in the care of the pregnant woman, during delivery, and the first week of life (2). According to the World Health Organization (WHO), infant mortality is an indicator of the quality of life that reflects the absence of public health interventions, while it is also a crude indicator of poverty and economic status in this population (3).

WHO defines extreme maternal morbidity as a state in which the pregnant woman almost died during gestation, delivery or puerperium, but survived thanks to timely and adequate care. It includes conditions such as severe postpartum hemorrhage, severe preeclampsia, eclampsia, severe systemic sepsis/infection, and uterine rupture, and considers its surveillance as a strategy for the reduction of fatal maternal-perinatal outcomes (4-7). Seventy-five percent of maternal deaths in the Americas are caused by these complications (8). These conditions clearly have an impact on the newborn, in terms of short- and long-term sequelae, as well as on their quality of life (9), loss of skills (10), and the economic cost to health systems (11). Extreme maternal morbidity events in a population and their effects on the health of the mother-child binomial are considered indicators of quality of health services.

In Colombia, maternal mortality had maintained a downward curve over time until 2019 (12). This could be explained by advances in medical interventions (7). According to data from the Directorate of Epidemiology and Demography of the Ministry of Health and Social Protection of Colombia, between 2000 and 2008, an oscillation between 104.9 and 60.7 maternal deaths per 1000 live births was reported, reaching a figure of 15.1 deaths in 2019 (12). However, this could be a false reality, because the number of deaths does not represent the current poor state of maternal health in the country (6,13). Evidence of this is the fact that by 2020 there was an increase of 38.4% compared to the figures for 2019, i.e., a setback of 8 years. With the advent of the pandemic, pneumonia caused by COVID-19 disease contributed an extra 13.5 % of deaths (14). In general, the causes of maternal death in the highest percentage correspond to obstetric hemorrhage and hypertensive disorders associated with pregnancy (15).

Extreme maternal morbidity experienced an opposite behavior, which showed an increase from 2012 to that reported in 2019 (12), which could be related to a combination of factors (16), including advanced maternal age in the first pregnancy, maternal obesity, chronic diseases, increasing rates of cesarean section, increase in notifications of public health events and increase in the number of migrant pregnant women without any type of pregnancy control and any social health coverage. The national extreme maternal morbidity ratio for 2019 was 36.3 cases per 1000 live births, relative to 2018 of 35.3 cases (12), mainly concentrated in extreme ages

(16). Age not only has an impact by increasing biopsychosocial risks but also influences the high proportion of perinatal and late neonatal mortality (17).

he highest proportion of perinatal deaths are registered in the fetal period before delivery, in conditions of prematurity and intrauterine growth restriction (18). In the country, the entities with the highest perinatal and late neonatal mortality ratios also share the highest rates of maternal mortality and morbidity (18). This statistical association is likely related to the high proportion of people with unsatisfied basic needs and the high poverty rate (19), with significant barriers to access to health services, especially during prenatal, delivery, and newborn care. The most frequent causes of perinatal mortality are congenital malformations, respiratory disorders typical of prematurity, bacterial sepsis of the newborn, and secondary to obstetric complications, such as asphyxia (20).

The neonatal period is critical and interventions should be oriented in this direction because actions to reduce infant mortality and to address such an important problem are still deficient. This article proposes an approach based on newborns according to their risk at birth, using characteristics related to the mother, the newborn, and sociodemographics, and in this way, we model the problem based on data capable of providing the probability of a newborn being exposed to extreme maternal morbidity events. Thus, the objective was to determine the risk of exposure of children of mothers with extreme maternal morbidity events.

Materials and methods

A secondary data analysis study was developed. The risk of exposure to an extreme maternal morbidity event was analyzed for all births occurring in a high-risk obstetric center and referral site of the public sector in the city of Bogotá throughout 2019. The information was collected from routine notification data of extreme maternal morbidity to the National Public Health Surveillance System and the registry of live births. The variables included in the analysis were: maternal data (age, schooling, residence, health system affiliation, and nationality) and birth data (weight, gestational age, and number of prenatal controls). The outcome of interest was the occurrence of extreme maternal morbidity. The clinical information was organized in an Excel database, where the variables were coded by number and analyzed using R Studio software, version 1.2.5.

Statistical analysis. Descriptive statistics were obtained by measures of central tendency and dispersion for numerical variables and frequencies and proportions for qualitative variables. Proportions were compared using the chi-square test (χ^2), to determine statistical significance by $p < 0.05$. To assess the risk of extreme maternal morbidity, first, chi-square tests were performed for each of the maternal, paternal, and birth data variables. All variables with a $p < 0.2$ were considered for binary regression.

The present investigation contemplated the parameters established in Resolution 008430 of 1993, which establishes the scientific, technical, and administrative norms for health research. This study is considered a minor risk study.

Results

We collected 2197 records of births occurring throughout 2019 (Table 1). 51.0 % (n =1121) of the births were male. Mean weight was 2920 ± 525.2 g, length was 49.6 ± 3.0 cm, gestational age was around 38 ± 2.1 weeks and there were 5.2 ± 2.8 prenatal controls. On average, 64.5 % (n = 1417) of the births occurred by vaginal delivery, and 35.5 % (n = 780) by cesarean section. Of the births, 2.3 % (n = 51) were the result of multiple pregnancy.

Table 1.
Characteristics of hospital-registered births, 2019

	Nationality				Total (n = 2197)		*p*-value
	Colombia (n = 1578)		Venezuela (n = 619)				
	n	%	n	%	n	%	
Sex							
Female	757	48.0	319	51.5	1076	49.0	0.133
Male	821	52.0	300	48.5	1121	51.0	
Weight (grams)							
<2500	241	15.3	116	18.7	357	16.2	0.089
2500-2999	550	34.9	232	37.5	782	35.6	
3000-3499	619	39.2	216	34.9	835	38.0	
3500-4000	151	9.6	51	8.2	202	9.2	
>4000	17	1.1	4	0.6	21	1.0	
Delivery							
C-section	582	36.9	198	32.0	780	35.5	0.031
Spontaneous	996	63.1	421	68.0	1417	64.5	
Weeks of gestation							
<37 weeks	191	12.1	98	15.8	289	13.2	0.066
37-40 weeks	1372	86.9	515	83.2	1887	85.9	
>40 weeks	15	1.0	6	1.0	21	1.0	
Prenatal checkups							
None	52	3.3	150	24.2	202	9.2	<0.001
1 to 4	699	44.3	304	49.1	1003	45.7	
5 to 10	797	50.5	162	26.2	959	43.7	
>10	30	1.9	3	0.5	33	1.5	

The characteristics of the mothers are shown in Table 2. The mean age of the mothers was 25.6 ± 6.5 years and of the fathers 28.8 ± 7.8 years. Seventy-nine point four percent (n = 1744) were Colombian and 21.6% (n = 453) were Venezuelan migrants. Eighty-seven.7% (n = 1926) of the mothers were from urban areas and 12.3% (n = 271) were from rural areas. Of the mothers, 77.6% (n = 1705) were affiliated with the health system.

Table 2.
Characteristics of mothers of children born in the hospital, 2019

	Nationality				Total (n = 2197)		*p*-value
	Colombia (n = 1578)		Venezuela (n = 619)				
	n	%	n	%	n	%	
Mother's age							
<20 years	165	10.5	254	41.0	419	19.1	<0.001
20-24 years	491	31.1	184	29.7	675	30.7	
25-29 years	398	25.2	104	16.8	502	22.8	
30-34 years	304	19.3	45	7.3	349	15.9	
35-40 years	161	10.2	28	4.5	189	8.6	
>40 years	59	3.7	4	0.6	63	2.9	
First-time pregnant	599	38.0	375	60.6	974	44.3	<0.001
Mother's educational level							
Basic	134	8.5	77	12.4	211	9.6	0.002
High School	1051	66.6	398	64.3	1449	66.0	
College education	344	21.8	113	18.3	457	20.8	
Other*	49	3.1	31	5.0	80	3.6	
Residence							
Municipal capital	1366	86.6	560	90.5	1926	87.7	0.012
Dispersed rural	212	13.4	59	9.5	271	12.3	
Social security							
Contributory	715	45.3	70	11.3	785	35.7	<0.001
Uninsured	97	6.1	395	63.8	492	22.4	
Subsidized	766	48.5	154	24.9	920	41.9	

*Other: none, pre-school and no data.

When comparing birth characteristics according to nationality, it was found that vaginal deliveries were more common in Venezuelan migrants (68.0 % versus 63.1 %; p = 0.031), and they attended fewer or no prenatal checkups (73.3 % versus 47.6 %; p < 0.001). Likewise, Venezuelan migrant mothers were younger (41 % versus 10.5 %; p < 0.001), more commonly first-time-pregnant (60.6 % versus 38.0 %; p < 0.001), without a partner (29.9 % versus 17.9 %; p < 0.001) and without affiliation to the health system (63.8 % versus 6.1 %; p < 0.001). Higher education and urban residence were more common in Venezuelan parents compared to Colombian parents (p < 0.05).

Extreme maternal morbidity

Extreme maternal morbidity events occurred in 4.7% (n = 103) of births (81 in Colombian women versus 22 in Venezuelan women; p = 0.122). The ratio of extreme maternal morbidity reached 46.8 events per 1000 live births. The characteristics are shown in Table 3. The most common event was preeclampsia (79 %; n = 81),

followed by severe obstetric hemorrhage (16 %; n = 16), eclampsia (3 %; n = 3) and septic shock (2 %; n = 2). Vascular failure occurred in almost half of the patients (48 %; n = 49), followed by liver failure (17 %; n = 17) and renal failure (11 %; n = 11). In 26 % (n = 26) of cases the mother required intensive care unit management, 7 % required transfusion and 1 % (n = 1) required additional surgery.

Table 3.
Multivariate analysis with binary logistic regression for the risk of extreme maternal morbidity in deliveries attended at the hospital, 2019

	Extreme maternal morbidity (n = 103)			
	n	%	OR	95CI %
Mother's educational level				
<20 years	17	16.5	1	---
20-24 years	29	28.2	0.908	0.47-1.756
25-29 years	20	19.4	0.771	0.377-1.578
30-34 years	18	17.5	0.895	0.42-1.91
35-40 years	8	7.8	0.733	0.289-1.856
>40 years	11	10.7	3.457	1.375-8.696
Mother's educational level				
Basic	5	4.9	1	---
High School	69	67.0	2.148	0.841-5.488
College education	20	19.4	1.895	0.685-5.242
Other*	9	8.7	3.269	1.009-10.596
Country of origin				
Colombia	81	78.6	1	---
Venezuela	22	21.4	0.643	0.376-1.101
Weight (grams)				
<2500	48	46.6	1	---
2500-2999	30	29.1	0.284	0.035-2.296
3000-3499	22	21.4	0.294	0.18-0.481
3500-4000	2	1.9	0.189	0.111-0.324
>4000 g	1	1.0	0.063	0.015-0.267
Delivery				
Vaginal	37	35.9	1	---
C-section	66	64.1	2.857	1.85-4.413

The multivariate model included the mother's age, schooling, country of origin, neonatal weight, delivery route, and gestational weeks (see Table 3). Gestational age was not included because this variable was collinear with birth weight. The risk of extreme maternal morbidity was 3.6 times higher (95%CI: 1.375-8.696) in women older than 40 years compared to those younger than 20 years. Likewise, the risk of cesarean delivery increased 2.8 times (95%CI: 1.850-4.413). Neonates had a fetal weight between 3500 and 4000 g (OR: 0.189; 95%CI: 0.111-0.324) and greater than 4000 g (OR: 0.063; 95%CI: 0.015-0.267).

Discussion

The extreme maternal morbidity events found in our population were high and exceeded the national average. In general, there is significant heterogeneity in the results of other studies, with frequencies ranging from 0.04% to 14.9% of all gestations (9,16).

The ratio of extreme maternal morbidity was lower than the district ratio. In Bogota, extreme maternal morbidity cases between 2015 and 2018 were reported in a total of 19,366 events, with an increasing ratio reaching 61.4 events per 1000 live births (21). Concerning 2020, extreme maternal morbidity maintains a rising curve and 64.7 events per 1000 live births were recorded (14).

Extreme maternal morbidity events, defined according to the WHO protocol, are indicators of the quality of health care, with a direct relationship on maternal and perinatal outcomes. Our study showed that perinatal outcomes in patients with extreme maternal morbidity have a significantly higher risk of being associated with preterm delivery, low birth weight, and higher cesarean section rates. Larger newborns are at lower risk of having been exposed to extreme maternal morbidity events, compared to those who had a fetal weight of less than 2500g. The most commonly encountered extreme maternal morbidity was preeclampsia. Severe hypertensive disorders are the major cause of extreme maternal morbidity worldwide and increase the risk of maternal-perinatal complications by more than 3 to 25 times (22), with a high incidence of preterm delivery and low birth weight (23).

Significantly, the greatest extreme morbidity was observed in adolescent women and older women. In agreement with other studies, we found a higher proportion of adverse perinatal outcomes in pregnant women of extreme age, with a higher risk in those older than 40 years; this group has a higher incidence of comorbidities

(22,24), and in adolescents, it is due to lower adherence to prenatal check-ups (25). According to the WHO, advanced maternal age contributes to increased rates of extreme maternal morbidity and maternal mortality. Individual factors such as the coexistence of complications of pre-existing diseases in older mothers (24,26) and general factors such as lack of knowledge of the problem on the part of the patient, inadequate prenatal care, delay in the patient's admission to prenatal control, referral to another level of care or timely treatment, and deficient care of the most severe cases favor a higher rate of complications in these groups.

We found that these extreme maternal morbidity events were associated with higher cesarean section rates. De Almeida et al. (27) observed that anesthesia during cesarean section increased the risk of ventilation to the newborn. Cesarean section reaches up to 13 times higher maternal mortality rates compared to vaginal delivery, twice the risk of obstetric bleeding, and a higher risk of severe obstetric complications in subsequent pregnancies (22).

Our results are consistent with the evidence regarding the association of preterm delivery with extreme maternal morbidity events (28). Having no maternal exposure to any morbidity event may be a protective factor concerning preterm delivery. Results in other studies support these findings and show that obstetric hemorrhage and severe hypertensive disorders are significantly associated with preterm delivery (29). In the study by Mengistu et al. (29), women with severe hemorrhage were more likely to have a very low birth weight newborn. In our study, the risk was found to exist when assessing the combined effect of extreme maternal morbidity with low birth weight.

It was not the aim of the study to assess the risk between the groups of Colombian and Venezuelan migrant patients, but important differences were found, especially in relation to fewer or no prenatal checkups. According to Colombia's 2018 National Demographic and Health Survey (30), despite increases in maternal care coverage in recent years, it is estimated that approximately a quarter of pregnant women still do not access care during gestation.

Due to the current social and political situation, it is necessary to evaluate, through other studies, the differences between these two groups and the different risks, to generate new intervention strategies. Public health surveillance is an important mechanism for decision-making regarding actions to prevent neonatal deaths and adverse maternal and perinatal events (31). Simple and cost-effective interventions, such as prenatal care, labor promotion, hand washing, and exclusive breastfeeding, can reduce them (32).

Conclusion

Hypertensive disorders and obstetric hemorrhage are the most frequent maternal morbidity events. In our study, the association between extreme maternal morbidity and perinatal outcomes is evident. Adverse outcomes, such as preterm delivery, low birth weight, and higher cesarean section rates, have a higher incidence in this group of patients. Our results enable us to conclude that all strategies that allow intervention in extreme maternal morbidity events will not only affect maternal health but also decrease the incidence of severe adverse perinatal outcomes, whose effects are important in the long-term health of the newborn.

References

1. Singha AK, Phukan D, Bhasin S, Santhanam R. Application of machine learning in analysis of infant mortality and its factors. Work Pap. 2016 feb. https://doi.org/10.13140/RG.2.1.3857.3687

2. Diana S, Wahyuni CU, Prasetyo B. Maternal complications and risk factors for mortality. J Public Health Res. 2020;9(2):1842.

3. Hug L, Alexander M, You D, Alkema L; UN Inter-agency Group for

Child Mortality Estimation. National, regional, and global levels and trends in neonatal mortality between 1990 and 2017, with scenario-based projections to 2030: a systematic analysis. Lancet Glob Health. 2019;7(6):e710-e720. https://doi.org/10.1016/S2214-109X(19)30163-9

4. Franco-Yáñez CE, Hernández-Pacheco JA. Monitoreo de morbilidad materna extrema (near miss) como compromiso internacional para complementar la calidad de la atención en salud materna. Perinatol Reproduc Hum. 2016;30(1):31-8. https://doi.org/10.1016/j.rprh.2016.03.004

5. Pattinson R, Say L, Souza JP, Broek Nv, Rooney C; WHO Working Group on Maternal Mortality and Morbidity Classifications. WHO maternal death and near-miss classifications. Bull World Health Organ. 2009;87(10):734.

6. Fescina RH, De Mucio B, Durán P, Martínez G. Organización Panamericana de la Salud y Centro Latinoamericano de Perinatología, Salud de la Mujer y Reproductiva (CLAP/SMR). Plan de acción para acelerar la reducción de la mortalidad materna y la morbilidad materna grave. 2.. ed. Montevideo: CLAP/SMR; 2011.

7. World Health Organization. Evaluating the quality of care for severe pregnancy complications: the WHO near-miss approach for maternal health [internet]. 2011. Disponible en: https://www.who.int/reproductivehealth/publications/monitoring/9789241502221/en/

8. Say L, Chou D, Gemmill A, Tunçalp Ö, Moller AB, Daniels J, et al. Global causes of maternal death: a WHO systematic analysis. Lancet Glob Health. 2014;2(6):e323-e333. https://doi.org/10.1016/S2214-109X(14)70227-X

9. Vederhus BJ, Markestad T, Eide GE, Graue M, Halvorsen T. Health related quality of life after extremely preterm birth: a matched controlled cohort study. Health Qual Life Outcomes. 2010;8:53.

10. Moral Y, Robertson NJ, Goni-de-Cerio F, Alonso-Alconada D. Hipoxia-isquemia neonatal: bases celulares y moleculares del daño cerebral y modulación terapéutica de la neurogénesis. Rev Neurol. 2019;68(1):23-36. https://doi.org/10.33588/rn.6801.2018255

11. Salman O, Procter SR, McGregor C, et al. systematic review on the acute cost-of-illness of sepsis and meningitis in neonates and infants. Pediatr Infect Dis J. 2020;39(1):35-40.

12. Ministerio de Salud y Protección Social, Dirección de Epidemiología y Demografía. Análisis de Situación de Salud (ASIS) Colombia, 2019 [internet]. 2019. Disponible en: https://www.minsalud.gov.co/sites/rid/Lists/BibliotecaDigital/RIDE/VS/ED/PSP/asis-2019-colombia.pdf

13. Eternod Arámburu M. Metodología para calcular la razón de mortalidad materna: un mejor registro y un indicador deficiente. Realidad Datos Espacio. Rev Int Estadíst Geograf [internet]. 2012;3(1):24-69. Disponible en: https://rde.inegi.org.mx/RDE_05/doctos/rde_05_art3.pdf

14. Observatorio de Salud de Bogota#, SaluData. Caracterización de la morbilidad materna extrema en Bogotá: razón de morbilidad materna extrema en Bogotá DC [internet]. 2019 ago 21. Disponible en: https://saludata.saludcapital.gov.co/osb/index.php/datos-de-salud/salud-sexual-y-reproductiva/morbilidadmaternaextrema/

15. Departamento Administrativo Nacional de Estadística (DANE).

Boletín técnico: estadísticas vitales, 2016-2017. 2018. Bogotá.

16. Lilungulu A, Bintabara D, Mujungu S, Chiwanga E, Chetto P, Nassoro M. Incidence and predictors of maternal and perinatal mortality among women with severe maternal outcomes: a Tanzanian facility-based survey for improving maternal and newborn care. Obstet Gynecol Int. 2020;2020:5390903.

17. Acelas-Granados DF, Orostegui A, Alarcón-Nivia MA. Factores de riesgo para morbilidad materna extrema en gestantes sin demora en la atención médica según la estrategia camino para la supervivencia. Rev Chil Obstet Ginecol. 2016;81(3):181-8. https://doi.org/10.4067/S0717-75262016000300003

18. Instituto Nacional de Salud. Comportamiento de meningitis bacteriana y enfermedad meningocócica. Boletín Epidemiológico Semanal [internet]. 2020 jun 28-jul4;27. Disponible en: https://www.ins.gov.co/buscador-eventos/BoletinEpidemiologico/2020_Boletin_epidemiologico_semana_27.pdf

19. Departamento Administrativo Nacional de Estadística-DANE. Medida de pobreza multidimensional municipal de fuente censal 2018. Bogotá DC., Colombia. 2018.

20. Vogel JP, Lee AC, Souza JP. Maternal morbidity and preterm birth in 22 low- and middle-income countries: a secondary analysis of the WHO Global Survey dataset. BMC Pregnancy Childbirth. 2014;14:56.

21. Observatorio de Salud de Bogota#, SaluData. Caracterización de la morbilidad materna extrema en Bogotá, 2015-2018 [internet]. 2019. Disponible en: https://saludata.saludcapital.gov.co/osb/index.php/2019/08/31/caracterizacion-de-la-morbilidad-materna-extrema-en-bogota/

22. Zanette E, Parpinelli MA, Surita FG, Costa ML, Haddad SM, Sousa MH, et al. Maternal near miss and death among women with severe hypertensive disorders: a Brazilian multicenter surveillance study. Reprod Health. 2014;11(1):4. https://doi.org/10.1186/1742-4755-11-4

23. Souza RT, Costa ML, Mayrink J, Feitosa FE, Filho EAR, Leite DF, et al. Clinical and epidemiological factors associated with spontaneous preterm birth: a multicentre cohort of low risk nulliparous women. Sci Rep. 2020;10(1):855. https://doi.org/10.1038/s41598-020-57810-4

24. Divo MJ, Martinez CH, Mannino DM. Ageing and the epidemiology of multimorbidity. Eur Respir J. 2014;44(4):1055-68.

25. Laopaiboon M, Lumbiganon P, Intarut N, Mori R, Ganchimeg T, Vogel JP, et al. Advanced maternal age and pregnancy outcomes: a multicountry assessment. BJOG. 2014;121 Suppl 1:49-56. https://doi.org/10.1111/1471-0528.12659

26. Alexopoulos AS, Blair R, Peters AL. Management of preexisting diabetes in pregnancy: a review. JAMA. 2019;321(18):1811-9.

27. De Almeida MF, Guinsburg R, da Costa JO, Anchieta LM, Freire LM, Campos D Jr. Non-urgent caesarean delivery increases the need for ventilation at birth in term newborn infants. Arch Dis Child Fetal Neonatal Ed. 2010;95(5):F326-30.

28. Souza RT, Costa ML, Mayrink J, Feitosa FE, Rocha Filho EA, Leite DF, et al. Perinatal outcomes from preterm and early term births in a multicenter cohort of low risk nulliparous women.

Sci Rep. 2020;10(1):8508. https://doi.org/10.1038/s41598-020-65022-z

29. Mengistu TS, Turner JM, Flatley C, Fox J, Kumar S. The impact of severe maternal morbidity on perinatal outcomes in high income countries: systematic review and meta-analysis. J Clin Med. 2020;9(7):2035.

30. Profamilia. Encuesta Nacional de Demografía y Salud (ENDS). Tomo 1: Componente demográfico. Bogotá; 2018.

31. Geller SE, Koch AR, Garland CE, MacDonald EJ, Storey F, Lawton B. A global view of severe maternal morbidity: moving beyond maternal mortality. Reprod Health. 2018;15(Suppl 1):98.

32. Oestergaard MZ, Inoue M, Yoshida S, et al. Neonatal mortality levels for 193 countries in 2009 with trends since 1990: a systematic analysis of progress, projections, and priorities. PLoS Med. 2011;8(8):e1001080.