Revista Colombiana de Obstetricia y Ginecología Vol. 70 No. 1 •Enero-Marzo 2019 • (8-18)

ORIGINAL RESEARCH

DOI: http://dx.doi.org/10.18597/rcog.3123

CAUSES OF MATERNAL DEATH IN THE CALLAO REGION, PERÚ. DESCRIPTIVE STUDY, 2000-2015

Causas de muerte materna en la región de Callao, Perú. Estudio descriptivo, 2000-2015

Carolina Tarqui-Mamani, PhD[1]; Hernán Sanabria-Rojas, MD, MSc[2]; Walter Portugal-Benavides, MD[3]; Héctor Pereyra-Zaldivar, MD, MSc[4]; Javier Vargas-Herrera, MD, MSc[5]; Milena Calderón-Bedoya, RN[6]

Received: December 29/17 – Accpeted: December 21/18

RESUMEN

Objetivo: identificar las causas de mortalidad materna en la región de Callao, entre los años 2000 y 2015.

Materiales y métodos: estudio de serie de casos en establecimientos de salud (ES) públicos y privados de la región de Callao en Perú. Se incluyeron 131 mujeres como casos de muerte materna (MM) que cumplían los criterios de selección. Se consideró MM, mujer fallecida durante el embarazo, parto o posparto (dentro de los 42 días posparto), en ES del Callao. Se revisaron las historias clínico-epidemiológicas de MM. El análisis se realizó usando frecuencias porcentuales y promedios.

Resultados: el 61,1 % de las causas fueron directas y el 38,9 % indirectas. Las causas directas más frecuentes fueron los trastornos hipertensivos del embarazo, las hemorragias obstétricas y el aborto. El tiempo medio que tardó la gestante desde el inicio de las molestias hasta que decidió pedir atención fueron 20 minutos, el tiempo medio que tardó en llegar al ES luego de decidir la atención fue de 20 minutos, y el tiempo medio de demora desde que llegó la gestante al ES hasta ser atendida fue de 7 minutos. El 96,9 % de las muertes maternas se produjeron en ES.

Conclusión: el estudio demostró que la principal causa de MM es la directa, principalmente debido a trastornos hipertensivos del embarazo; la hemorragia obstétrica y el aborto, mientras que en menor proporción fueron las MM indirectas, principalmente enfermedades infecciosas.

Palabras clave: mortalidad materna, embarazo, epidemiologia, Perú, causalidad.

1. Obstetrician; Doctor in Public Health; Master in Epidemiology, Preventive Medicine and Public Health Academic Department, Human Medicine School, Universidad Nacional Mayor de San Marcos, Lima (Perú); Instituto Nacional de Salud, Lima (Perú). ctarquim@unmsm.edu.pe
2. Physician and Surgeon; Specialist in Infectious and Tropical Diseases; Master in Medicine; Epidemiology Diploma, Preventive Medicine and Public Health Academic Department, Human Medicine School, Universidad Nacional Mayor de San Marcos, Lima (Perú); Instituto Nacional de Salud, Lima (Perú). hsanabriar@unmsm.edu.pe
3. Physician and Surgeon; Epidemiologist. Epidemiology Director, DIRESA-Callao; former Director of the Epidemiology Office, Dirección Regional de Salud Callao, Callao (Perú). wportugalb@unmsm.edu.pe
4. Physician and Surgeon; Pediatrician; Master in Public Health, Preventive Medicine and Public Health Academic Department, Human Medicine School, Universidad Nacional Mayor de San Marcos, Lima (Perú). hpereyraz@unmsm.edu.pe
5. Physician and Surgeon; Master in Epidemiology, Preventive Medicine and Public Health Academic Department, Human Medicine School, Universidad Nacional Mayor de San Marcos, Lima (Perú). jvargash@unmsm.edu.pe
6. Nurse. Former Head of the Epidemiological Surveillance Unit of the Office of Epidemiology-DIRESA Callao (Perú). epicalla@dge.gob.pe.

ABSTRACT

Objective: To identify the causes of maternal mortality in the Callao Region between 2000 and 2015.
Materials and methods: Case series study conducted in public and private healthcare institutions in the region of Callao in Perú. Overall, 131 women who met the selection criteria were included as cases of maternal mortality (MM). MM was defined as death of a woman during pregnancy, childbirth or the postpartum period (within the first 42 days after childbirth) in healthcare institutions in Callao. MM clinical-epidemiological records were reviewed. The analysis was performed using percent frequencies and means.
Results: Of the causes of MM, 61.1% were direct and 38.9% were indirect. The most frequent direct causes were hypertensive disorders of pregnancy, obstetric bleeding and abortion. Median time between the onset of discomfort and the decision to ask for assistance was 20 minutes; median time to arrive at the healthcare institution after making the decision was 20 minutes; and median delay time between arrival to the institution and provision of care was 7 minutes. Of the total number of maternal deaths, 96.9 % occurred in a healthcare institution.

Key words: Maternal mortality, pregnancy, epidemiology, Perú, causality.

INTRODUCTION

Maternal mortality (MM) is a healthcare problem which also serves as a measure of the health status in a community. In the world, the maternal mortality ratio (MMR) has dropped from 385 deaths for every 100,000 live births (1990) to 216 for every 100, 000 live births (1); in developing countries, this ratio is 239, while it is 12 for every 100,000 live births in developed countries (2). In Perú, MMR dropped from 298 deaths for every 100,000 live births in 1990, to 68 for every 100,000 in 2015 (3), pointing to some degree of improvement in maternal mortality; nonetheless, the MMR continues to be high when compared to maternal mortality reported in developed countries (4).

The fifth Millenium Development Goal referred to maternal health and established the goal of reducing maternal mortality by three-fourths between 1990 and 2015, a goal that was met (5). The majority of these deaths are due to preventable complications. There are several social determinants of health (6) associated with maternal mortality (MM), including economic, education, geographic, and cultural factors, as well as the healthcare system in charge of providing care before, during and after childbirth (7). It is reasonable to take into account the importance of access to health services and their quality, as well as their resolution capability for women at risk of MM, in order to ensure recognition of the signs and symptoms of alarm during pregnancy (8).

The World Health Organization (WHO) stated that women living in poverty have a lower probability of receiving adequate healthcare from qualified professionals, and that only close to one-third of pregnant women attend four or more prenatal visits, receive professional healthcare during delivery, or receive postnatal care, circumstances that contribute to the increase in maternal mortality ratios (2). Over the past decade, the percentage of prenatal care received by Peruvian women at a national level has increased to 97.5%, while institutional delivery has increased to 93.0% (9). Of pregnant women in urban areas, 97.7% delivered in an institution, although the MMR continues to be higher than reported in developed countries (2).

The General Epidemiology Directorate of the Peruvian Ministry of Health reports that the regions with the highest MM are Lima, La Libertad, Loreto, Piura and Cajamarca (10), the main direct causes being hemorrhage, pregnancy-induced hypertension and abortion. The majority of maternal deaths occur in remote and poor rural areas, reflecting, among other things, the social inequities and exclusions of a country. However, many maternal deaths are found to occur in the cities and in healthcare institutions with specialized centers for childbirth, greater resolution capability and high prenatal care

coverage (11).

The region of Callao, adjacent to Lima, the Peruvian capital, is essentially urban. Callao is one of the Regional Health Directorates (Diresas) with well-implemented epidemiological surveillance of maternal mortality. It uses an epidemiological record that includes several personal, obstetric, gestational, prenatal, delivery and postpartum aspects, apart from data on the healthcare institution; it also quantifies Maine time delays and conducts verbal autopsy of MM cases. Maternal mortality cases in Callao continue to be reported in public and private hospitals and maternal care centers that provide care 24 hours a day; most of the cases are related to a direct cause (10). Given proximity to Lima, the capital, these healthcare institutions have state-of-the-art technology for diagnosis, as well as nd healthcare staff with the necessary qualifications to solve obstetric emergencies and provide perinatal maternal care.

Several activities have been implemented with the aim of reducing maternal mortality, including the reduction of undesired pregnancy by strengthening family planning promotion activities (12); increase in the number of prenatal visits both in the urban as well as the rural areas (9), thus contributing to an improved identification of pregnant women at a higher risk and with signs of alarm, in order to improvement management of pregnancy, delivery and postpartum complications; implementation of vertical childbirth in healthcare institutions, allowing the woman to choose the birthing position with the support of the couple or another family member (13), which has increased the number of women seeking institutional delivery (9); and education intervention, enhancing women's empowerment to ascertain their rights (14). However, maternal deaths are still reported in the rural and urban areas alike, as is the case even in Callao, where hospitals and specialized personnel are available (10). This outlook requires a more in-depth analysis of the causes of MM in the urban areas, including some of the characteristics of prenatal care, childbirth, estimated time delays described by Deborah Maine (15), and the causes of maternal death (16), in order to propose focused strategies and actions aimed at reducing MM, taking into consideration the context or setting in which these deaths occur. Therefore, the objective of the study was to identify the causes of maternal mortality in the Callao region between 2000 and 2015.

MATERIALS AND METHODS

Design and population. Case series study based on a review of the clinical and epidemiological records on MM in the region of Callao. MM cases were reported by the hospitals and maternal care centers of the public sector (Ministry of Health) that serve pregnant women who are not affiliated to the Social Security System in Health (Essalud), as well as by the Essalud hospitals that serve pregnant women insured under the worker's contributive system. MM cases occurring in the region between 2000 and 2015 were included. The cases of non-obstetric MM and those for which a clinical record was not available were excluded. Consecutive sampling was used.

Procedure. Maternal mortality cases were identified in the maternal mortality surveillance registry kept by the Epidemiology Office of the Callao Health Regional Directorate. Once the cases were identified, clinical records and Maternal Death Epidemiological Investigation records of the cases occurring during the study time period were reviewed. It is important to note that the Callao Diresa Epidemiology Office is the custodian of the MM files, which consist of the clinical record, the MM epidemiological record, the analyses of the Maternal and Perinatal Death Prevention Committees at a local and department level, and the qualitative MM report carried out pursuant to the Peruvian regulations (14). An *ad hoc* record validated by expert judgement and tested in a pilot study was used. Information regarding delays in care was estimated by the Callao Diresa staff who conducted the epidemiological investigation of MM cases, which were entered in the MM Surveillance Epidemiological Investigation. Data processing was

performed after data collection from the clinical/epidemiological records and following completion of the quality control process.

Definition of variables. In accordance with the WHO, maternal mortality was classified as the death of a woman during pregnancy, childbirth or within 42 days of delivery, due to a cause related or aggravated by pregnancy or pregnancy care, but not due to accidental or incidental causes (9). Direct obstetric MM was defined as the result of an obstetric complication of the gravid condition (pregnancy, childbirth or puerperium), interventions, omissions, incorrect treatments, or a chain of events originating from these circumstances (2). Indirect obstetric MM is defined as the result of a pre-existing condition or a disease arising during pregnancy, childbirth or puerperium and not due to direct obstetric causes, but which was aggravated by the physiological effects of pregnancy (17). Maternal deaths were grouped in accordance with the International Classification of Diseases (ICD-10) (17).

Moreover, measurements included sociodemographic characteristics (age, occupation, level of education, marital status, prenatal care information (prenatal care, number of prenatal visits, person doing the follow-up), childbirth plan, home visit and signs of alarm written in the perinatal card. The cause of MM was taken from the clinical/epidemiological record which states the basic cause of death, month, year and classification in accordance with the Epidemiological Surveillance protocols of the Peruvian Ministry of Health (14). Mean time delays described by Deborah Maine were estimated (delay in recognizing the problem, delay in deciding to seek help, and delay in receiving adequate treatment) (15).

Statistical analysis. A database was built in SPSS v. 22, and the relevant quality control was carried out. Data normality was assessed using the Kolmogorov Smirnov test, the age variable was recategorized as adolescent (10 to 19 years), young (20 to 29 years) and adult (30 to 49 yers), and percent frequencies and means were then calculated.

Ethical considerations. The study was submitted to the Regional Health Directorate of Callao and approved by the Ethics Committee. Codes were assigned to MM cases in order to ensure data confidentiality.

RESULTS

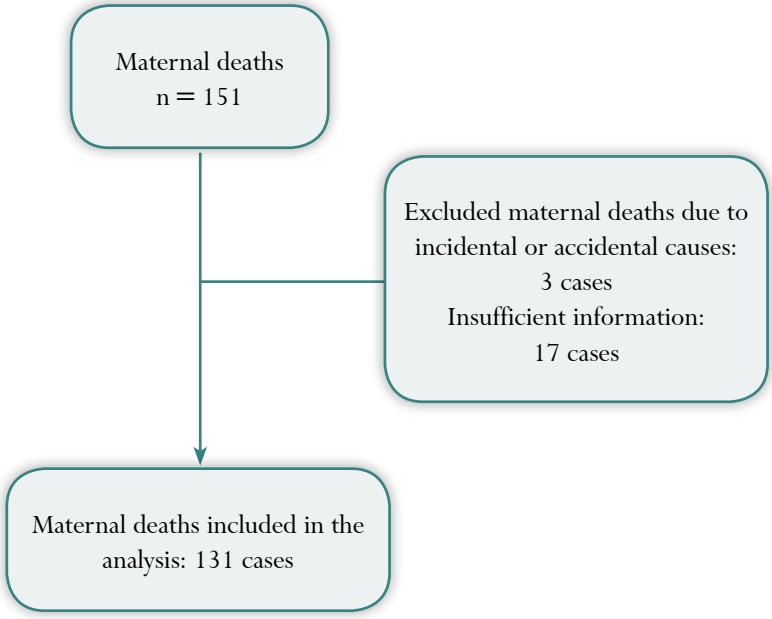
Out of a total of 151 records of deaths during pregnancy, childbirth or puerperium, 131 MM cases which met the inclusion criteria were included, while 3 cases of incidental deaths (asphyxia, motor vehicle accidents) were excluded, as well as 17 cases of MM because of the absence of clinical/epidemiological records (Figure 1).

In terms of the main sociodemographic characteristics, it was found that, of the 131 study cases, 49.6% [65/131] of the women who died were adults, 19.1% (25/131) had a low level of schooling, 51.9% [68/131] were housewives, and 68.7% [90/131] were married or in a de facto relationship. Table 1 illustrates the sociodemographic characteristics in detail.

Of the total number of women who died, 58.8% [77/131] attended at least one prenatal visit. In terms of prenatal care, 63.6% [49/77] attended 4 or more visits, 26.0% [20/77] had a prenatal card with written information on the signs of alarm that occurred during pregnancy (inadequate weight gain, anemia, short inter-pregnancy interval, excess pregnancy-related vomiting, etc.). Home visits did not take place for 93.5% of the pregnant women. Table 2 shows the distribution of other characteristics of prenatal care.

Of the total number of pregnant women studied, 57.3% [75/131] recognized the risk. In 23.7% [31/131] of cases, the women themselves decided to seek help, in 16.8% [22/131] the search for help was initiated by the family, in 9.2% [12/131] it the partner made the decision; no data are available for the remaining percentage of women. Median time between the onset of discomfort and the decision to seek care was 20 minutes; median time between the decision to seek care and arrival at the health-care institution was 20 minutes; and median time

Figure 1.
Distribution of maternal deaths in Callao, 2000-2015



between arrival at the institution and receiving care was 7 minutes. Of the women who died, 69.4% [93/131] were admitted to the hospital.

According to the type of obstetric cause of MM, 61.1% [80/131] were direct causes and 38.9% [51/131] were indirect. Among maternal deaths due to direct causes, 32.8% [43/131] were due to hypertensive disorders of pregnancy, 12.2% [16/131] to obstetric bleeding, and 10.7% [16/131] were associated with abortion. Of the total number of abortions, 38.9% received care in a Level II healthcare institution, while 38.9% received care in a Level III institution; 50.0% of the abortion cases were managed by gynecologists, one-third presented with bleeding, and 27.8% had infection. Among indirect causes, 16.8% were due to other conditions (systemic lupus erythematosus, fatty liver, aneurysm, thromboembolism, hemolytic anemia, intestinal bleeding, acute pancreatitis, among others), 15.3% were due to infectious diseases (tuberculosis, HIV, pneumonia, bronchopneumonia, AH1N1, brucellosis, disseminated strongyloidiasis, among others), and 6.9% were tumor processes. Table 3 illustrates all-cause MM.

Of the total number of deaths, 48.1% [63/131] occurred in healthcare institutions of the Ministry of Health, 43.5% [57/131] in Essalud institutions and 0.8% [1/131] in Armed Forces institutions. The majority of maternal deaths occurred in Level III care institutions [86.1%], followed by Level II [6.9%], and Level I [3.1%]. According to the timing of death, the vast majority of MM cases occurred during the postpartum period [68.7%], followed by gestation [24.4%], abortion [3.8%], childbirth [2.3%], and the time was unknown in 0.8% of cases. Two cases of MM [1.5%] occurred in the home. No autopsy data were found in any of the clinical records for the total number of MM cases.

DISCUSSION

This study reports that direct MM is the most important in the Callao region of Peru, with preg-

Table 1.
Distribution of sociodemographic variables of maternal deaths, Callao Diresa*, Perú, 2000-2015

Characteristics	n = 131	%
Age		
Adolescent	12	9,2
Young adult	52	39,7
Adult	65	49,6
No data	2	1,5
Education level		
Illiterate	1	0,8
Primary	24	18,3
Secondary	60	45,8
Higher	31	23,7
No data	15	11,5
Occupation		
Student	10	7,6
Housewife	68	51,9
Employed	19	14,5
Self-employed	7	5,3
House maid	2	1,5
No data	25	19,1
Marital status		
Single	31	23,7
Married/de facto relationship	90	68,7
Widow/divorced/separated	2	1,5
No data	8	6,1

* Diresa: Dirección Regional de Salud.

nancy-associated hypertension and bleeding being the primary causes. In terms of indirect mortality, morbidity prior to pregnancy and non-obstetric infections were the most frequent causes. The delays analysis showed that time intervals were 20 minutes at the most.

Our results show that the causes of MM are consistent with the national distribution of maternal deaths (18), pointing to a higher percentage of MM from direct causes and a lower percentage due to indirect causes (8). However, the percentage of MM due to direct causes is much lower than the one reported at a national level and in La Libertad region in northern Peru, where 81.9% of the cases of maternal deaths were due to direct causes (19, 20). Compared to other international reports of direct MM, our result was higher than the figure of 57% reported for Baja California (Mexico) (21),

Table 2.
Distribution of prenatal care characteristics of maternal death cases. Callao Diresa*, Perú, 2000-2015

Prenatal care characteristics	n = 77	%
Number of prenatal visits		
< 1 to 3	28	36,4
4 and more	49	63,6
Prenatal care site		
Level I	37	48,1
Level II	11	14,3
Level III	17	22,1
Clinic	1	1,3
Other	2	2,6
No data	9	11,7
Home visit		
Yes	8	10,4
No	69	89,6
Humber of home visits		
None	72	93,5
One	3	3,9
Two	1	1,3
Three	1	1,3
Signs of alarm written in card		
Yes	20	26,0
No	57	74,0

* Diresa: Dirección Regional de Salud.

lower than 82.5% reported in Puebla (Mexico), and similar to the figures of the Mexican Social Security which ranged between 50% and 63% (22).

The distribution of the most frequently reported direct causes in our study is similar to that reported for La Libertad in northern Peru (20) and for the entire country (19), and even for cases of MM in Mexican women in the Social Security (22), a situation which is not dissimilar to the rest of the world (23). Abortion is the third most frequent direct cause in Callao, lower than observed in Ica (24) and Tacna (19), similar to the report for all of Peru (19), and lower than the finding in Chile (25). Our results are consistent with the world landscape, where abortion ranges between 7% and 9% (23) in the developed world (23), developing countries (23) and Latin America and the Caribbean (23). The conditions in which abortion is performed, and the people who perform it, in particular unsafe abortion, could influence the occurrence of maternal

Table 3.
Distribution of obstetric causes of maternal death. Callao Diresa*, Perú, 2000-2015

Cause of maternal death	Nº = 131	%
Direct		
Hypertensive disorders of pregnancy	43	32,8
Obstetric hemorrhage	16	12,2
Abortion	14	10,7
Pregnancy-related infection	2	1,5
Ectopic pregnancy	2	1,5
Molar pregnancy	2	1,5
Other obstetric complications	1	0,8
Indirect		
Other conditions	22	16,8
Infectious diseases	20	15,3
Tumors	9	6,9

* Diresa: Dirección Regional de Salud.

deaths in the Ica and Tacna regions (26). It is worth mentioning that abortion in Peru is penalized and this results in a paucity of hospital records because most of the cases are documented as bleeding or infection (8). Women who decide to interrupt their pregnancy seek clandestine places where care is provided under precarious conditions by people who may not be specialized, increasing the risk of maternal death. Tarqui-Mamani (26) reported a prevalence of approximately 15% of attempted pregnancy interruption in Callao.

The level of indirect causes found in the study is higher than the national level reported in 2012 and 2015 (18, 19) and much higher than the one reported in Argentina (27), where a marked increase in MM was reported in 2009 due to respiratory infections, in particular the H1N1 influenza pandemic (27). Additionally, MM due to influenza virus was also higher on that same year in Mexico (28).

Close to 9% of maternal deaths occurred in adolescents, only somewhat lower than the figure of MM reported in Chile (29).

It comes as a reason for concern that little more than 40% of the pregnant women did not receive prenatal care, resulting in a risk factor for MM. Our figure of prenatal care is lower than the one reported for Peru (19), but higher than the one reported in a national hospital in Puebla (30) and in Baja California in Mexico (21). It would be convenient to analyze prenatal care quality and content. Some studies show that pregnant women who develop any complication during pregnancy arrive at the healthcare institution already in a critical condition (31), or seek help in low complexity Level I health services which are unprepared for addressing obstetric emergencies (32).

Our results pertaining to delays are different from those reported for La Libertad (northern Peru) which reflect a big delay in the decision to seek help, and between the decision and arrival at the healthcare institution (ranging between 1 and more than 10 hours), with time to receiving care being less than 10 minutes (20). This situation could be explained by the fact that Callao is fully urban

area with good accessibility to maternal centers with 24-hour service, referral hospitals with the necessary capabilities and specialized human resources. Mortality could be explained by the fact that pregnant women arrive at the healthcare institution in a critical condition and, even though there are no delays, the management of the obstetric emergency may be insufficient despite care being provided within 10 minutes. In Peru, regulations require that high-risk pregnant women receive care from specialists in obstetrics and gynecology, and be referred on timely basis and to adequate care institutions in the event they present with complications (14).

The limitations of the study include potential selection bias due to non-inclusion of 11.6% of maternal deaths, as well as measurement bias given that the source of information consisted of clinical and epidemiological records of the cases available at Callao Diresa. On the other hand, the time of residence in the Callao region was not considered, which means that some pregnant women coming from other places in Lima or the provinces may have been included as MM recorded and notified by the Callao Diresa, resulting in frequency overestimation; however, it is important to consider that MM under-recording in Callao is 24.2%, discretely higher than the figure for national under-recording (19). The study design does not permit generalization of the results at a national level, but it provides information to identify the causes of MM in the region of Callao, and may be useful to guide public policy for MM reduction in the region.

CONCLUSION

In the Callao region in Peru, the causes of MM are mainly direct, primarily due to hypertensive disorders of pregnancy, obstetric bleeding and abortion. There is a smaller proportion of indirect causes, mainly infectious diseases.

REFERENCES

1. Alkema L, Chou D, Hogan D, Zhang S, Moller AB, Gemmill A, et al. Global, regional, and national levels and trends in maternal mortality between 1990 and 2015, with scenario-based projections to 2030: A systematic analysis by the UN Maternal Mortality Estimation Inter-Agency Group. The Lancet. 2016;387:462-74. https://doi.org/10.1016/S0140-6736(15)00838-7
2. Organización Mundial de la Salud. Mortalidad materna . Ginebra: Centro de prensa: Nota descriptiva 311 [visitado 2018 ago 20]. Disponible en: http://www.who.int/es/news-room/fact-sheets/detail/maternal-mortality
3. WHO, UNICEF, UNFPA. The World Bank estimates. Evolución de la mortalidad materna: 1990-2015. Ginebra: World Health Organization. 2014 [visitado 2017 nov 20]. Disponible en: http://apps.who.int/iris/bitstream/handle/10665/204114/who_rhr_15.23_spa.pdf;jsessionid=9334513E95BACD3CC103D53880FB5203?sequence=1
4. González R. Salud materno-infantil en las Américas. Rev Chil Obstet Ginecol.] 2010 [visitado 2018 jul 28];75:411-21. Disponible en: https://scielo.conicyt.cl/scielo.php?script=sci_arttext&pid=S0717-75262010000600011&lng=es. https://doi.org/10.4067/S0717-75262010000600011
5. Programa de las Naciones Unidas para el Desarrollo (PNUD). Objetivos de Desarrollo del Milenio. Informe de 2015. Nueva York: PNUD; 2015 [visitado 2018 nov 16]. Disponible en: http://www.un.org/es/millenniumgoals/pdf/2015/mdg-report-2015_spanish.pdf
6. Organización Mundial de la Salud. Determinantes sociales de la salud en la región de las Américas. Ginebra: Centro de prensa: Nota descriptiva 311 [visitado 2018 ago 20] . Disponible en: https://www.paho.org/salud-en-las-americas-2017/?p=45

7. Medina-Ramírez MC, Leal-Anaya P, Aguilera-Romero TN, Leyva-Quintero E. Principales causas de mortalidad materna en Mexicali, Baja California. Ginecol Obstet Mex. 2015;83:690-6.
8. Del Carpio Ancaya L. Situación de la mortalidad maternal en el Perú, 2000-2012. Rev Peru Med Exp Salud Publica. 2013;30:461-4.
9. Instituto Nacional de Estadística e Informática (INEI). Encuesta Demográfica y de Salud Familiar 2016. Lima: INEI; 2017.
10. Dirección Regional de Salud del Callao. Situación de Vigilancia Epidemiológica de muerte materna SE. 18-2016. Callao: Dirección Regional de Salud Callao. 2016 [visitado 2017 nov 30]. Disponible en: http://www.diresacallao.gob.pe/wdiresa/documentos/boletin/epidemiologia/DanosEnfermedades/supFILE0002442016.pdf
11. Farro A, Pacheco J. Mortalidad materna: experiencia en el Hospital Nacional Edgardo Rebagliati Martins, Essalud 1958-2002. Ginecol Obstet Perú. 2003;49:18-30.
12. Ministerio de Salud. Minsa promueve la planificación familiar para reducir la mortalidad materna. Lima: Centro de prensa: Nota de prensa [visitado 2018 nov 18]. Disponible en: https://www.gob.pe/institucion/minsa/noticias/13436-minsa-promueve-la-planificacion-familiar-para-reducir-la-mortalidad-materna
13. Ministerio de Salud. Norma técnica de salud para la atención del parto vertical en el marco de los derechos humanos con pertinencia intercultural. Lima: MINSA. 2016 [visitado 2018 nov 18]. Disponible en: http://bvs.minsa.gob.pe/local/MINSA/4240.pdf
14. Ministerio de Salud, Perú. Plan Estratégico Nacional para la Reducción de la Mortalidad Materna y Perinatal 2009-2015. Lima: Ministerio de Salud. 2009 [visitado 2017 nov 20]. Disponible en: http://www.unfpa.org.pe/publicaciones/publicacionesperu/MINSA-PEN-Reduccion-Mortalidad-Materna2009-2015.pdf.
15. Maine D, Akalin MZ, Ward VM, Kamara A. Diseño y evaluación de programas para mortalidad materna. Nueva York: Centro para la Población y Salud Familiar, Facultad de Salud Pública, Universidad de Columbia; 1997.
16. Ministerio de Salud, Perú. Protocolos de vigilancia epidemiológica. Parte I. Lima: Oficina General de Epidemiología; 2004.
17. World Health Organization (WHO). International classification of diseases. Manual of the International Statistical Classification of Diseases, Injuries and Causes of Death. 10 ed. Geneva: WHO. 2010 [visitado 2018 ago 22]. Disponible en: www.who.int/classifications/icd/ICD10Volume2_en_2010.pdf
18. Gil F. Situación epidemiológica de la muerte materna en el Perú 2015. Boletín Epidemiológico (MINSA). 2015;25:66-74.
19. Maguiña M, Miranda J. La mortalidad materna en el Perú 2002-2011. Lima: Dirección General de Epidemiología/Ministerio de Salud. 2013 [visitado 2017 nov 6]. Disponible en: http://www.dge.gob.pe/portal/docs/tools/MORTALIDAD_%20MATERNAPERU.pdf.
20. Santos L, Mori L, González M. Mortalidad materna: factores determinantes modificables mediante políticas públicas en la región La Libertad. Ucv-Scientia. 2010;2(1):22-33.
21. Medina-Ramírez MC, Leal-Anaya P, Aguilera-Romero TN, Leyva-Quintero E. Principales causas de mortalidad materna en Mexicali, Baja California. Ginecoly Obstet Moex. 2015;83:690-6.
22. Ruiz R, Cruz P. Causas de mortalidad materna en el Instituto Mexicano del Seguro Social, periodo 2009-2012. Rev Med Inst Mex Seguro Soc. 2014;52:388-96.
23. Say L, Chou D, Gemmill A, Tunçalp Ö, Moller AB, Daniels J, et al. Global causes of maternal death: A WHO systematic analysis. The Lancet Global Health. 2014;2:e323-e33. https://doi.org/10.1016/S2214109X(14)70227¬X
24. Ybaseta-Medina J. Factores de riesgo asociados a mortalidad materna en la región de Ica, Perú, 2001-2005. Rev Med Panacea. 2011;1.
25. Donoso E, Vera C. Mayor mortalidad materna por aborto en Cuba que en Chile, 2000-2015. Rev Chil Obstet Ginecol]. 2018 [visitado 2018 nov 27];83(3):240-9. Disponible en: https://scielo.conicyt.cl/scielo.php?script=sci_arttext&pid=S0717-75262018000300240&lng=es. https://doi.org/10.4067/s0717-75262018000300240

26. Tarqui-Mamani C, Barreda A, Barreda M, Sanabria-Rojas H. Prevalencia del intento de interrumpir el embarazo y factores asociados en una comunidad urbano marginal de Lima-Perú, 2006. Rev Peru Med Exp Salud Publica. 2010;27:38-44. https://doi.org/10.17843/rpmesp.2010.271.1442
27. Ministerio de la Salud. Presidencia de la República. Natalidad y mortalidad 2014: Síntesis Estadística I/2016. Buenos Aires: Dirección de Estadísticas e Información de Salud. 2016 [visitado 2017 nov 10]. Disponible en: http://www.deis.msal.gov.ar/wp-content/uploads/2016/05/Sintesis-estadistica-Nro1.pdf.
28. Fajardo-Dolci G, Meljem-Moctezuma J, González V, Venegas E, Vicente F, Villalba-Espinoza I, et al. Análisis de las muertes maternas en México ocurridas durante 2009. Rev Med Inst Mex Seguro Soc. 2013;51:486-95.
29. Donoso E, Carvajal JA, Vera C, Poblete JA. La edad de la mujer como factor de riesgo de mortalidad materna, fetal, neonatal e infantil. Rev Med Chil. 2014;142:168-74. https://doi.org/10.4067/S0034-98872014000200004
30. Hernández J, López J, Ramos G, López A. Análisis de casos de muerte materna ocurridos en un periodo de 10 años. Ginecol Obstet Mex. 2007;75:61-7.
31. Gonzaga-Soriano MR, Zonana-Nacach A, Anzaldo-Campos MC, Olazarán-Gutiérrez A. Atención prenatal y mortalidad materna hospitalaria en Tijuana, Baja California. Salud Publica Mex. 2014;56:32-9. https://doi.org/10.21149/spm.v56i1.7320
32. Cáceres-Manrique F. El control prenatal: una reflexión urgente. Rev Colomb Obstet Ginecol. 2009;60:165-70.

Conflict of interest: none declared.