



## Near miss maternal: influencing factors and guidelines for reducing maternal morbidity and mortality

*Near miss* materno: fatores influenciadores e direcionamentos para redução da morbidade e mortalidade materna

Alana Santos Monte<sup>1</sup>, Igor Cordeiro Mendes<sup>2</sup>, Mônica Oliveira Batista Oriá<sup>2</sup>, Francisco Herlânio Costa Carvalho<sup>2</sup>, Helen Brown<sup>3</sup>, Ana Kelve de Castro Damasceno<sup>2</sup>

**Objective:** to analyze the scientific evidence about the factors influencing maternal near miss cases and possible guidelines for reducing maternal morbidity and mortality. **Methods:** integrative review with 2895 articles found and 17 selected articles. **Results:** the factors influencing the near miss cases were: delays in obstetric care; unprepared health team; precarious conditions of services; limited availability of blood derivatives; and prenatal disability, the limited use of evidence-based practices and audits. As main directions to minimize these events, we have evidenced: to strengthen the network of reference and counter-reference; carry out professional training; improve prenatal coverage; and invest in infrastructure, process management and clinical audits. **Conclusion:** the factors that influence the maternal near miss cases range from delayed care to failure to perform prenatal care, whose management improvement is the main direction.

**Descriptors:** Maternal Mortality; Morbidity; Maternal Health; Near Miss, Healthcare; Nursing.

**Objetivo:** analisar as evidências científicas acerca dos fatores que influenciam os casos de *near miss* materno e possíveis direcionamentos para redução da morbidade e mortalidade materna. **Métodos:** revisão integrativa com 2.895 artigos encontrados e 17 selecionados. **Resultados:** os fatores que influenciam nos casos de *near miss* foram: atrasos nos cuidados obstétricos; despreparo da equipe de saúde; condições precárias dos serviços; disponibilidade limitada de derivados de sangue; e deficiência no pré-natal, no uso de Práticas Baseadas em Evidências e nas auditorias. Como principais direcionamentos para minimizar esses eventos, evidenciaram-se: fortalecer a rede de referência e contrarreferência; realizar capacitação profissional; melhorar a cobertura do pré-natal; e investir na infraestrutura, na gestão de processos e em auditorias clínicas. **Conclusão:** os fatores que influenciam os casos de *near miss* materno englobam desde o atraso nos cuidados até a não realização do pré-natal, cuja melhoria na gestão constitui o principal direcionamento.

**Descritores:** Mortalidade Materna; Morbidade; Saúde Materna; *Near Miss*; Enfermagem.

<sup>1</sup>Universidade da Integração Internacional da Lusofonia Afro-Brasileira. Fortaleza, CE, Brazil.

<sup>2</sup>Universidade Federal do Ceará. Fortaleza, CE, Brazil.

<sup>3</sup>School of Nursing at University British Columbia. Vancouver, Canada.

Corresponding author: Alana Santos Monte

Rua Alexandre Baraúna, 1115 - Rodolfo Teófilo. CEP: 60430-160. Fortaleza, CE, Brazil. E-mail: alanasmonte@yahoo.com.br

## Introduction

Maternal mortality is used as a parameter to evaluate the quality of the health service offered, identify situations of inequality and contribute to the evaluation of health levels and socioeconomic development of the population.

Despite the progress made in achieving the fifth Millennium Development Goal, which advocates reducing the maternal mortality rate by 75.5% by 2015, more than 300,000 preventable maternal deaths still occur annually in the world<sup>(1)</sup>. Maternal mortality represents only the tip of an iceberg, in which several women survive complications during pregnancy, childbirth and puerperium, and may have different degrees of sequelae<sup>(2)</sup>.

In this scenario, a new condition - severe maternal morbidity or near miss - has been studied for more than two decades, which applies to women who almost died from complications during pregnancy, childbirth or the puerperium, but survived due to chance or adequate hospital care<sup>(3)</sup>.

Although it is a subject of great relevance in the discussion on pregnancy, childbirth and puerperium care, the major obstacle to the effective consolidation of the concept of maternal near miss was the lack of a clear and consensual definition for the event<sup>(4)</sup>. Faced with this difficulty, this definition was temporally aligned and it was recommended that the concept be based on a list of 25 clinical, laboratory and management criteria<sup>(2)</sup>.

The key principles guiding the development of these World Health Organization criteria were: universal use, regardless of complexity; comparability between health units and over time; and feasibility for use in any environment and high case detection thresholds, so that the surveillance system is not overloaded by the collection of data from a large number of cases<sup>(3)</sup>.

Therefore, these criteria make it possible to identify the most serious cases early and allow the use of specific measures to minimize the consequences of

severe maternal morbidity, mainly reducing maternal deaths due to preventable causes<sup>(4)</sup>.

The study becomes relevant, since health professionals will be better able to know the reality of the maternal near miss and to develop strategies to promote the health of pregnant / postpartum women. The objective of this study was to analyze the scientific evidence about the factors that influence maternal near miss cases and possible guidelines for reducing maternal morbidity and mortality.

## Methods

The integrative review was conducted following the recommended steps: definition of the guiding question, literature search, data collection, critical analysis of selected studies, presentation of results and discussion of integrative review<sup>(5)</sup>.

The first step was characterized by the definition of the guiding question: what factors influence maternal near miss cases and possible guidelines for reducing maternal morbidity and mortality?

The literature search occurred from August to October 2015, in the following databases: Latin American and Caribbean Literature in Health Sciences (LILACS); Medical Literature Analysis an Online Retrieval System (MEDLINE); Cumulative Index to Nursing and Allied Health Literature (CINAHL); and Scopus.

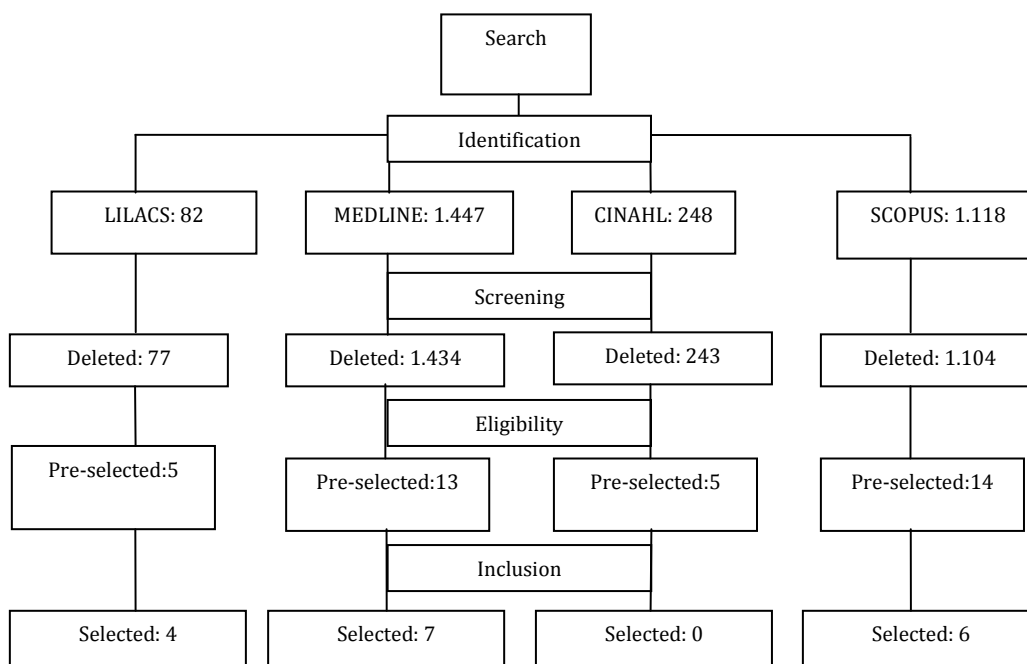
The uniterms near miss maternal mortality, near miss maternal morbidity, near miss obstetric, and maternal morbidity were selected. These descriptors were cross-checked using the Boolean operators (AND, OR, NOT). The following inclusion criteria were used: articles with summaries available, regardless of language that had interventions, guidelines or suggestions to reduce maternal near miss indexes and used criteria defining this event<sup>(6)</sup>. The exclusion criteria were: theses, dissertations, monographs, editorials, reviews, manuals, books, and book chapters, articles repeated in two or more databases and studies that did not present original data or study specific populations.

Data collection was performed in pairs, in which studies whose titles or abstracts mentioned the presentation of original data on maternal morbidity were obtained in their entirety and then analyzed.

2,895 articles in the Identification Stage were found, through the databases searched, 2,858 of which were excluded because they did not meet the objective of the investigation, constituting the Screening Stage. Thus, 37 articles were retrieved for evaluation in full, thus composing the Eligibility Stage (Figure 1)<sup>(7)</sup>.

Critical analysis of the selected studies was started with the extraction of data from the studies in a systematized manner, using an adapted instrument<sup>(8)</sup>.

Evidence from a systematic review or meta-analysis and evidence originating from the opinion of authorities and/or expert committee reports was not classified because they were excluded at the data collection stage. The next phases, corresponding to the presentation of the results and discussion of the integrative review, are discussed in the following section.



**Figure 1** – Flowchart based on PRISMA<sup>(7)</sup> for review studies

In the Inclusion Step, of the 37 pre-selected (eligible) articles, 17 composed the review, since 20 were excluded. Of these, 15 did not address the criteria proposed by the World Health Organization, four because they were repeated and one because they assessed only maternal mortality.

## Results

Among the 17 studies included in this integrative review, seven were conducted in Brazil<sup>(9-15)</sup>, one in Argentina<sup>(16)</sup>, three in the African continent<sup>(17-19)</sup> and six in Asia<sup>(20-25)</sup>.

Influencing Factors of the maternal near miss	Directions
Absent or ineffective prenatal care <sup>(10,15,22,25)</sup>	Improve prenatal coverage <sup>(9,15)</sup>
Delays in obstetric care <sup>(11,14,22-23)</sup>	Deploy Service Protocol <sup>(9,13,21,23-24)</sup>
Absence of clinical audits <sup>(17)</sup>	Conduct clinical audits <sup>(12,17,20,23)</sup>
Sub-notification of maternal near miss <sup>(17-19)</sup>	To standardize the criteria addressed in maternal near miss studies <sup>(12)</sup>
Limitation of Use of Evidence-Based Practice <sup>(16,20,23)</sup>	Use evidence-based practice <sup>(16,18,20)</sup>
Lack of access to health services <sup>(16)</sup>	Strengthen reference and counter-referral networks <sup>(10,14,20,23)</sup>
Limited resources to assess World Health Organization criteria <sup>(18-19,24)</sup>	Adapt the criteria of maternal near miss of the World Health Organization for low resource situations <sup>(17-19,24)</sup>
Limited availability of blood derivatives <sup>(18,22,24-25)</sup>	Support blood donation <sup>(22)</sup>
Unprepared professionals <sup>(22,25)</sup>	Empower professionals and human resources <sup>(14,22-23)</sup>
Delay in seeking care <sup>(22-23)</sup>	Implement an integrated Epidemiological Surveillance system <sup>(10,16,25)</sup>
Association of maternal near miss with negative perinatal outcomes <sup>(14)</sup>	Using maternal near miss as a marker of maternal death <sup>(11,21)</sup>
Limitations to diagnostic and therapeutic features in services <sup>(15)</sup>	Provide intersectoral and multiprofessional collaborations <sup>(13,15-16)</sup>
Maternity overcrowding <sup>(15)</sup>	Improve process management and maternity infrastructure <sup>(15,21)</sup>

**Figure 2** – Synthesis of the Influencing Factors of the maternal near miss and respective directions

## Discussion

This study presented as a limitation the scarce amount of publications of articles about the guidelines, interventions or suggestions to reduce maternal near miss indexes, besides the difficulty of using definitive criteria.

Regarding the factors that influence the maternal near miss, delays in obstetric care due to delayed initiation of appropriate treatment after hospital arrival, delay in the exact diagnosis of the disease and emergency surgeries or rescue procedures are the main factors that may promote cases of morbidity or even death<sup>(14)</sup>. In response to these questions, training programs and continuing education are suggested<sup>(21)</sup>. The deteriorated facilities and overcrowding of maternity wards may also have delayed access to appropriate treatment<sup>(16,23)</sup>.

In addition, procrastination or shortage of access to health services was also cited. According to a retrospective study, a large proportion of women who experienced acute symptoms when they arrived at the hospital or had a delivery without obstetric facilities did not seek health services because they considered themselves to be relatively healthy and had no history of disease or symptoms<sup>(22)</sup>.

In places with few resources, there is a need to separate the cases of morbidity that come to the hospital from those who develop within it. The first case indicates failure to access facilities and / or referral, in which such a hospital would need resources and organization to deal with such emergency situations; and those developed after admission indicate a potential tool for monitoring the performance of obstetrical services<sup>(20,22,25)</sup>.

In a cross-sectional study, 69.7% of the women reported delays in transfer and initial treatment within the first 30 minutes after arrival, along with various forms of precarious care, such as the lack of blood derivatives and an unavailable surgical center, delaying emergency surgeries. In addition, 70.7% of cases of near miss were referred from other health units, which implies deterioration of the woman and condition of the newborn, due to the longer time in the referral process and counter-referral between facilities and delays in care<sup>(26)</sup>.

This fact points to another factor evidenced in the literature: unprepared professionals<sup>(14)</sup>. In a multicenter study, inadequate or delayed medical care was the most important problem identified, also involving insufficient technical competence among the employees<sup>(27)</sup>.

According to a systematic review, a set of factors contributes to maternal mortality, such as: inadequate training/skills of the team receiving the patient, lack of medication/logistics problems, staff shortages, crowded maternities and unprepared/low staff motivation health<sup>(28)</sup>. Adequate provision of intensive care, together with appropriate staff, equipment and management strategy, can improve outcomes for women with life-threatening conditions<sup>(14,24)</sup>.

It is known that advances in obstetrics have significantly reduced direct deaths from hemorrhagic syndromes. In view of this, another risk factor for maternal near miss is the limited availability of blood products, restricting the effective management of morbidities<sup>(22,24-25)</sup>. In places with few resources, where there are not enough blood banks, transfusion of five or more units of blood was considered very unlikely<sup>(15,25)</sup>. Therefore, it is recommended that the transfusion criterion for five units of blood be reduced to two units where there are no blood banks<sup>(18)</sup>.

In addition to blood transfusion, administration of misoprostol is also recommended. Recent data suggest that misoprostol could prevent 1,647 cases of severe postpartum hemorrhage and save \$ 115,335 in transportation costs, intravenous therapy and transfusions per 10,000 births<sup>(29)</sup>.

The absence of prenatal care or inadequate follow-up delays the possible diagnosis and previous treatments<sup>(15)</sup>. When prenatal consultations are performed adequately, they allow the early identification of risk factors associated with pregnancy, which usually trigger pathologies, causing complications such as gestational diabetes, hypertensive syndromes, among others. In this sense, it is possible to provide adequate care for these complications and better planning for childbirth, minimizing the factors that could lead to maternal morbidity and mortality<sup>(15)</sup>.

The limited use of evidence-based practices was also cited as a risk factor for maternal near miss events<sup>(16,18,20,23)</sup>. Practices not based on the best evidence were part of the stories of half the women who lived near miss, which reinforces the existence of the

indiscriminate use of non-recommended interventions<sup>(30)</sup>. Therefore, care provided by health professionals and their institutional protocols should be based on the best available health evidence<sup>(30)</sup>.

It is worth mentioning that scarce records and insufficient documentation have a negative impact on the identification of cases and the development of larger studies. In addition, shortages of human resources may lead to underreporting and, therefore, adversely interfere with case identification and data collection<sup>(18)</sup>.

Clinical audits provide useful information on the pathways that have led to severe morbidity, becoming an important tool for investigating and monitoring the quality of obstetric health<sup>(17,25)</sup>. Therefore, improved process management, through the development of research and frequent review of care protocols, will help identify maternal morbidity and serve as a marker of maternal death for the planning of interventions capable of modifying health services<sup>(13,21)</sup>.

Another important factor is the uniformity of the criteria addressed in the maternal near miss studies for the purpose of comparison, since the use of different criteria can generate the heterogeneity of the events. This inconsistency clearly reiterates that the comparison between studies with different approaches should be avoided, making it clear that recent results show that older criteria tend to detect more cases than current ones<sup>(12)</sup>.

However, there are criticisms regarding the indiscriminate use of the current criterion, demonstrating that its applicability depends on the context of the site and the available resources. In view of this, it is suggested that the maternal near miss criteria be adapted to low-resource hospitals where the most sophisticated laboratory criteria should not be used or, at least, adapted to the local reality. These cases of morbidity probably will not be identified in places of low income, causing an underestimation of these events<sup>(17-19,24)</sup>.

In an international study, researchers failed to apply all criteria because of the limited capacity of la-

laboratories to confirm cases, inadequate donor blood supply and deprivation of medical equipment and alternative facilities for the care of severely ill women<sup>(24)</sup>. In this context, in the possibility of implanting a maternal surveillance system, this event being treated as a sentinel, the use of more sensitive criteria can be useful<sup>(3)</sup>.

Therefore, it is important that the maternal near miss be investigated, as it will allow a more precise analysis of the factors related to its occurrence and will also be used to audit the quality of obstetric care from the hospital point of view and as a comparison group in studies of cases of maternal death.

## Conclusion

Factors influencing maternal near miss cases range from delayed care to failure to perform prenatal care, whose management improvement is the main focus.

## Collaborations

Monte AS and Damasceno AKC contributed in the design, analysis and interpretation of the data. Mendes IC, Oriá MOB and Carvalho FHC contributed in the essay writing and critical review of the intellectual content. Brown H contributed to the final approval of the version to be published.

## References

1. Fernandes BB, Nunes FBBF, Prudêncio PS, Mamede FV. Epidemiological research of the maternal deaths and compliance with the fifth millennium development goal. *Rev Gaúcha Enferm.* 2015; 36(esp):192-9. doi: <http://dx.doi.org/10.1590/1983-1447.2015.esp.56792>
2. Norhayati MN, Hazlina NHN, Sulaiman Z, Azman MY. Severe maternal morbidity and Near misses in tertiary hospitals, Kelantan, Malaysia: a cross-sectional study. *BMC Public Health.* 2016; 16:229. doi: <http://doi.org/10.1186/s12889-016-2895-2>
3. Rosendo TMSS, Roncalli AG. Prevalência e fatores associados ao Near miss materno: inquérito populacional em uma capital do Nordeste Brasileiro. *Ciênc Saúde Coletiva.* 2015; 20(4):1295-304. doi: <http://dx.doi.org/10.1590/1413-81232015204.09052014>.
4. Monte AS, Teles LMR, Costa CC, Gomes LFS, Damasceno AKC. Analysis of the potentially life threatening conditions of women in intensive care units. *Rev Rene.* 2017; 18(4):461-7. doi: <http://dx.doi.org/10.15253/2175-6783.2017000400006>
5. Whittemore R, Knafl K. The integrative review: updated methodology. *J Adv Nurs.* 2005; 52(5):546-53. doi: <http://doi.org/10.1111/j.1365-2648.2005.03621.x>
6. World Health Organization: Evaluating the quality of care for severe pregnancy complications: the WHO near-miss approach for maternal health. Geneva: WHO; 2011.
7. Moher D, Liberati A, Tetzlaff J, Altman DG. The PRISMA group preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med.* 2009; 6(7):e1000097. doi: <https://doi.org/10.1371/journal.pmed.1000097>
8. Ursi ES, Gavão CM. Prevenção de lesões de pele no perioperatório: revisão integrativa da literatura. *Rev Latino-am Enfermagem.* 2006; 14(1):124-31. doi: <http://dx.doi.org/10.1590/S0104-11692006000100017>
9. Cecatti JC, Souza, JP, Oliveira Neto AF, Parpinelli MA, Sousa MH, Say L, et al. Pre-validation of the WHO organ dysfunction based criteria for identification of maternal Near miss. *Reprod Health.* 2011; 8:22. doi: <https://doi.org/10.1186/1742-4755-8-22>
10. Morse ML, Fonseca SC, Gottgroy CL, Waldmann CS, Gueller E. Severe maternal morbidity and near misses in a regional reference hospital. *Rev Bras Epidemiol.* 2011; 14(2):310-22. doi: <http://dx.doi.org/10.1590/S1415-790X2011000200012>
11. Lotufo FA, Parpinelli MA, Haddad SM, Surita FG, Cecatti JG. Applying the new concept of maternal near-miss in an intensive care unit. *Clinics.* 2012; 67(3):225-30. doi: [http://dx.doi.org/10.6061/clinics/2012\(03\)04](http://dx.doi.org/10.6061/clinics/2012(03)04)



12. Lobato G, Nakamura-Pereira M, Mendes-Silva W, Dias MAB, Reichenheim ME. Comparing different diagnostic approaches to severe maternal morbidity and near-miss: a pilot study in a Brazilian tertiary hospital. *Eur J Obstet Gynecol Reprod Biol.* 2013; 167(1):24-8. doi: <http://doi.org/10.1016/j.ejogrb.2012.10.030>
13. Oliveira LC, Costa AR. Fetal and neonatal deaths among cases of maternal near miss. *Rev Assoc Med Bras.* 2013; 59(5): 487-94. doi: <http://dx.doi.org/10.1016/j.ramb.2013.08.004>
14. Dias MAB, Domingues RMSM, Schilithz AOC, Nakamura-Pereira M, Diniz CSG, Brum IR, et al. Incidence of maternal near miss in hospital childbirth and postpartum: data from the Birth in Brazil study. *Cad Saúde Pública.* 2014; 30(Suppl1):169-81. doi: <http://dx.doi.org/10.1590/0102-311X00154213>
15. Galvão LPL, Alvim-Pereira F, Mendonça CMM, Menezes FEF, Góis KAM, Ribeiro Jr RF, et al. The prevalence of severe maternal morbidity and near miss and associated factors in Sergipe, Northeast Brazil. *BMC Pregnancy Childbirth.* 2014; 14(25):1-8. doi: <http://dx.doi.org/10.1186/1471-2393-14-25>
16. Karolinski A, Mercer R, Micone P, Ocampo C, Mazzoni A, Fontana O, et al. The epidemiology of life-threatening complications associated with reproductive process in public hospitals in Argentina. *BJOG.* 2013; 120(13):1685-94. doi: <http://doi.org/10.1111/1471-0528.12395>
17. Van den Akker T, Beltman J, Leyten J, Mwagomba B, Meguid T, Stekelenburg J, et al. The WHO maternal near miss approach: consequences at Malawian district level. *PLoS One.* 2013; 8:e54805-10. doi: <https://doi.org/10.1371/journal.pone.0054805>
18. Nelissen E, Mduma E, Broerse J, Ersdal H, Evjen-Olsen B, van Roosmalen J, et al. Applicability of the WHO maternal near miss criteria in a low-resource setting. *PLoS One.* 2013; 8:e61248-10. doi: <https://doi.org/10.1371/journal.pone.0061248>
19. Litorp H, Kidanto HL, Rööst M, Abeidl M, Nyström LN, Essén B. Maternal near-miss and death and their association with caesarean section complications: a cross-sectional study at a university hospital and a regional hospital in Tanzania. *BMC Pregnancy Childbirth.* 2014; 14:244. doi: <https://doi.org/10.1186/1471-2393-14-244>
20. Jabir M, Abdul-Salam I, Suheil DM, Al-Hilli W, Abul-Hassan S, Al-Zuheiri A, et al. Maternal Near miss and quality of maternal health care in Baghdad, Iraq. *BMC Pregnancy Childbirth.* 2013; 13:11. doi: <https://doi.org/10.1186/1471-2393-13-11>
21. Rana A, Baral G, Dangal G. Maternal Near-Miss: A multicenter surveillance in Kathmandu valley. *J Nepal Med Assoc [Internet].* 2013 [cited 2017 Nov. 10]; 52(190):299-304. Available from: <http://jnma.com.np/jnma/index.php/jnma/article/view/256/1570>
22. Shen FR, Liu M, Zhang X, Yang W, Chen YG. Factors associated with maternal near-miss morbidity and mortality in Kowloon Hospital, Suzhou, China. *Int J Gynecol Obstet.* 2013; 123(1):64-7. doi: <http://dx.doi.org/10.1016/j.ijgo.2013.06.011>
23. Tunçalp O, Hindin MJ, Adu-Bonsaffoh K, Adanu RM. Assessment of maternal near-miss and quality of care in a hospital-based study in Accra, Ghana. *Int J Gynecol Obstet.* 2013; 123(1):58-63. doi: <http://doi.org/10.1016/j.ijgo.2013.06.003>
24. Luexay P, Malinee L, Pisake L, Bouvier-Colle MH. Maternal near-miss and mortality in Sayaboury Province, Lao PDR. *BMC Public Health.* 2014; 14:945. doi: <https://doi.org/10.1186/1471-2458-14-945>
25. Pandey A, Das V, Agarwal A, Agrawal S, Misra D, Jaiswal N. Evaluation of obstetric Near miss and maternal deaths in a tertiary care hospital in North India: shifting focus from mortality to morbidity. *J Obstet Gynaecol India.* 2014; 64(6):394-9. doi: <http://doi.org/10.1007/s13224-014-0552-1>

26. David E, Machungo F, Zanconato G, Cavaliere E, Fiosse S, Sululu C, et al. Maternal near miss and maternal deaths in Mozambique: a cross-sectional, region-wide study of 635 consecutive cases assisted in health facilities of Maputo province. *BMC Pregnancy Childbirth*. 2014; 14:401. doi: <https://doi.org/10.1186/s12884-014-0401-3>
27. Pacagnella RC, Cecatti JG, Parpinelli MA, Sousa MH, Haddad SM, Costa ML, et al. Delays in receiving obstetric care and poor maternal outcomes: results from a national multicentre cross-sectional study. *BMC Pregnancy Childbirth*. 2014; 5;14:159. doi: <http://doi.org/10.1186/1471-2393-14-159>
28. Knight HE, Self A, Kennedy SH. Why are women dying when they reach hospital on time? A systematic review of the “third delay”. *PLoS One*. 2013; 8:e63846. doi: <https://doi.org/10.1371/journal.pone.0063846>
29. Organização Mundial da Saúde. Recomendações da OMS para a prevenção e tratamento da hemorragia pós-parto [Internet]. 2014 [citado 2017 11 out]. Disponível em: [http://apps.who.int/iris/bitstream/10665/75411/12/9789248548505\\_por.pdf](http://apps.who.int/iris/bitstream/10665/75411/12/9789248548505_por.pdf)
30. Aguiar CA, Tanaka ACA. Memórias coletivas de mulheres que vivenciaram o near miss materno: necessidades de saúde e direitos humanos. *Cad Saúde Pública*. 2016; 32(9):e00161215. doi: <http://dx.doi.org/10.1590/0102-311X00161215>