



## STUDYING MATERNAL NEAR-MISS AND MATERNAL MORTALITY IN AL NAJAF PROVINCE/ IRAQ

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### ABSTRACT

**Objectives:** To estimate the maternal mortality ratio, to determine the frequency of severe maternal near miss cases, and to determine the causes and pattern of MNM and mortality occurrence in Najaf province. **Design:** A descriptive cross-sectional study. **Method:** All women who developed maternal death or reported maternal near miss (Selected review of most informative cases), during the years 2018, and 2019 in five hospitals in Najaf province were studied. Data was obtained using records, reports, and statistical sheets at the maternity unit in the public health department/ Najaf directorate of health. These data were collected, categorized, classified, and analyzed. Maternal deaths and maternal near-miss cases were identified according to WHO definitions and criteria. **Results:** The total maternal deaths were 34, seventeen cases each year, at a rate of 34.5/ 100000 live births. The total near-miss cases reported were 123 with a Maternal near-miss ratio MNMR of 1.25/1000 live births. The most common cause of maternal death was thromboembolism, followed by sepsis, and hypertensive disorders respectively. Most women reported maternal near miss had more than one criterion. Of which the majority was obstetric hemorrhage, cardiovascular dysfunction, and hypertensive disorders respectively. **Conclusion:** The most common cause of maternal mortality was pulmonary embolism but that for the maternal near-miss was obstetric hemorrhage, with a maternal near-miss to mortality ratio of only 3.5 necessitating better surveillance and quality of care.

**KEYWORDS:** Maternal near-miss, maternal mortality, severe maternal outcomes, WHO near-miss criteria.

### INTRODUCTION

Maternal mortality is defined as death during pregnancy or within 42 days after the termination of pregnancy due to any cause aggravated by the pregnancy or its management, but not incidental or accidental causes.<sup>[1]</sup> A maternal near miss is defined as survival of a life-threatening complication during pregnancy, delivery, or within 42 days of termination of pregnancy. Such complications could be due to any cause either related to, or aggravated by, the pregnancy or its management, But accidental or incidental causes are excluded.<sup>[1]</sup>

The WHO's vision is a world in which "every pregnant woman and newborn receives quality care throughout pregnancy, childbirth, and the postnatal period". The quality of care is recognized as a crucial aspect of WHO's global strategies for ending preventable maternal mortality. The primary objective of maternal death

surveillance is to improve the quality and organization of care at the national level (recommendations for policymakers, university and professional associations, managers, health professionals, and the community), while the primary objective of maternal near-miss surveillance is to improve quality and organization of care at the local level and in addition it is considered a learning opportunity for local hospital teams, share lessons learned with other hospital teams, and provide recommendations to the ministry of health (e.g. to update national guidelines).<sup>[2]</sup>

In 2009, the World Health Organization (WHO) led the development of a set of criteria for identifying women with life-threatening conditions during pregnancy, childbirth, and the postpartum period, defined as maternal near-miss cases. Women with 'potentially life-threatening conditions' are identified, based on whether

they had any severe complication (e.g. severe postpartum hemorrhage, severe pre-eclampsia, eclampsia, sepsis, or severe systemic infection, ruptured uterus) or whether they received a critical intervention (e.g. blood products, laparotomy, admission to intensive care unit). The use of locally relevant potentially life-threatening conditions is encouraged and the WHO guidance provides a basic set of conditions together with operational definitions.<sup>[3]</sup>

This study aims to find the prevalence of maternal mortality and maternal near-miss in Al-Najaf province and to identify the most common causes. Analysis of near-miss cases provided both the opportunity to understand maternal survival in life-threatening clinical situations and a tool to measure the quality of care and required interventions. Also, to enforce awareness and advocacy for promoting policy action and improving the quality of care.

### MATERIALS AND METHOD

This study is a facility-based descriptive cross-sectional study. Data was collected from the Najaf directorate of health, by reviewing maternal mortality reports and maternal near-miss case reports. These cases were identified by healthcare providers during their daily work and reported routinely to DOH for two years (2018-2019). The cases included in this study were all women, during 2018-2019, who died or met at least one criteria of WHO near-miss criteria during pregnancy, childbirth, or puerperal period. These uniform identification criteria were classified as severe maternal complications, critical

intervention or intensive care unit use, and organ dysfunction<sup>[2]</sup> [Index 1].

All seven hospitals that reported cases in Al-Najaf DOH were targeted for inclusion in the study. Of these, five hospitals provided documented data. We obtained data from the directorate of health on demographic and reproductive characteristics, history, mode of delivery, and antenatal care. Also information on the primary complication (underlying cause) that triggered the maternal near-miss or death and the crucial intervention (or combination of interventions) required to actually end or reverse the underlying pathological process and avert death. All of these data are analyzed using Microsoft EXCEL software.

### RESULTS

We found that 98568 live births out of 99470 deliveries were recorded during two years (2018-2019). Out of these, 157 cases were identified as a severe maternal outcome, which resulted in 34 maternal deaths and 123 near-miss cases (each woman had at least one criterion of WHO criteria of MNM to be included and some had more than one criterion).

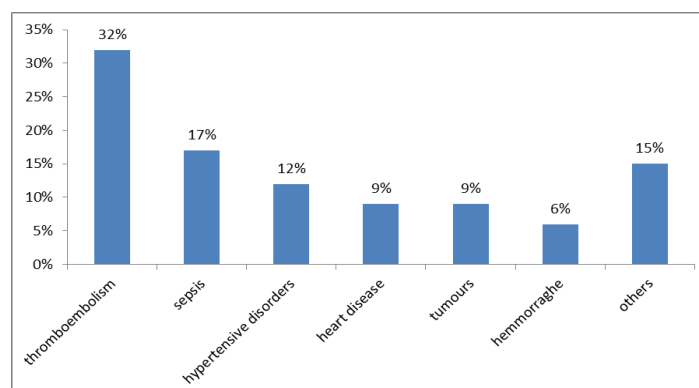
The MNM indicators were calculated in (Table 1). Where we found that the severe maternal outcome (SMO) is 1.6 per 1000 live births, the maternal near miss ratio (MNM) is 1.3 per 1000 live births, the maternal mortality ratio (MMR) is 34.5 per 100000 live births, the maternal near-miss mortality ratio is 3.6, and the mortality index is 21.7%.

**Table 1: Maternal mortality and maternal near-miss indicators.**

|                                                   |       |
|---------------------------------------------------|-------|
| All live births (n)                               | 98568 |
| Severe maternal outcome cases (n)                 | 157   |
| Maternal death cases (n)                          | 34    |
| Maternal near-miss cases (n)                      | 123   |
| Severe maternal outcome ratio (/1000 live births) | 1.6   |
| Maternal near-miss ratio (/1000 live births)      | 1.3   |
| Maternal mortality ratio (/100000 live births)    | 34.5  |
| Maternal near-miss mortality ratio                | 3.6   |
| Mortality index                                   | 21.7% |

Regarding causes of maternal mortality, pulmonary embolism was the most frequent cause accounting for

(32 %) followed by infections and sepsis (17 %), hypertensive disorders (12 %), and others (figure 1).



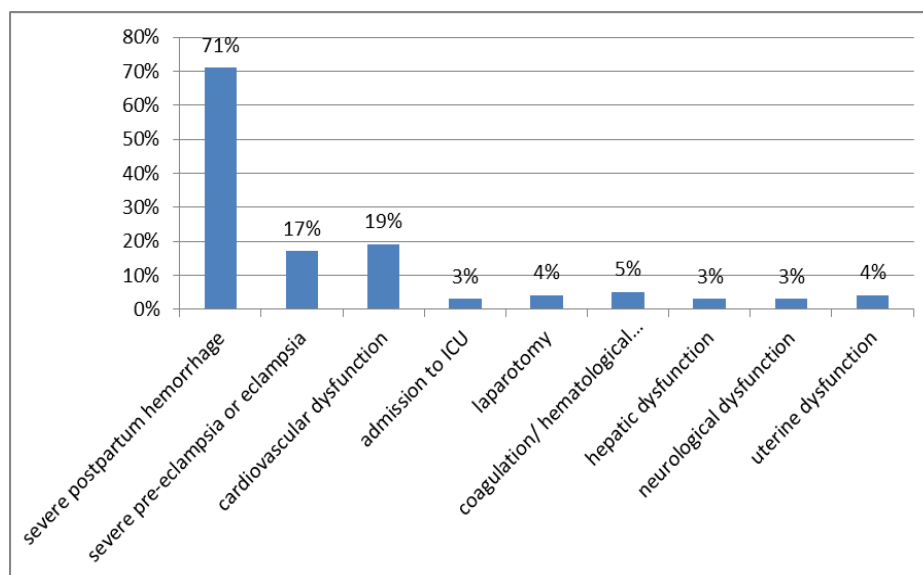
**Figure 1: Causes of maternal mortality.**

The demographic and reproductive characteristics of maternal death cases are shown in (Table 2), which shows that most are in the 18-35 age group (59%). 20% were primigravidae, 47% had 2- 4 pregnancies, and 29% had 5 or more pregnancies. (41%) of maternal deaths occurred during pregnancies, (3%) during labor, and (56%) occurred during the postpartum period. The women who died during the postpartum period were mostly delivered by the caesarian section mode accounting for 61%.

Regarding the maternal near-miss cases, our analysis shows that some women had more than one MNM

criterion. Obstetric hemorrhage topped the list accounting for 71% (92 cases), and all of them needed blood or blood products transfusion. Some were ended by hysterectomy (18%) or bilateral uterine artery ligation and hysterectomy (7%), while some were controlled with bilateral uterine artery ligation (21%).

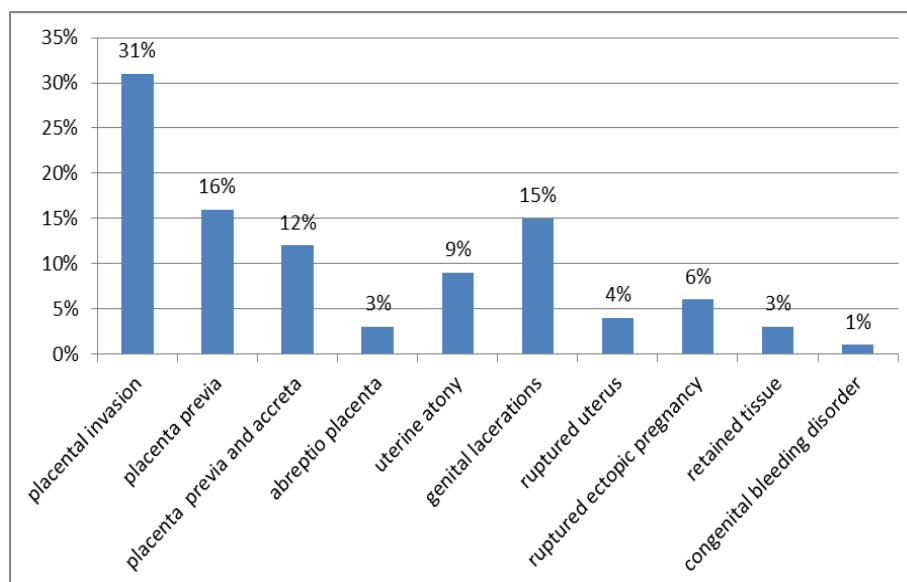
Other less frequent MNM criteria were severe pre-eclampsia, eclampsia and cardiovascular dysfunction contributed to 10%, 7%, and 19%, respectively (figure 2).



**Figure 2: Frequency of maternal near-miss criteria.**

The main cause behind obstetric hemorrhage was found to be placental abnormalities in form of placenta accrete, placenta increta or placenta pericreta (29 cases, 31%), placenta previa (15 cases, 16%), placenta previa & accreta (11 cases, 12%), placental abruption (4 cases,

3%). Other causes were cervical, vaginal, or perineal laceration (14 cases, 15%), uterine atony (8 cases, 9%), ruptured uterus (4 cases, 4%), ruptured ectopic pregnancy (5 cases, 6%), and other less frequent causes shown in (Figure 3).



**Figure 3: Causes of obstetric hemorrhage.**

Like maternal mortality, the maternal near-miss cases were mainly aged 18-35 years accounting for 76%. 16% were primigravidae, 34% had 2- 4 pregnancies, and 42% had 5 or more pregnancies. The MNM cases were mostly 103 (84%) reported at Al-Zahra teaching hospital. 8

cases ended with stillbirth. Of the 157 severe maternal outcome cases, just 9% of women developed severe complications before 24 weeks of gestation. Other demographic and reproductive characteristics are shown in (Table 2).

**Table 2: Demographic and reproductive characteristics of Severe Maternal Outcome.**

| MNM<br>n= 123          |            | MM<br>n= 34 | SMO<br>n= 157 |  |
|------------------------|------------|-------------|---------------|--|
| n (%)                  |            | n (%)       | n (%)         |  |
| Age group              |            |             |               |  |
| <18                    | 4 (3 %).   | 1 (3 %).    | 5 (3 %)       |  |
| 18-35                  | 94 (77 %). | 20 (59 %).  | 114 (73 %)    |  |
| > 35                   | 21 (17 %). | 13 (38 %).  | 34 (22 %)     |  |
| Not mentioned.         | 4 (3 %).   | 0 (0 %)     | 4 (2 %)       |  |
| GA (weeks)             |            |             |               |  |
| <24.                   | 6 (5 %).   | (24 %).     | 14 (9 %)      |  |
| 24-36.                 | 38 (31 %). | 14 (11 %).  | 52 (33 %)     |  |
| 37-42.                 | 52 (42 %). | 12 (35 %).  | 64 (41 %)     |  |
| Not mentioned.         | 27 (22 %). | 0 (0 %).    | 27 (17 %)     |  |
| Gravidity              |            |             |               |  |
| 1                      | 20 (16 %). | 7 (20 %).   | 27 (17 %)     |  |
| 2 - 4                  | 42 (34 %). | 16 (47 %).  | 58 (37 %)     |  |
| 5 or more              | 52 (42 %). | 11 (35 %).  | 63 (41 %)     |  |
| Not mentioned          | 9 (7 %).   | 0 (0 %)     | 9 (5 %)       |  |
| Regular antenatal care |            |             |               |  |
| Yes.                   | 29 (24 %). | 29 (85 %).  | 58 (37 %)     |  |
| No.                    | 4 (3 %).   | 2 (6 %).    | 6 (4 %)       |  |
| Not mentioned.         | 90 (73 %). | 3 (9 %).    | 93 (59 %)     |  |
| Mode of delivery       |            |             |               |  |
| Vaginal.               | 32 (26 %). | 8 (24 %).   | 40 (25 %)     |  |
| CS.                    | 81 (65 %). | 11 (32 %).  | 92 (59 %)     |  |
| Laparotomy (ectopic)   | 3 (2 %).   | 1 (3 %).    | 4 (3 %)       |  |
| During pregnancy       | 7 (6 %).   | 14 (41 %).  | 21(13 %)      |  |

As risk factors for maternal near-miss, previous caesarian section history was found in 41%, gestational hypertension in (18%) about only half of them were on antihypertensive treatment (55%), anemia in (20%), and only (0.8%) reported gestational DM (Table 3).

**Table 4: Risk factors associated with maternal near-miss cases.**

| Risk factor     | %    |
|-----------------|------|
| Previous CS     | 41%  |
| Gestational HT. | 18%  |
| Anaemia.        | 20%  |
| Gestational DM. | 0.8% |

## DISCUSSION

The maternal near-miss ratio and severe maternal outcome ratio, (indicators give an estimation of the amount of care and resources that would be needed<sup>[2]</sup>) were found to be low (1.3/ 1000 live births) and (1.6/ 1000 live births) respectively. They were lower than that reported in a study carried out in major public hospitals in Egypt, Lebanon, Palestine, and Syria (7.8/1000 live births and 8.5/1000 live births)<sup>[4]</sup>, and also lower than that reported in a study carried out in Baghdad

(5.06/1000 live births).<sup>[5]</sup> The registered maternal near-miss mortality ratio (a higher ratio indicates better care) was only 3.6, which is much less than the estimated 15 cases of maternal near-miss for every maternal death.<sup>[6]</sup> The mortality index (21.7%) in our study was higher than the overall mortality index (7.8%) of four countries Egypt, Lebanon, Palestine, and Syria.<sup>[4]</sup> Also, higher than Baghdad(11.03%)<sup>[5]</sup> which reflects the lower quality of care.<sup>[2]</sup> This may be because the MNM surveillance system was in its initial steps during the study period, where limited cases were documented fully. So these results represent indicators for improving the surveillance system together with improving the quality of care.

Our results show that the most common cause of maternal near-miss was obstetric hemorrhage which was responsible for more than two-thirds of cases with a prevalence of 71%, which is comparable to a study carried out in Baghdad, Iraq.<sup>[5]</sup> While in a large multicentre study in the USA, the prevalence of obstetric hemorrhage was only 0.3%.<sup>[6]</sup> A PPH prevalence of 2.2% was observed in a study in Nigeria, which is double the prevalence reported for a study in Brazil, which used the same WHO criteria and standard definitions for outcome

measures.<sup>[7]</sup> Our prevalence of obstetric hemorrhage is much higher than that estimated for the African region, 10.5%, and the reported global prevalence of 5–12%.<sup>[8,9]</sup> By analyzing the causes behind this high prevalence of hemorrhage as an indicator of MNM, the most common cause was found to be intrapartum hemorrhage rather than just PPH, in which abnormal penetration of the placenta into the uterine wall represented more than one-third of obstetric hemorrhage cases, 88 % of which were associated with a history of previous cesarean section. The marked increase in several abnormal penetrations of the placenta into the uterine wall has been attributed to the increasing rate of cesarean sections in recent years. In Al-Najaf province the cesarean section rate increased from 36.5% in 2016 to 43.5% in 2019 and 45% in 2020<sup>[10]</sup>, which is again an indicator of the need to improve the quality of care regarding cesarean section indications to prevent these long term complications, which may need invasive surgical interventions such as hysterectomy. In this study, 43 % of abnormal placental adhesion ended with a hysterectomy to control bleeding. This result is similar to a systematic review on emergency postpartum hysterectomy for uncontrolled PPH (38%).<sup>[11]</sup>

Uterine atony counted for 9 % of obstetric hemorrhage cases, whereas the atonic uterus was the most frequently reported cause of bleeding for near-miss cases in a systematic review of maternal near-miss and mortality due to postpartum hemorrhage.<sup>[12]</sup> Uterine atony, genital laceration, and ruptured uterus together accounted for 28 % of obstetric hemorrhage cases, a high result that requires quality intrapartum care.

About one-quarter of obstetric hemorrhage cases were complicated by shock, and one-quarter ended with hysterectomy to control bleeding and save the mother's life. But timely intervention with life-saving treatment and attention by senior medical personnel for patients with obstetric hemorrhage was not documented. Life-threatening PPH is considered a test of resources and organizational effort. The availability of drugs and interventions to stop hemorrhage are equally as important as funding and policy to raise standards of health care.<sup>[12]</sup> So increased availability of senior obstetric personnel during emergencies and training of junior personnel for immediate response to life-threatening hemorrhage could potentially improve maternal outcomes from severe bleeding.

Cardiovascular dysfunction was the second most frequent MNM indicator accounting for 19%, as this category includes both heart problems, and signs of shock associated with and complicated severe bleeding.

Hypertensive disorders complications i.e. severe preeclampsia and eclampsia represented the third most common cause, 17%, of MNM, as compared to a study in Syria, where they were the leading causes of maternal near-miss.<sup>[13]</sup>

Previous caesarian section, gestational hypertension, and anemia were the most common risk factors that were found to be associated with maternal near-miss cases. This may be due to poor commitment to caesarian section indications and obstetric guidelines, and to antenatal care guidelines and counseling, as we noticed that antenatal care status was not regularly documented in the MNM records and only about half of the hypertensive pregnant women were on treatment.

The reported maternal mortality ratio, 34/ 100000 live birth, is comparable to that reported in Najaf in the previous year, 2017, which was 31/ 100000 live birth<sup>[14]</sup>, and to that reported nationally in Iraq, 32/ 100000 live birth during the same period.<sup>[15,16]</sup> While the WHO estimates maternal mortality in Iraq for the same period is 79/ 100000 live birth. Globally the maternal mortality ratio estimates for the year 2017 was 211/ 100000 live birth, and it was 149/ 100000 live birth in the Arab World, and 57/ 100000 live birth in the Middle East.<sup>[17]</sup>

The most common cause of death was thromboembolism, mainly pulmonary embolism, accounting for about one-third of cases, as compared to hemorrhage, the most common cause of maternal death nationally and globally. This may be due to good control of bleeding and appropriate time of intervention when bleeding occurs, as most deliveries, 99.8 % in Najaf during the study period were facility delivery<sup>[15,16]</sup>, due to strict regulations of home deliveries followed by Najaf DOH in response to maternal deaths accrued during previous years when PPH was the most frequent MM cause at the area during 2013-2015.<sup>[18]</sup> In contrast, a study carried out in Damascus, Syria found that hemorrhage was the leading cause of maternal mortality (60%).<sup>[13]</sup> A WHO systematic review of the global causes of maternal mortality found that obstetric hemorrhage was the leading cause, with PPH accounting for two-thirds of all such deaths.<sup>[19]</sup> PPH reportedly accounts for up to 30% of maternal deaths in Africa and Asia.<sup>[20]</sup> Therefore, improving severe bleeding recognition and response times along with improved team communication may significantly improve patient outcomes and decrease maternal mortality due to hemorrhage as a result.

As thromboembolism, sepsis and hypertensive disorders are the three forefront causes of maternal deaths, this necessitates preventive and treatment measures to be taken strictly according to guidelines. In contrast, the most common 3 causes nationally were PPH, hypertensive disorders, and pulmonary embolism respectively.<sup>[15,16]</sup>

Surprisingly, a high percentage, 25% of the total SMO cases were in the risky age group, less than 18 or more than 35, and 41% of SMO cases were the risky mother whose gravidity was 5 or more. A result that highlights the importance of family planning measures and preconception care, especially in risky groups. 21% of

the total SMO cases occurred during pregnancy, of which 14 % occurred while the gestational age is less than 24 weeks. That mandates good antenatal care to be offered.

A strength of the present study is that it is the first study in Najaf province tackling maternal near miss and maternal mortality prevalence and indicators and thereby to adopt all the necessary efforts and programs in order to improve quality of care in our city.

### Limitations of this study

The main limitation relates to it is the poor documentation and incomplete availability of data on risks and confounding factors associated with maternal mortality and near-miss cases. Also, our study was conducted in only Al-Najaf province, therefore our results cannot be generalized to the overall our country Iraq.

### CONCLUSION

The most common cause of maternal mortality was pulmonary embolism but that for the maternal near-miss was obstetric hemorrhage, with a maternal near-miss to mortality ratio of only 3.5 necessitating better surveillance and quality of care.

### Recommendations

Further research is needed to compare prevalence of maternal near-miss cases and maternal deaths which is better to be done prospectively in order to study in detail the standard care for the prevention of every complications during pregnancy, delivery or puerperium.

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### Competing interests

The authors declare that there is no conflict of interest.

### Author Contributions

The author wrote, read and approved the final manuscript.

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### REFERENCES

1. Say L, Souza JP, Pattinson R. Maternal near miss – towards a standard tool for monitoring the quality of maternal health care. *Best Pract Res Clin Obstet Gynaecol*, 2009; 23: 287–296.
2. World Health Organization. Improving the quality of maternal and perinatal health care. Conducting a maternal near-miss case review cycle at hospital level. Geneva: World Health Organization, 2016.
3. World Health Organization. Evaluating the Quality of Care for Severe Pregnancy Complications: The WHO Near-Miss Approach for Maternal Health. Geneva: WHO, 2011.
4. Hyam Bashourl, Ghada Saad-Haddad, Jocelyn DeJong, et al. “A cross-sectional study of maternal ‘near-miss’ cases in major public hospitals in Egypt, Lebanon, Palestine, and Syria.” *BMC Pregnancy and Childbirth*, 2015; 15: 296.
5. Maysoon Jabir, Imad Abdul-Salam, Dhikra M Suheil, et al. “Maternal near miss and quality of maternal health care in Baghdad, Iraq.” *BMC Pregnancy and Childbirth*, 2013; 13: 11.
6. Rocha-Filho EA, Costa M, Cecatti JG, Parpinelli MA, Haddad SM, Pacagnella RC, et al. Severe maternal morbidity and near miss due to postpartum hemorrhage in a national multicentre surveillance study. *Int J Gynaecol Obstet*, 2015; 128: 131–6.
7. JO Sotunsa, AA Adeniyi, JO Imaralu, B Fawole, O Adegbola, CO Aimakhu, AS Adeyemi, K Hunyinbo, OA Dada, OO Adetoro, OT Oladapo, Maternal near-miss and death among women with postpartum hemorrhage: a secondary analysis of the Nigeria Near-miss and Maternal Death Survey, *BJOG*, 2019; 126(S3): 19–25.
8. Waterstone M, Bewley S, Wolfe C. Incidence and predictors of severe obstetric morbidity: a case-control study. *BMJ*, 2001; 322: 1089–94.
9. Carroli G, Cuesta C, Abalos E, Gulmezoglu AM. Epidemiology of postpartum hemorrhage: a systematic review. *Best Pract Res Clin Obstet Gynaecol*, 2008; 22: 999–1012.
10. Amal Abdul Mahdi Kadhim, Amel Faraj Flaih, Hanaa Hameed Abbas Alheidery. “Placenta accreta spectrum: maternal near miss.” *Profiles evaluation of infection of camels with T evansi*, 2020; 23: 20.
11. Rossi A, Lee R, Chmait R. Emergency postpartum hysterectomy for uncontrolled postpartum bleeding: A systematic review. *Obstet Gynaecol*, 2010; 115: 637–644.
12. Salome Maswimel, Eckhart Buchmann, A systematic review of maternal near miss and mortality due to postpartum hemorrhage, *Int J Gynecol Obstet*, 2017; 137: 1–7.
13. Yara Almerie, Muhammad Q Almerie, Hosam E Matar, et al. “Obstetric near-miss and maternal mortality in a maternity university hospital, Damascus, Syria: a retrospective study.” *BMC Pregnancy and Childbirth*, 2010; 10: 65.
14. MOH, Iraq, Annual statistical report, 2017.
15. MOH, Iraq, Annual statistical report, 2018.
16. MOH, Iraq, Annual statistical report, 2019.
17. WHO, UNICEF, UNFPA, World Bank Group, and the United Nations Population Division. Trends in Maternal Mortality: 2000 to 2017. Geneva, World Health Organization, 2019.

18. MOH, Iraq, Report on maternal mortality in Iraq 2013- 2015, 2016.
19. Say L, Chou D, Genmill A, et al. Global causes of maternal death: A WHO systematic analysis. *Lancet Glob Health*, 2014; 2: e323–e333.
20. Khan KS, Wojdyla D, Say L, Gulmezoglu AM, Van Look PFA. WHO analysis of causes of maternal death: a systematic review. *Lancet*, 2006; 367: 1066–74.