Autopsy versus Clinical Decisions Regarding Causes of Maternal Death in Iraq

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Abstract

Background: Complications during pregnancy and childbirth are a leading cause of death and disability among women in developing countries. The target for mortality reduction is important, yet accurate data of maternal mortality remains challenging as reporting errors including misclassification of cause of death continue to pose a major challenge. Objectives: This study aimed to identify if there is any discrepancy between clinical and autopsy causes of maternal death. Methods: A review of all maternal deaths records that had two sources for registered cause of death; one made by the obstetrician depending on clinical setting and the other by forensic medicine after autopsy and search for any discrepancies between the two sources. Results: A total of 468 maternal death reports were reviewed; the discrepancies were more with the second commonest cause of maternal death in Iraq which is pulmonary embolism. The review revealed that 10.1% of those clinically died because of pulmonary embolism turned to be dead from other causes; 8.7% of them from postpartum hemorrhage, and the rest from sepsis and other indirect causes. Conclusion: There is a substantial discrepancy between clinical and autopsy causes of maternal death which necessitates asking for autopsy in cases of maternal mortality of uncertain cause. The use of maternal death review within 3–6 weeks of death as a tool to identify causes of maternal deaths is recommended.

Keywords: Autopsy, causes, Iraq, maternal death, postpartum hemorrhage, pulmonary embolism

INTRODUCTION

Maternal mortality remains challenging especially in developing countries, despite global efforts to reduce it.[1,2] The World Health Organization stated that maternal mortality ratio has dropped worldwide by 44% between 1990 and 2015.[3] About 295 000 women died during and following pregnancy and childbirth in 2017. The vast majority of these deaths (94%) occurred in low-resource settings.[4] They die mainly as a result of complications during and following pregnancy and childbirth most of which are preventable or treatable. Other complications may exist before pregnancy but are worsened during pregnancy, especially if not managed as part of the woman’s care. The major complications that account for nearly 75% of all maternal deaths are: Severe bleeding, infections, hypertension (pre-eclampsia and eclampsia), complications from delivery and unsafe abortion. The remainder are caused by or associated with infections (malaria or HIV-AIDs) or related to chronic conditions such as cardiac diseases or diabetes.[5]

In developing countries, postpartum hemorrhage remains the commonest cause of death followed by pulmonary embolism, hypertensive disorders during pregnancy, and sepsis in addition to the indirect causes among which the commonest is cardiac diseases among mothers.[1,2]

A proper knowledge of the causes of maternal death is necessary condition to reduce maternal deaths through evidence-based health planning to choose and adopt proper surveillance, sound antenatal care, emergency obstetric care, and postnatal care. Verbal autopsies or the review of clinical data, have shown a high degree of misclassification regarding maternal deaths.[1]

Situation in Iraq

In Iraq, maternal mortality was usually underestimated, and the official rates depend on surveys rather than other

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How to cite this article: Ghalib Yassin BA, Hassan AL-Safi AM, AL-Saneed EH. Autopsy versus clinical decisions regarding causes of maternal death in Iraq. Indian J Community Med 2022;47:177-81.

Received: 13-03-21, Accepted: 25-10-21, Published: 11-07-22

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registrations. Ministry of Health, in an effort to improve their registration system through the cooperation between the Maternal and the Child Health Section (Directorate of Public Health and Primary Health Care), Department of Health and Vital Statistics (Directorate of Planning and Resource Development), and the World Health Organization implemented a special maternal mortality inquiry form for hospital registrations of maternal deaths on the year 2000, and eventually, all professionals responsible for registration and prevention of maternal deaths, all over Iraq, were trained to record, supervise and study the deaths one by one. This form was revised and improved later to include more information regarding maternal mortality.[6,7]

Maternal mortality surveillance revealed that postpartum hemorrhage remains the first cause of maternal death during 2010–2018, pulmonary embolism was the second cause of death during 2010–2016, and the third cause of maternal deaths during both 2017 and 2018 leaving the second cause for hypertension.[8-12] Despite all these effort, many maternal deaths are still not correctly identified, and Iraq was among the 15 countries with high maternal mortality ratio during 2017 according to the Fragile States Index.[4]

**Rationale of the study**

Finding the actual cause of death among deceased mothers is critical in deciding proper management of at risks and allocating resources. Autopsy although remained the gold standard for cause of death determination, yet it is not free of limitations as it is an invasive procedure, often not accepted by the relatives, and requires trained pathologists to perform it.[13]

**Objectives**

This study aimed to compare the causes of maternal deaths stated according to the review of clinical data with those confirmed by autopsy, the gold standard for cause of death investigation.

**Methodology**

A review of maternal deaths records was performed in the Ministry of Health-Iraq, Public Health Directorate, Primary Health Care Section, Maternal and Child Health Unit. This section is responsible for supervising, planning, implementation, monitoring, and evaluation for nearly all the services and programs related to maternal and child health. Reports regarding maternal deaths from all Iraqi governorate are reviewed and studied at the unit by the Central Committee for Maternal Mortality Surveillance. Consultants in Gynecology and Obstetrics and Community Medicine and managers of different sections in the Ministry of Health are members of this committee. Similar Mini committees are present at all Directorates of Health in Iraq’s governorates.

According to the Iraqi Ministry of Health, each maternal death should be notified by the obstetrician or birth attended within 24 h, urgent meeting with the maternal mortality committee at the Directorate of Health should be conducted on the next day to study the case, evaluate the service provided, identify the areas of under care and to act accordingly. Then the report should be sent to the Central Committee for Maternal Mortality Surveillance for further analysis. All these procedures are under and confidential inquiry aiming to find the exact cause and circumstances for each maternal death to prevent recurrance. Identifying the exact cause of death is essential for issuing the death certificates in Iraq according to the Iraqi Public Health law. If the cause of death is not certain for any reason the deceased should be referred to the Forensic Medicine for autopsy and maternal deaths are no exception. However, postmortem examination, being invasive, is usually not well accepted by deceased relatives and in certain circumstances, postmortem examination will be suspended according to official order from a judge.

In the current study, all maternal deaths records received centrally from 2010 to 2018 were reviewed and those with dual registration for the cause of death; one as a result of reviewing history and clinical data and the other after performing postmortem autopsy, were studied and compared.

Official approvals were obtained from the Scientific Committees at both Ministry of Higher education and the Ministry of Health after ensuring confidentiality.

Data were analyzed using Microsoft Excel 2016. Continuous variables were presented as mean ± standard deviation (SD) and categorical variables were presented as frequency and relative frequency.

**Results**

A total of 468 maternal deaths’ records were reviewed, the age of the deceased ranged from 15 to 46 years with the mean of 31 years ± 7.8 SD maternal mortality was highest among women aged 30–39 years (42.3%) and lowest among those younger than 20 years (5.1%).

Table 1 shows the discrepancy in registering the cause of death between patient’s records according to the treating obstetrician and that written in the death certificate depending on autopsy reports for the 468 deceased women that had both reports postpartum hemorrhage was the highest cause in both clinically and according to autopsy followed by pulmonary embolism then hypertension.

Table 2 shows the compatibility and incompatibility of causes of death between clinical decision and autopsy. No discrepancy was found in bleeding during early pregnancy (before 22 weeks). The highest proportion of incompatibility was found with pulmonary embolism; among 138 cases diagnosed clinically as pulmonary embolism; 14 (10.1%) were proved wrong by autopsy, as 12 (8.7%) were postpartum hemorrhage, and two cases (1.5%) were sepsis and other indirect causes. Among 127 cases diagnosed clinically as postpartum hemorrhage; only three cases (2.4%) were proved to be obstructed labor/ruptured uterus, hypertension, and other indirect causes by autopsy. As for hypertension among the 70 cases diagnosed by the obstetricians three cases (4.3%) were
Among the Millennium Development Goals is reducing maternal mortality by 2015. Although as stated by World Health Organization, the leading causes of direct maternal deaths are hemorrhage (nearly 3-quarters from postpartum hemorrhage, obstructive labor/rupture uterus, and amniotic fluid embolism), and hypertensive disorders of pregnancy. The most common cause of death in the current study was postpartum hemorrhage followed by Pulmonary Embolism and Hypertension. Globally, as stated by the World Health Organization, the leading cause of indirect maternal deaths is amniotic fluid embolism, and hypertensive disorders of pregnancy, the leading cause of indirect maternal deaths is cardiac disease of the mother. [6]

In Jordan, Okon et al., 2012, stated that the main causes of maternal death were hemorrhage and pulmonary embolism. In the same year, in the Arab League, it was stated that among the direct causes of maternal deaths obstructive labor/rupture uterus (13.0%) were the commonest cause followed by amniotic fluid embolism (12.4%).

In Iraq, teenager’s marriage is increasing and most of the mothers in their twenties are multiparas with the increased risk of complications. In India, Karakas et al., 2017, found that maternal mortality was highest among women aged 30–39 years.

The value of autopsy to determine the cause of maternal deaths in Turkey, 2017, on studying “Causes of Maternal Deaths in Faisalabad, Pakistan,” found that most of their deceased mothers were in age group of 21–25 years comprising 38 (40.0%); whereas Asim et al., 2012, stated that the main causes of maternal death in Pakistan were hemorrhage and pulmonary embolism. The association between causes of death and incompatibility was statistically not significant; Chi-square: Goodness of fit, P > 0.05.

In the current study, the age of the deceased ranged from 15 to 46 years with the mean of 31 ± 8 years. Material mortality was highest among women aged 30–39 years. In Iraq, teenager’s marriage is increasing and most of the mothers in their twenties are multiparas with the increased risk of complications. In India, Karakas et al., 2017, found that maternal mortality was highest among women aged 30–39 years.
direct causes of maternal deaths were bleeding, eclampsia, sepsis and embolism. Among the indirect causes background diseases ranked first followed by heart diseases.\cite{19}

In Japan, on studying the status of pregnancy-related maternal deaths found that maternal deaths were frequently caused by obstetric hemorrhage (23%), brain disease (16%), amniotic fluid embolism (12%), cardiovascular disease (8%), and pulmonary disease (8%).\cite{20} Later Hasegawa \textit{et al.} found that obstetric hemorrhage decreased from 29% during 2010 to 7% during 2017.\cite{21}

Globally, the most important fatal condition for which there is a lack of autopsy evaluation is maternal death.\cite{22} In Iraq the idea of sending deceased women for postmortem examination is not always accepted culturally, and most of those referred to the forensic medicine postmortem examination are postponed after issuing official agreement from a specialized judge, keeping the exact cause of death unknown. Castillo \textit{et al.}\cite{13} found that the minimally invasive autopsy method including evaluating samples of body fluids in terms of histology and microbiology, could give clue in certain cases like infections.

Data from developed countries revealed that pulmonary thromboembolism and, amniotic fluid embolism were on top of the list followed by primary postpartum uterine hemorrhage, infection, and complications of hypertension.\cite{23} Although this sequence, in the current study, was found depending on both the autopsy results and the clinical decision, yet a discrepancy was found in registering the cause of death between patient’s records according to the treating obstetrician and that written in the death certificate depending on autopsy reports. This was obvious in cases diagnosed by records as pulmonary embolism and found to be postpartum hemorrhage by autopsy, this could be attributed to that death from postpartum hemorrhage, especially in hospital with all needed facilities is usually considered as failure of the medical professional to perform their tasks as expected, or the deceased reached the hospital in late stage that the health provider face difficulty in identifying the exact cause. The same discrepancy was noticed in the Japanese study which emphasized that the necessity of autopsies should be more widely accepted in Japan,\cite{21} supported by another study that considered maternal autopsy as important procedure for understanding the cause of deaths in nearly half of the cases of maternal deaths.\cite{13}

**CONCLUSION**

Most of the deceased mothers, especially in developing countries, died from causes need not be fatal. The determination of the etiologies of maternal mortality must be a priority to achieve a significant reduction in maternal mortality. Certainty requires autopsy as a gold standard procedure in diagnosing the exact cause of death. Feasible, acceptable, and accurate postmortem methods could provide the necessary evidence to improve the understanding of the real causes of maternal mortality, planning a proper program of interventions to reduce this burden.

The use of maternal death review within 3–6 weeks of death as a tool to identify causes of maternal deaths is recommended.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

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**Table 2: Compatibility of causes of death between clinical decision and autopsy**

| Cause of death                              | Clinical diagnosis compatible with autopsy, n (%) | Clinical diagnosis incompatible with autopsy, n (%) | Total, n (%) | P Value |
|--------------------------------------------|--------------------------------------------------|--------------------------------------------------|--------------|---------|
| Bleeding during early pregnancy            | 21 (4.9)                                         | 0                                                | 21 (4.4)     |         |
| APH                                        | 15 (3.5)                                         | 3 (7.9)                                          | 18 (3.9)     |         |
| PPH                                        | 124 (28.8)                                       | 3 (7.9)                                          | 127 (27.1)   |         |
| Obstructive labor/rupture uterus           | 23 (5.4)                                         | 1 (2.6)                                          | 24 (5.1)     |         |
| HT                                         | 67 (15.6)                                        | 3 (7.9)                                          | 70 (15)      | >0.05*  |
| Sepsis                                     | 16 (3.7)                                         | 2 (5.3)                                          | 18 (3.9)     |         |
| Pulmonary embolism                         | 124 (28.8)                                       | 14 (36.8)                                        | 138 (29.4)   |         |
| Renal disease                              | 12 (2.8)                                         | 2 (5.3)                                          | 14 (3)       |         |
| Others/indirect causes                     | 28 (6.5)                                         | 10 (26.3)                                        | 38 (8.1)     |         |
| Total                                      | 430 (100.0)                                      | 38 (100.0)                                       | 468 (100.0)  |         |

*The association between causes of death and incompatibility was statistically not significant; Chi square: Goodness of Fit p > 0.05. APH: Antepartum Hemorrhage, PPH: Postpartum hemorrhage, HT: Hypertension*
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