Factors contribute to the incidence of maternal death among pregnant women in Diyala Governorate, Iraq

Abstract: The mortality of a woman during pregnancy, childbirth, and within 42 days after giving birth has an immediate detrimental effect on both her family and community. Annually, it is estimated that over 770 women in the United States die due to pregnancy or complications associated to pregnancy. Maternal mortality is a significant medical issue that places a strain on the global healthcare system and necessitates meticulous investigation to identify its underlying causes. This prospective study was carried out to examine the various factors that influence maternal mortality among pregnant women in the Diyala Governorate. Assuming that the elements that govern maternal mortality include age, cause of death, residency, and number of children, these factors were involved in this study. A cross-sectional study was conducted among 75 pregnant women in Diyala Governorate to assess these characteristics. The aim was to determine the link between maternal mortality and parameters such as age, causes of death, residency, and parity among women. Study results revealed that the predominant number of fatalities among women took place within the age range of 21 to 30, with the subsequent highest occurrence observed among women aged 31 to 40. Cardiovascular disease was the primary determinant of these deaths, representing 43% of all mortality causes. Uterine hemorrhage was the second most common cause of mortality, responsible for 29% of all deaths. The survey also found that women residing in rural areas had a significantly greater mortality rate, accounting for 53%, as compared to their urban counterparts; in addition, the survey revealed that 76% of the female population consisted of multigravida women, indicating that they had experienced numerous pregnancies, in contrast to primigravida women who were pregnant for the first time. Study's findings posit that cardiovascular disease is the leading cause of death for women overall, particularly among younger women (those aged 21–30), rural women, and women who have already given birth many times.

INTRODUCTION

Maternal death refers to the demise of a woman during pregnancy, childbirth, or within 42 days after the termination of pregnancy; This includes deaths caused by factors directly related to or worsened by the pregnancy or its management, excluding accidental or incidental causes. The duration and location of the pregnancy are irrelevant in this definition (1,2); in 2017, global maternal mortality decreased by 44% compared to the levels recorded in 1990. However, even with this decline, a total of 830 women lost their lives due to complications arising from pregnancy or childbirth; the vast majority of these fatalities can be avoided entirely.

In 2015, around 303,000 women worldwide lost their lives due to issues associated with pregnancy or childbirth; hemorrhaging and complicated childbirth are the primary factors contributing to maternal fatalities. The global maternal mortality ratio has declined from 385 maternal deaths per 100,000 live births in 1990 to 216 maternal deaths per 100,000 live births in 2015, as women have obtained access to family planning and skilled birth attendants with backup emergency obstetric treatment; the maternal mortality rates in numerous countries have been reduced by 50% over the past decade (3).

It is essential to distinguish between direct and indirect maternal mortality, which refers to deaths caused by difficulties during pregnancy, childbirth, or medical care (4); maternal mortality primarily arises in developing nations as a result of problems during pregnancy, delivery, and the postpartum phase (5). The US maternal mortality rate experienced a significant rise of 16.8% in 2020, mainly due to the impact of the COVID-19 pandemic. The preventability of most of these deaths arises from their primary causes, which include bleeding, infection, hypertension (including eclampsia), delayed or obstructed labor, and botched abortion (6). The maternal mortality ratio highlights the prominent disparity between established and developing nations, as well as the distinction between affluent and impoverished women within the same countries. (7).
The leading causes of maternal mortality were postpartum hemorrhage and infection, although secondary factors such as anemia and cardiovascular issues could further complicate pregnancy. Both the mother's age and obesity are risk factors. Adolescent females are at a greater susceptibility to experiencing problems and mortality during pregnancy compared to elder females. Adolescent moms face an elevated exposure to postpartum hemorrhage, puerperal endometritis, vaginal birth, and episiotomy, all of which can contribute to maternal death. Maternal mortality can be influenced by the presence of family support or the experience of social isolation. Unsafe abortion is a significant contributor to maternal mortality. According to the World Health Organization (W.H.O.) in 2009, a woman died every eight minutes due to complications such as bleeding, infection, and genital damage resulting from a hazardous abortion, the incidence rate is 41 instances per 100,000 live births in industrialized countries and 23 cases per 100,000 live births in poor countries.

Previous studies have examined mortality rates among women in various countries, but they have not specifically addressed maternal mortality among pregnant women in Diyala government. The objective of our study is to investigate the factors contributing to maternal mortality in Diyala city.

Patients and methods:

No patient was involved in this study. It was a cross-sectional study; the criteria included 75 case records of maternal deaths in Diyala governorate in the forensic medicine department from the first of January. 2017 to 31 December 2021, the Inclusive Forensic Medicine Department is the referral center for all maternal deaths in the Diyala governorate. Data were collected from the 75 case records; Points studied included (name, age, residency, and causes of death).

Research ethics:

Ethical approval was obtained from the University of Diyala, Baqubah Medical Faculty. Data were collected from the forensic medicine department in the Diyala government and extracted from patient records without identification of the subject. Data abstraction forms were filled in after death; therefore, study inclusion did not affect the treatment.

Statistical analysis:

Data analysis was performed using IBM SPSS statistics for Windows version 20. Microsoft Excel for Windows 2010. Data analysis was performed using Qualitative variables of parameters expressed as number and percent; a T-test was used to determine the significance of differences between groups composed from continuous variables; the significance level was (0.05) in all statistical testing.

RESULTS AND DISCUSSIONS

The total number of maternal deaths during the study period was (75). The maternal mortality ratio was (37). The highest mortality was in the age group of (21 – 30) years (52%) and the 2nd age group was (31 – 40) years (30.7%), as shown in the table and figure (1). According to the cause of death, cardiovascular diseases form (45.3%), followed by uterine bleeding (29.3%), as shown in table and figure (2). Rural residents form (53.4%) while urban residents form (46.6%) as shown in table and figure (3). The majority of maternal deaths were multigravida (76%) while primigravida form (24) as shown in table and figure (4).

<table>
<thead>
<tr>
<th>Age group / year</th>
<th>Maternal death number</th>
<th>Percentage of maternal death</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 20</td>
<td>7</td>
<td>9.3 %</td>
</tr>
<tr>
<td>21-30</td>
<td>39</td>
<td>52 %</td>
</tr>
<tr>
<td>31-40</td>
<td>23</td>
<td>30.7 %</td>
</tr>
<tr>
<td>41-50</td>
<td>6</td>
<td>8 %</td>
</tr>
<tr>
<td>Mean Difference</td>
<td>14.75000</td>
<td>-</td>
</tr>
<tr>
<td>T – test</td>
<td>1.893</td>
<td>-</td>
</tr>
<tr>
<td>P - value</td>
<td>0.155 *</td>
<td>-</td>
</tr>
</tbody>
</table>

* The mean difference is significant at the 0.05 level.
The distribution of maternal deaths according to age group

(Figure 1): The distribution of maternal deaths according to age group.

Table 2. The distribution of causes of maternal deaths

<table>
<thead>
<tr>
<th>Causes of maternal death</th>
<th>maternal death number</th>
<th>Percentage of maternal death</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular diseases</td>
<td>34</td>
<td>45.3</td>
</tr>
<tr>
<td>Uterine bleeding</td>
<td>22</td>
<td>29.3</td>
</tr>
<tr>
<td>Hypertension and eclampsia</td>
<td>7</td>
<td>9.4</td>
</tr>
<tr>
<td>Infection</td>
<td>7</td>
<td>9.4</td>
</tr>
<tr>
<td>Rupture ectopic</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Cerebrovascular accident</td>
<td>2</td>
<td>2.6</td>
</tr>
<tr>
<td>Total</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>Mean difference</td>
<td>15.42857</td>
<td>-</td>
</tr>
<tr>
<td>t-test value</td>
<td>1.550</td>
<td>-</td>
</tr>
<tr>
<td>p-value</td>
<td>0.172*</td>
<td>-</td>
</tr>
</tbody>
</table>

* The mean difference is significant at the 0.05 level.

(Figure 2): The distribution of causes of maternal deaths
Table 3. The distribution of the maternal deaths according to the residency.

<table>
<thead>
<tr>
<th>Residency</th>
<th>Number of maternal deaths</th>
<th>Percentage of maternal death</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>40</td>
<td>53.4</td>
</tr>
<tr>
<td>Urban</td>
<td>35</td>
<td>46.6</td>
</tr>
<tr>
<td>Total</td>
<td>75</td>
<td>100</td>
</tr>
</tbody>
</table>

Mean difference: 35.5

\[ t\text{-test value} = 14.2 \]

\[ p\text{-value} = 0.045^* \]

* The mean difference is significant at the 0.05 level.

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Table 3. The distribution of parity in maternal deaths

<table>
<thead>
<tr>
<th>Parity</th>
<th>Percentage of maternal death</th>
<th>Maternal death number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primigravida</td>
<td>18</td>
<td>24</td>
</tr>
<tr>
<td>Multigravida</td>
<td>57</td>
<td>76</td>
</tr>
<tr>
<td>Total</td>
<td>75</td>
<td>100</td>
</tr>
</tbody>
</table>

Mean difference: 35.5

\[ t\text{-test value} = 1.821 \]

\[ p\text{-value} = 0.320^* \]

* The mean difference is significant at the 0.05 level.

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Figure 4. The distribution of parity in maternal deaths

The maternal death ratio in Diyala governorate was 37, which aligns with research conducted in Saudi Arabia (17 per 100,000 live births) (14), Jordan (46 per 100,000 live births) (15), and Iran (26 per 100,000 live births) (16). The maternal mortality rate in Turkey is 17 per 100,000 live births (17).
Our study finding shows the commonest age group affected is [21-30] year 52%. This high maternal mortality in this age group could be explained by the fact that this group is the most common group becoming pregnant. Another study, done in October 2018, mentioned that the age group that died during pregnancy is [35-44] years (38.5%), then the age group [25-34] years (14%) (19). Another study done in April 2013 revealed that the most common age group exposed to maternal death is [20-29] years (55.6%), and the 2nd joint age group is below 20 years (33%) (14). A report on maternal death in Washington 2015 mentioned that the commonest age group affected is [20-29] years (47%) because of infection and eclampsia, then the age group [30-39] years (40%) (10). In 2017 study showed the age group affected is [20-35] years (64%) and then the age group [36-50] years (18%) (21).

The findings of our study indicate that cardiovascular reasons accounted for 45.4% of all maternal deaths, whereas uterine bleeding accounted for 29.4%. In contrast to earlier research, a study conducted in April 2006 revealed that the primary cause of the condition is uterine hemorrhage, accounting for 25% of cases, followed by cardiovascular problems at 20%, and infection at 15% (10).

A report in the pregnancy surveillance system C.D.C. mentions that the most common cause of maternal death is cardiovascular diseases (25.5%), followed by infection (12.8%) due to unsafe abortion and then uterine bleeding (11.5%). In 2018 Neel Shah demonstrated that the first Common causes of maternal death are cardiovascular diseases (15.2%) then infection (13%) and uterine bleeding (11%) (18). While in 2017, a study done by Lachmi R-Jordan revealed that uterine bleeding is the first cause of maternal death (20), then cardiovascular diseases (19%) (21). In 2019, another study found that women in their 20s tend to have few complications during pregnancy and mostly hemorrhage. Below 20, the risk of death is high because of eclampsia and uterine bleeding (22). The findings of our study differ from other studies in the percentage of cardiovascular causes because we have a low infection rate. Still, other studies have a high rate of infection due to the high rate of induced abortion.

Our study finds, the maternal mortality was highest (53.4%) among rural resident’s women and that come from urban area is (46.6%). This is due to low education, mid wife and shortage in health care in rural area. In 2017, Lauren M. Rossen shows that (65%) come from urban area this is differ from other study because high rate of induced abortion (23). While study results that done in Pakistan 2021 reveled to, (14%) of maternal mortality were comes from urban area and (61%) from rural area in India. According to parity the primigravida is (24%) and the multigravida is (76%). This high percent among multigravida is due to multi cesarean section make the uterine wall weak and more liable for rupture and bleeding (22). In 2008 Rohuljabeen shah shows that (56%) of maternal death is multigravida and (29%) are primigravida (25). On other side study that done by Begum S, Aziz in 2003 reveled to, (69%) of maternal death is in multigravida and (31%) in primigravida (20).

The primary limitations of our study are the small sample size, which was restricted to pregnant women over a period of 3 years and limited to participants from a single city. Additionally, our study focused on specific critical factors that contribute to maternal mortality, rather than examining a broader range of factors that may influence it.

CONCLUSIONS
In this study, the most common age group for maternal mortality is 21-30 years (52%) and the leading cause is cardiovascular disease (45.4%), followed by uterine bleeding (29.4%). Most cases occur in rural areas (53.4%) and multigravida (76%).

Authors’ contributions
(Youssef S. Yasin and MohammedA. Farhan) was involved in the conception and design of the study, carried out the analysis and wrote the first draft of the paper. (MohammedT. Hamad) assisted with the conception and design of the study and contributed to the writing of the paper. All authors read and approved the final draft of the paper.

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REFERENCES
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