



*Etiology of maternal deaths in a tertiary care hospital in Oman, over 27 years (1991-2017)*

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***Abstract***

***Background:*** Maternal mortality was specifically targeted by the WHO Millennium Development Goal 5 (MDG-5) which required reducing the maternal mortality ratio (MMR) by three quarters between 1990 and 2015. Although maternal MMR has changed in the Eastern Mediterranean Region, the trend of maternal deaths in the countries of the region is important.

***Methods:*** This was a retrospective chart review for 27 years. Data was collected from the delivery ward register and Hospital Information System.

***Results:*** There were 18 maternal deaths out of 62849 live births making the MMR 28.6 per 100,000. The direct causes were embolism **and hemorrhage** 3 for each, sepsis 2 and abortion 2. The indirect causes were sickle cell disease (n=2), cardiac lesions (n=2), retroviral infection (n=1), and metastatic adenocarcinoma (n=1), Road traffic accident (n=1) and one with unknown cause brought dead (n=1).

***Conclusion:*** Indirect causes contributed to maternal death over 27 years, especially **in second half of the study period.**

***Keywords:*** Maternal mortality, Causes of death, Risk factors, Oman.



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**Introduction:**

World Health Organization (WHO) defines the maternal mortality as "Death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes"<sup>1</sup>. Maternal mortality ratio (MMR) defines the number of maternal deaths during a given period of time per 100 000 live births<sup>2</sup>. Globally, it is **estimated as 216 per 100 000 live birth in 2015 compared to 385 per 100 000 live birth in 1990 representing drop by 44%**. Still, developing regions over the world represent high unacceptable **MMR reaching 1360 in Sierra Leone in 2015 (the highest MMR in the world)**<sup>3</sup>.

Maternal mortality was specifically targeted by the WHO Millennium Development Goal 5 (MDG-5) which required reducing the MMR by three quarters between 1990 and 2015<sup>4</sup>. The rate of reduction in maternal mortality is only 2.6% as against the expected 5.5 %, according to the Millennium development Goals<sup>5</sup>. Ending of preventable maternal deaths is the key international objective of sustainable development goals (SDG) by 2030<sup>6, 7</sup>. In 2015, MMR was 166 across the Middle East<sup>8</sup>. A review on maternal death helps define the problem, determine its scope, as well as identify the factors involved in and those leading to the problem<sup>9</sup>. Many of the reported maternal deaths and injuries are preventable entirely<sup>10, 11</sup>.

Sultanate of Oman is a high income country and it has achieved about 61% decrease in maternal mortality since 1990<sup>12, 13, 14</sup>. However there is still scope to reduce it further by identifying the variable preventable conditions. Hence this study of maternal deaths over about 27 years was undertaken to check the etiology of maternal deaths in a single tertiary care hospital.

**Material and Methods**

This study was a **retrospective cohort chart** review study included all cases of maternal deaths at SQU hospital in the last 27 years from January 1991 to December 2017. Ethical approval was obtained from Medical research and Ethics Committee#1751.

Maternal death cases **were** collected from the delivery ward register at department of obstetrics and gynecology. A detailed chart review through Hospital Information System (HIS) and hard



copy of the files prior to 2006 (as electronic records available only from 2006) was done to collect the demographic and clinical details.

The main parameters of data collection followed for each maternal characteristic were age, parity, previous medical history, mode of the delivery, estimated blood loss, place of delivery, complications, number of miscarriages, and number of previous caesarean sections, infant weight and death association.

### **Data analysis:**

A descriptive data analysis was done after entering the data into SPSS version 23.0 All the cases were separated by dividing the cases according to the year into two periods, first 14 years (1991-2004) and second 13 years (2004-2017).

### **Results:**

There were 18 maternal deaths out of 62849 live births at SQUH and the maternal mortality ratio is 28.6 per 100,000. Seven cases of maternal mortality occurred in the first period (1991-2004) and eleven cases in the second period (2005-2017).

Table 1 shows the numerical characteristics of the 18 women who died during puerperium, labour and pregnancy during the last 27 years from 1991-2017. Majority of women were at a mean age of 32 years in the whole period (1991-2017), similar mean seen in the first period from (1991-2004) and second period from (1991-2017) .

Ten women died at age of 30-39 years, six women at 20-29 years old and only two women at 40-49 years old. Of the 18 deaths, 16 occurred in hospitals and two at home. All the women were of Omani nationality except one Egyptian female. Majority of women died during child birth and puerperium (13), two after miscarriage and three were still pregnant and not delivered at the time of death. Of the thirteen who had delivered, five were by cesarean section and eight normal deliveries. There were no significant differences in the mode of delivery among all these women.

Table 2 shows the associated complications in these women. The direct and indirect causes of maternal deaths during the two time lines are enumerated in Table 3.

### **Discussion**

Sultanate of Oman is a high income country according to world bank<sup>15</sup>. Though according to the Eastern Mediterranean Region-Framework for health information systems and core indicators for monitoring health situation and health system performance, the MMR has decreased to 11 per 100,000 in 2013 in Oman; our institute rate is a bit higher at almost 28 during almost the same time period. The indirect causes were as much prevalent as the direct causes and actually were slightly more in the period from 2005 to 2017. Most of the women who died were about 32 years old and mean parity was also only two. Though age was found to be a risk factor otherwise in Oman by Islam and Bakhiet it was not a factor in our center. This is because of the small sample and a single center study. Most women in our study had vaginal delivery and cesarean



*section was not a contributor to mortality. In countries like Africa, cesarean section has 50 higher risk of maternal mortality due to cesarean section compared to UK as published by prospective observational cohort study crossed 183 hospitals in Africa<sup>17</sup>.*

*Our findings were very similar to studies published in the gulf region such as Saudi Arabia that shows hemorrhage is the leading cause of death contributing to 43% of the direct maternal deaths and in Bahrain hemorrhage is the second leading cause of maternal mortality<sup>18,19</sup>. Hemorrhage still a life-threatening condition worldwide affecting 130,000 women per year<sup>20</sup>. Embolism is a leading cause of maternal death in UK and also contributed to the direct causes in both Saudi Arabia and Bahrain<sup>21</sup>. Embolism contributed to about 17% in our study.*

*The number of maternal deaths was apparently more in the second 13 years but mainly due to indirect causes. The direct causes were almost similar in both time lines. Sickle cell disease was a major factor in the second half and haemoglobinopathy is a significant factor for morbidity in this part of the world. Availability of matched blood without antibodies is a major challenge especially in parous women, due to the presence of atypical antibodies. The nature of these antibodies is variable and increase with transfusions and makes it difficult to get compatible blood in many instances. Our hospital is a referral center for sickle cell disease and similar experience was noted in Bahrain with reference to sicklers.<sup>19</sup>.*

*The strength of our study is the observation over 27 years and an opportunity to focus on more indirect causes of death than direct causes. The retrospective nature and sample size are the limitations.*

*National committee is formed to review the maternal mortality and recently a near miss committee also is formed to analyze the cases as an initiative to reduce the maternal mortality further.*

**Declaration:**

*The manuscript has been read and approved by all the authors;*

*The requirements for authorship have been met for all the authors, based on the criteria stated by ICMJE.*

*Approval of all the authors regarding the order of authorship is obtained*

*Each author confirms that the manuscript represents honest work.*

*There is no conflict of interest*

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**Table 1: Obstetric data of women who died in 1991-2017**

	<b>Whole period (1991-2017) Mean (SD) (n = 18)</b>	<b>First period (1991-2004) Mean (SD) (n = 7)</b>	<b>Second period (2005-2017) Mean (SD) (n = 11)</b>
<b>Women age</b>	32.17 (5.05)	32.86 (5.64)	31.73 (4.88)
<b>Para</b>	2.89 (2.60)	4.14 (2.85)	2.09 (2.25)
<b>Gravida</b>	4.50 (3.20)	5.57 (3.45)	3.82 (2.99)
<b>Number of miscarriages</b>	1.08 (1.38)	1.00 (1.00)	1.13 (1.64)
<b>Number of previous caesarean sections</b>	0.60 (0.54)	0.50 (0.70)	0.67 (0.57)
<b>Blood loss (ml)</b>	1606 (2259.81)	1550.00 (2313.36)	1662.50 (2560.39)



<b>Infant weight (kg)</b>	3.06 (1.77)	2.63 (0.93)	3.31 (2.20)
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**Table 2: The previous medical history of maternal deaths in 1991-2017**

	<b>First period (1991-2004) frequency (N out of 7)</b>	<b>Second period (2005-2017) frequency (N out of 11)</b>
<b>Previous medical disorder:</b>		
<i>AIDS &amp; retrovirus</i>	1	0
<i>Chronic hypertension</i>	0	1
<i>Hypotension</i>	1	0
<i>Idiopathic thrombocytopenia</i>	1	0
<i>Malignant neoplasm</i>	0	1
<i>Sickle cell disease</i>	0	3
<i>No disorders</i>	4	6

**Table 3: Direct and Indirect causes in the two time lines**

	<b>1991- 2004</b>	<b>2005-2017</b>
<b>Direct Causes</b>		
<i>Hemorrhage</i>	2	1
<i>Embolism</i>	1	2
<i>Miscarriage related</i>	1	1
<i>Sepsis</i>	0	2
<b>Indirect causes</b>		
<i>Cardiac disorders</i>	1	1
<i>Road traffic accident</i>	1	0
<i>Retroviral infection</i>	1	0
<i>Sickle cell disease</i>	0	3

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<i>Metastatic adenocarcinoma</i>	<i>0</i>	<i>1</i>
<i>Unknown, brought dead</i>	<i>0</i>	<i>1</i>