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A 5-year audit of maternal mortality in Mansoura University Hospital, Egypt

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ABSTRACT

Background: This 5-year audit aims to estimate maternal mortality ratio (MMR) and describe causes of deaths as well as demographic and obstetric characters of dead mothers in Mansoura University Hospital (MUH), Egypt.

Methods: A hospital-based retrospective descriptive study was carried out during the period from 2011 to 2015. All obstetric records (case notes, records of labor room, emergency records, and ward admission files) were reviewed for maternal deaths. The following data were abstracted: age, residence, occupation, cause of deaths, gestational age, gravidity, and mode of termination of pregnancy. Causes of maternal deaths were classified as direct and indirect.

Results: During the study period, 23,078 obstetric admissions, 22,323 live births, and 61 maternal deaths were recorded. The MMR declined from 380.8 in 2011 to 145.5/100,000 live births in 2015. Hemorrhage and hypertensive disorders with pregnancies were the two main direct causes of maternal deaths.

Out of the total deaths, 83.6% were in the age group of 21 to 35 years. The majority of maternal deaths (72.1%) belonged to rural areas and 91.8% were non-working. Most of the women who died were primigravida (49.2%). Only 26.2% of the mothers who died received antenatal care. More than half (57.4%) of deaths occurred after 48 hours of admission.

Conclusion: The MMR in MUH is higher than national and regional figures. Adequate antenatal care and early referral of mothers with complications could contribute to reduction of maternal mortality. It is important to establish an audit committee for maternal deaths to determine the trends, causes, quality of care provided, and preventability of the death.

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Introduction

According to the International Statistical Classification of Disease and Related Health Problems, 10th Revision, World Health Organization defined maternal death as the 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 [1]. This definition allows identification of maternal deaths based on their causes as either direct or indirect. Direct obstetric deaths are those resulting from obstetric complications of pregnancy, labor, and post-partum, from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above such as hemorrhage, preeclampsia/eclampsia, complications of anesthesia, or caesarean section. Indirect causes are those resulting from previous existing diseases or diseases that develop during pregnancy and aggravated by physiological effects of pregnancy [2].

Maternal mortality is one of the world's most neglected problems [3]. It has been recognized as a public health challenge in developing countries [4].

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The World Health Organization estimated that more than 80% of maternal deaths could be prevented or avoided through actions that are proven to be effective and available, even in the poorest countries. The fifth Millennium Development Goal (MDG) aims to improve maternal health, with a target of reducing maternal mortality ratio (MMR) by 75% between 1990 and 2015 [5].

Egypt has made substantial progress in achieving this goal [6]. The MMR dropped by 71% from 230 in 1990 to 66/100,000 lives births in 2010. Nevertheless, maternal mortality is still relatively high, and the country faces challenges in reducing it further [7]. Egypt is on the track to achieve this goal and needs to further reduce its MMR to around 44/100,000 live births to reach the fifth MDG [2].

To move effectively toward reducing maternal mortality, it is essential to determine and prioritize the causes of maternal deaths. Avoiding maternal deaths is possible, knowing the level of maternal mortality is not enough, it is important to understand the underlying factors that led to deaths [8]. Maternal death audit is broad and used to describe maternal death case reviews, confidential enquiries, and maternal death surveillance. It is a quality improvement process that seeks to improve patient care and outcomes [8].

Audit of maternal mortality can take the form of simply recording the number of deaths; the causes of deaths can categorized and the potential avoidable factors or suboptimal care can be recorded [9]. Kongnyuy et al. [10] concluded that clinical audit is associated with moderate improvements in obstetric care. As Egypt comes closer to achieving the MDG for maternal deaths, the rate of progress is slowing down. There is a need for accurate assessment of maternal deaths in Mansoura University Hospitals (MUH).

This study aims to estimate the hospital-based MMR and describe its causes, as well as the demographic and obstetric characters of deceased mothers in MUH, Egypt.

Subjects and Methods

This is a hospital-based retrospective descriptive study carried out in the Department of Obstetrics and Gynaecology, MUH, Egypt, during the period from January 2011 to the end of December 2015. MUH is a referral, tertiary care hospital with 78 obstetric beds (29 for free admissions, 28 economic class, and 21 for emergency cases), 26 beds for high-risk pregnancies, and an outpatient clinic. Mansoura is the capital of Dakahlia Governorate with a population of more than six million. Patients are referred from nearby community and public as well as private hospitals.

All obstetric records (case notes, records of labor room, emergency records, and ward admission files) during the study period were reviewed for maternal deaths by two independent researchers. During that period, 23,078 obstetric admissions, 22,323 live births, and 61 maternal deaths were recorded.

The study has been conducted according to the code of ethics of MUH, Egypt, after approval of the hospital director.

The following data were collected: age, residence, occupation, cause of deaths, gestational age, gravidity, and mode of termination of index pregnancy. Causes of maternal deaths were classified as direct and indirect causes. Data were tabulated and statistically analyzed using SPSS Version 16.

Results

During the study period (2011-2015), there was a trend for decline of MMR from 380.8 in 2011 to 145.5 per 100,000 live births in 2015 (Table 1). The most common causes of deaths were hypertensive disorders with pregnancy (29.5%) followed by post-partum hemorrhage (21.3%) and 16.4% were due to indirect causes (Table 2).

Tab. 3 shows that 83.6% of total deaths were in the age group of 21-35 years. The majority of deaths (72.1%) belonged to rural areas and 91.8% of maternal deaths were non-working. Most of the deceased women were primigravida (49.2%). Only 26.2% of deceased mothers received antenatal care. Caesarean section was the mode of deliveries in 39.3% of deaths and 37.7% terminated their pregnancies at MUH. More than half (57.4%) of the deaths occurred after 48 hours of admission, 50.8% of maternal deaths received blood transfusion, and 70.5% of them were admitted to the intensive care unit.

Table 1. Annual hospital-based maternal mortality ratio (MMR) in Mansoura University Hospital, Egypt (2011-2015).

Year	Obstetric admissions	Live births	Maternal deaths	MMR (per 100,000 live births)
2011	4,629	4,464	17	380.8
2012	4,355	4,190	14	334.1
2013	4,464	4,299	13	302.4
2014	4,723	4,558	10	219.4
2015	4,907	4,812	7	145.5
Total	**23,078**	**22,323**	**61**	**273.3**

χ^2 for trend = 12.5, P≤0.001

Table 2. Causes of maternal deaths.

Causes	N (%)
Direct causes:	**47 (77.0)**
Post-partum haemorrhage	13 (21.3)
Ante-partum haemorrhage	4 (6.6)
Post-abortive haemorrhage	2 (3.3)
Hypertensive disorders with pregnancy	18 (29.5)
Pulmonary embolism	4 (6.6)
Post-abortive/puerperal sepsis	3 (4.9)
Others (ruptured uterus, anesthetic complications, amniotic fluid embolism)	3 (4.9)
Indirect causes:	**10 (16.4)**
Cardiac disease	3 (4.9)
Hepatic disorders	3 (4.9)
Malignancy	2 (3.3)
Diabetes mellitus	1 (1.6)
Renal disorders	1 (1.6)
Unknown/unrecorded	**4 (6.6)**

Table 3. Characteristics of maternal deaths.

Characteristics	Maternal deaths N (%)
Total	**61**
Age (years):	
≤20	4 (6.6)
21-35	51 (83.6)
>35	6 (9.8)
Residence:	
Urban	6 (9.8)
Urban slums	11 (18.0)
Rural	44 (72.1)
Women's work:	
Working	5 (8.2)
Not working	56 (91.8)
Gravidity:	
Primigravida	30 (49.2)
2nd to 4th	26 (42.6)
5th and more	5 (8.2)
Antenatal care:	
Yes	16 (26.2)
No	45 (73.8)
Timing of death in relation to pregnancy:	
First trimester	1 (1.6)
Second trimester	3 (4.9)
Third trimester (including intra-partum)	42 (68.9)
Postpartum/post-abortion*	15 (24.6)
Mode of pregnancy termination:	
No pregnancy termination	9 (14.8)
Vaginal (including abortion)	28 (45.9)
Caesarean section	24 (39.3)
Place of pregnancy termination#:	
Mansoura University hospital (MUH)	23 (37.7)
Secondary care hospitals*	13 (25.0)
Private clinics*	6 (11.5)
Homes*	10 (16.4)
Admission to death duration:	
<24 hours	10 (16.4)
24-48 hours	16 (26.2)
>48 hours	35 (57.4)
Blood transfusion	31 (50.8)
Intensive care unit admission	43 (70.5)

#9 women died while still pregnant were excluded
*Referred to MUH after delivery/abortion due to complications.

Discussion

The MMR is a delicate and accurate scale for measurements of the quality of healthcare system. Maternal death reviewing process represents a quality perfection cycle with five steps including documentation of causes of maternal deaths, collection of data about cases, review and analysis of data to identify potentially preventable factors, and the development and implementation of interaction to decrease the risk of future deaths and to evaluate the results [11].There is a global challenge to assess accurate maternal deaths in both developed and developing countries. Facility-based approach is a potential tool for conducting a national maternal mortality audit in developing countries [12].

The present study documented 61 maternal deaths with a trend for decline of MMR from 380.8 in 2011 to 145.5 per 100,000 live births in 2015. However, these rates are much higher than overall MMR of Egypt in 2010 (66/100,000 live births) [13] and MMR of Dakahlia governorate, the study locality (71.3/100,000 live births in 2004-2005) [14]. In Tanta University Hospital, Egypt, the MMR was reported to be 123.9 during 2007-2009 [15]. A much lower MMR of 73 and 84 during 2008 and 2009 were reported in Cairo University Hospital [16]. Also lower health facility-based MMR were reported in Lebanon (39/100,000 live births) [12] and Kenya (124 per 100,000 live births in 2009) [17]. A much higher rate of hospital MMR (1,360/100,000 live births) was reported in Ethiopia during the period 2007-2010 [18].

MUH is a tertiary center; therefore, it receives complicated cases from several nearby healthcare facilities, like other teaching hospitals of Egypt, causing inflation of this mortality rate compared with the national MMR [15]. Also we have to confess that this higher rate might be due to the three delays: delay in the decision to seek care, delay in arrival at healthcare facilities due to traffic problems in Egypt, and the delay in women accessing emergency obstetric care [19]. Healthcare facilities in the developing world are still chronically under-resourced with high workload and unable to cope effectively with serious obstetric complications [20].

We found that direct causes were responsible for 77% of all maternal deaths. The corresponding proportions ranged from 81% to 85.7% in Cairo University Hospital [16] and Tanta University Hospital [15] and 80.8% in Morocco [21]. It is difficult to document whether the lower percent of direct causes of maternal deaths in our study is the result of partial improvement in the control of avoidable causes of deaths or it is due to inaccuracy in documentation of the cause of death. It is possible that obstetricians are likely to ascribe death to indirect causes or to suppress information to avoid any legal liability and accountability [2].

Despite the finding that 50.8% of mothers who died received blood transfusion, hemorrhage (post-partum, ante-partum, and post-abortive) represented the most common causes of maternal deaths followed by hypertensive disorders with pregnancy. This is comparable to the findings of previous facility-based and community-based studies in Egypt and other countries [4,15,16,21-26]. In Egypt, there is problem in adequate blood supply together with delays in recognizing problems and delay in seeking medical care.

In the present study, most of maternal deaths were in the 21- to 35-year age group. This is consistent with the previous findings [16-18,27-29]. However, another hospital-based study revealed that deaths were mainly in the 14- to 24-year age group [29]. This variation could be attributed to differences in demographic and reproductive characteristics. Most of maternal deaths were from rural areas with their peculiar characteristics of being non-working, having high gravidity, and lack of antenatal care. In villages, women still give birth under the supervision of untrained traditional birth attendants (Dayas) with delayed recognition and referral of complicated cases. This agrees with Ghanem et al. [16] and Deneke et al. [18].

More than two thirds of maternal deaths occurred during the third trimester and intra-partum and about one fourth occurred post-partum/post-abortion, and about 40% of mothers died who delivered by caesarean section. This agrees with previous studies [16,18,23,31].

Most of the women (57.4%) died after 48 hours of hospital admission. This may reflect the failure of management measures especially with delayed referral. This necessitates managerial changes and formulation of management guidelines for obstetric complications with stress on the post-partum/post-abortion period.

It is important to establish an audit committee for maternal deaths to determine the trends, medical causes, quality of care provided, and preventability of the death. Computerized medical records and orientation of obstetric staff about accurate reporting of maternal care are a prerequisite for success of maternal deaths audit. The audit committee requires formulating evidence-based guidelines to promote obstetric management, administrative support, capacity building, and regular feedback. It should be clear that audit is not a process for apportioning blame, shame, or penalty but exists to identify and learn lessons from the remediable factors that might save the lives of more mothers in future. Coordination between MUH and primary health care is important to follow up mothers after hospital discharge.

In conclusion, the MMR in MUH is not acceptable and most of the deaths were preventable. It is much higher than the levels at the national, regional, and other Egyptian University Hospitals. Universal and adequate antenatal care, early referral of mothers with complications, and availability of rapid blood transfusion will contribute to further reduction of maternal mortality.

Study strengths and weakness

This is the first maternal mortality audit in MUH that highlighted its magnitude and causes. However, it is a record-based study with its inherent limitations of representativeness and generalizability. We are not sure about the quality of data recorded and the accuracy of recognizing the cause of death. No autopsy was carried out to confirm the cause. Maternal deaths were recorded during the duration of hospitalization. There is no policy for follow-up during the puerperium despite the early discharge of the majority of women after delivery due to high workload. Another limitation is that the quality of care was not assessed in this study.

Conflict of Interest

The authors declared no conflicts of interest

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