CLINICAL ARTICLE

Severe maternal outcomes and their predictors among Pakistani women in the WHO Multicountry Survey on Maternal and Newborn Health

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ABSTRACT

Objective: To determine the incidence of, and the demographic and obstetric factors associated with, severe maternal outcome (SMO) among women presenting at healthcare facilities in Pakistan. *Methods:* A cross-sectional study was conducted in 16 healthcare facilities across Pakistan that had been selected for the WHO Multicountry Survey on Maternal and Newborn health. The hospital records of women who delivered at a participating facility or were admitted with SMO (defined as maternal death or near miss) within 7 days of delivery/abortion were reviewed for a period of 2–3 months in 2011. The incidence of SMO, its associated demographic and obstetric characteristics, and the influence of various maternal health interventions were assessed. *Results:* Among 13 175 included women, 132 (1.0%) had an SMO (94 [0.7%] near miss and 38 [0.3%] died). The maternal mortality ratio was 299 deaths per 100 000 live births. Major causes of SMO included postpartum hemorrhage (64 [48.5%] women), hypertensive disorders (34 [25.8%]), and ruptured uterus (9 [6.8]). Illiteracy, anemia, and several obstetric complications (e.g. eclampsia) were significant contributors. *Conclusion:* Improving education, nutrition, and uniform implementation of obstetric care protocols are needed for better maternal and neonatal health in Pakistan.

1. Introduction

Maternal mortality is a major concern for health systems around the world, particularly in low-income countries. Nearly 800 deaths occur due to pregnancy-related complications around the world every day—99% in low-resource settings, and most from a preventable or treatable cause [1,2]. In 2000, through the fifth Millennium Development Goal, the world aimed to reduce the maternal mortality ratio by three-quarters between 1990 and 2015. Worldwide, the MMR dropped by 47% between 1990 and 2010, but this decrease is still far behind the set goal [3]. Approximately 287 000 women die annually of pregnancy-related conditions, which continue to be the major cause of death among women of reproductive age [3,4].

WHO conducted a multicountry survey [5] in 2011 to estimate the incidence of, and evaluate management strategies for, maternal and neonatal conditions highly associated with maternal and neonatal mortality in multiple countries. According to this survey, Pakistan lags behind in achieving Millennium Development Goal 5, despite the implementation of key maternal interventions on a large scale. Therefore, the major factors that increase a mother's risk of morbidity and

mortality need to be investigated and addressed. Moreover, an in-depth analysis of the obstacles that need to be overcome after the occurrence of an acute complication could ensure that corrective actions are taken to reduce mortality and long-term morbidity.

The objective of the present study was to determine the incidence and causes of severe maternal outcome (SMO)—defined as maternal death or morbidity with organ dysfunction occurring within 7 days of delivery or abortion—among women delivering in selected health facilities in Pakistan and to compare the sociodemographic and obstetric characteristics and the quality of obstetric interventions among women with and without SMO.

2. Materials and methods

The present cross-sectional study was conducted in Islamabad Capital Territory and the provinces of Punjab and Sindh from March 1 to May 31, 2011, as part of the WHO Multicountry Survey on Maternal and Newborn Health. The WHO study examined data from more than 300 000 women attending 359 healthcare facilities in 29 countries and determined the incidence of SMO, as well as the coverage of essential interventions in the healthcare facilities studied.

The Pakistan Institute of Medical Sciences provided the central coordination for the study in Pakistan. The survey included 16 government facilities in Pakistan that dealt with at least 1000 deliveries annually

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and could perform cesarean delivery. These facilities were selected randomly through a stratified, multistage cluster sampling technique. Most facilities were secondary or tertiary healthcare facilities located in urban or peri-urban areas. The study population comprised all women who either delivered in or presented to one of the participating hospitals with an obstetric complication within 7 days of delivery or an abortion. The presenting women could have given birth at a participating center or delivered (or had an abortion) elsewhere.

The study was approved by the WHO Ethics Review Committee and Pakistan's National Bioethics Committee (Pakistan Medical and Research Council). The country data obtained from this WHO Multicountry Survey were analyzed with permission from WHO. Because the data were collected from hospital records, consent from participants was not needed.

The medical records of all eligible women admitted over a period of 2–3 months (length of time dependent on the annual number of deliveries) were reviewed. For each facility, a hospital coordinator (the head of unit) and a data collector were designated; central coordination was provided by the Maternal and Child Health Care Centre, Pakistan Institute of Medical Sciences, Islamabad. The data collectors and coordinators were trained on data collection and recording in 1-day workshops conducted in Islamabad, Lahore, and Karachi. The trained personnel collected data for both mothers and infants on a daily basis by reviewing the hospital records at the time of discharge, transfer, or death up to 7 days post partum. Intra-form validity checks were performed and the hospital records of selected women were cross-checked. A short pilot phase was conducted to test the feasibility of data management.

For women with multiple pregnancies, the data refer to the first neonate. The collected data included maternal demographic and obstetric characteristics, pregnancy-related complications, and SMO, defined as maternal death or near miss occurring up to 7 days post partum or postabortion irrespective of the pregnancy duration and the delivery status [6]. A near miss was defined as the survival of a life-threatening organ dysfunction (as identified by WHO criteria [7]). In addition, the maternal mortality ratio, the maternal near-miss ratio, and maternal mortality index (number of maternal deaths divided by the number of women with life-threatening conditions) were calculated to assess the quality of obstetric care. The women were divided into two groups: those with SMO and those without ("normal outcome", control group). The association between SMO and various maternal demographic and obstetric characteristics such as age, education, parity, pregnancy duration, number of fetuses, previous cesarean delivery, onset of spontaneous labor, and mode of delivery was assessed. In addition, the provision, implementation, and effectiveness of recommended maternal health interventions—including the treatment and prevention of postpartum hemorrhage, the management of severe pre-eclampsia/eclampsia, and the use of prophylactic antibiotics during cesarean delivery—were compared between women with and without SMO.

Any data inconsistencies were reported back to the relevant hospital coordinator. The data were entered into SPSS version 18 (SPSS Inc, Chicago, IL, USA) and analyzed using the χ^2 test. The significant sociodemographic features were analyzed using logistic regression models. $P < 0.05$ was considered statistically significant.

3. Results

Overall, 13 175 women were included in the present study (Fig. 1). In total, 13 122 women delivered in a participating facility; 8527 (65.4%) delivered vaginally and 4487 (34.4%) had a cesarean delivery. The study also included 53 women who did not deliver in a participating health facility but were admitted to the participating facility with a pregnancy complication. There were 13 156 deliveries, of which 12 729 were live births. There were 426 fetal deaths, and data were missing in one case.

In total, 13 043 (99.0%) women had a normal outcome and 132 (1.0%) women had an SMO, giving an SMO ratio of 10 per 1000 live births. Among the women with SMOs, 94 (0.7%) had a near miss and 38 (0.3%) died. Therefore, the maternal mortality ratio was 299 deaths per 100 000 live births. The maternal mortality index was 28.7%. The maternal near-miss ratio was 7 per 1000 live births. The ratio between maternal near miss and mortality was 2.5:1.

Pregnancy-related complications occurred in 1158 (8.8%) women in the study population. Postpartum hemorrhage was recorded in 64 (48.5%) women with SMO, hypertensive disorders of pregnancy in 34 (25.8%), and a ruptured uterus in 9 (6.8%) (Supplementary Material S1). Postpartum hemorrhage was the leading cause of maternal death, causing 18 (48.4%) deaths, whereas hypertensive disorders of pregnancy resulted in 7 (18.4%) deaths.

Overall, 75 (56.8%) women with SMO developed multiorgan failure. Cardiovascular dysfunction was the most common organ dysfunction, affecting 78 (59.1%) women with SMO, followed by respiratory failure (affecting 56 [42.4%]) and coagulation dysfunction (45 [34.1%]) women (Supplementary Material S1). Intensive-care facilities were available for 43 (32.6%) of the 132 women with SMOs, but 17 (44.7%) of the 38 maternal deaths occurred among women who had not received intensive care because resources were lacking.

Level of maternal education varied between women with SMOs and those with a normal outcome, with the proportion of women who were illiterate significantly higher in the SMO group ($P < 0.001$) (Table 1). Additionally, the proportion of women with a single pregnancy was significantly lower in the SMO group than in women with normal outcomes ($P < 0.001$) (Table 1). Preterm delivery was significantly more common
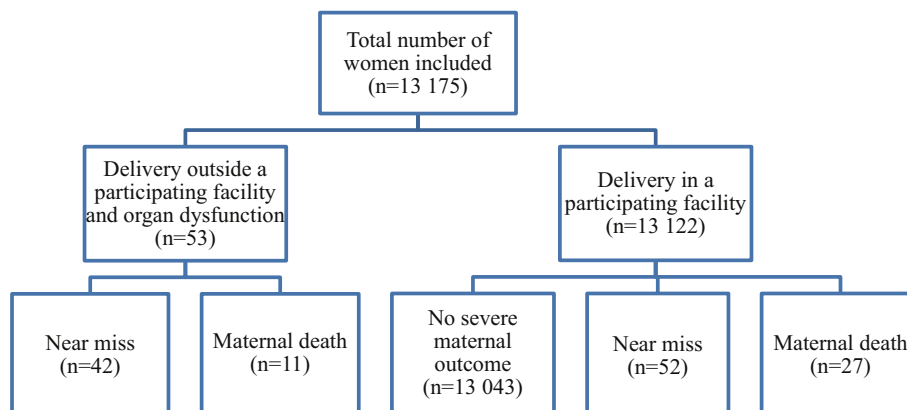

Fig. 1. Study population.