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International Journal of Gynecology and Obstetrics

journal homepage: www.elsevier.com/locate/ijgo



CLINICAL ARTICLE

A case-control study of correlates of severe acute maternal morbidity in Kabul, Afghanistan

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ARTICLE INFO

Article history:

Received 30 August 2014

Received in revised form 6 February 2015

Accepted 30 April 2015

Keywords:

Afghanistan

Maternal morbidity

Maternal mortality

Pregnancy complications

ABSTRACT

Objective: To identify correlates of severe acute maternal morbidity (SAMM) in Kabul, Afghanistan. **Methods:** The present case-control study enrolled postpartum couples at four public maternity hospitals between September 2007 and December 2009. Eligibility was determined by: spousal consent; SAMM criteria from chart review for cases; and matching by age, parity, and time since previous delivery for controls (uncomplicated deliveries). Staff administered questionnaires to women and their husbands separately. SAMM correlates were analyzed with conditional logistic regression in models including (proximate) and excluding (distal) care factors. **Results:** Among 285 case and 285 control couples, the most frequent SAMM diagnoses were obstructed labor (104 [36.5%]) and hemorrhage requiring transfusion (102 [35.8%]). In both models, SAMM was associated with the husband having more than one wife (distal: adjusted odds ratio [aOR] 48.6, 95% CI 5.4–436.5; proximate: 141.8, 3.5–5819.0), prior stillbirth(s) (distal: 16.2, 6.1–42.9; proximate: 8.0, 2.9–22.4), and complications in a prior pregnancy (distal: 5.4, 95% CI 2.5–12.1; proximate: 7.1, 2.5–20.4). In the proximate model, SAMM was associated with visiting another facility before hospitalization (aOR 7.5, 95% CI 3.1–17.9), male-reported planned home delivery (5.5, 1.5–20.0), and provider-determined care-seeking (4.8, 1.6–14.9). **Conclusion:** Planned home delivery and referral to multiple facilities or by providers are factors associated with SAMM that are potentially amenable to intervention in Afghanistan.

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1. Introduction

Maternal mortality and morbidity disproportionately affect families in low-resource settings [1,2]. Although maternal mortality is decreasing, the annual number of maternal deaths remains high (289 000 deaths in 2013) [1–3]. Severe acute maternal morbidity (SAMM) occurs approximately 20 times more frequently, affecting 3%–9% of women in low-income countries [4,5]. Assessments of SAMM offer valuable perspectives on health system function and provide opportunities to obtain input regarding potentially modifiable predisposing factors [6–8].

Afghanistan ranks among the 20 countries with the highest maternal mortality ratios (MMR) globally and is the highest in Asia [1,9]. Levels

and direct causes of maternal mortality have been examined in several regions of Afghanistan; the same causes are probably applicable to SAMM [9]. Hirose et al. [7] described the construct of decision and departure delays in the Afghan context and by case diagnosis in a cross-sectional SAMM assessment. Delays in the decision to access care were strongly linked with socioeconomic factors and lack of prenatal care, and delays in departure were linked with distance from care and social networks [7]. However, index pregnancy perceptions and the husband's decision-making role were minimally explored. Further, no couples with uncomplicated births were assessed to determine the relative weight of predisposing factors.

Kabul, the Afghan capital, has a population of approximately 5 million, with 84.9% prenatal care single-visit coverage [10]. The estimated MMR for Kabul decreased from 418 per 100 000 live births in 2002 [9] to 95 in 2010 [10], although the overall MMR was 285 for the Central zone, which contains most people within Kabul's catchment area [10]. Kabul has the highest medical resource concentration nationally, with various public and private intrapartum services available. The aim of the present study was to identify correlates of SAMM among uncomplicated deliveries in Kabul, Afghanistan. The results could guide programming efforts to reduce maternal morbidity and mortality.

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2. Methods

In the present case-control study, postpartum couples were recruited at four public maternity hospitals in Kabul (Rabia Balkhi, Malalai, Istiqlal, and Khair Khana) between September 6, 2007, and November 22, 2009 by trained male–female study teams, comprising Afghan medical professionals not employed at the study sites. Women in stable medical condition following delivery were identified by female study staff as eligible for inclusion in either the case or control group by consultation with physicians and chart review. They were asked for their husband's name (and telephone number if not present at the hospital). Male staff then contacted their husbands and asked for consent for study participation, in accordance with cultural norms. Subsequently, both members of the identified couple were asked to meet study staff in a private area, given study information, and asked to provide written informed consent. Women for whom a spouse could not be contacted were excluded. Couples declining participation were not enumerated and no information was collected from them. Ethical approval was obtained from the institutional review boards of the Afghan Ministry of Public Health; the University of California, San Diego, USA; the University of California, San Francisco, USA; and Columbia University, USA.

Potential SAMM cases for the index pregnancy (the pregnancy and birth leading to the current hospitalization) were identified retrospectively on the basis of events leading to, and during, their hospitalization that met SAMM criteria (Box 1). These selection criteria were adapted from those described by Filippi et al. [11], with adjustment for context. These criteria were defined before publication of the WHO standardized the near-miss criteria [12]; they meet the WHO

Box 1

Definitions of severe acute maternal morbidity used to determine case eligibility. Criteria based on Filippi et al. [11].

- 1) Shock (all types resulting in inadequate tissue oxygenation, systemic hypoxia, organ dysfunction, and circulatory failure).
- 2) Postpartum hemorrhage requiring/receiving blood transfusion: classic definition of postpartum hemorrhage for normal spontaneous delivery is blood loss of more than 500 mL and that for cesarean delivery is blood loss of more than 1000 mL; blood transfusion required because of excessive bleeding that makes the patient symptomatic (e.g. lightheadedness, vertigo, and syncope) and/or results in signs of hypovolemia (e.g. hypotension, tachycardia, or oliguria).
- 3) Severe pre-eclampsia/eclampsia: onset of hypertension and proteinuria after 20 weeks of pregnancy in a previously normotensive woman (pre-eclampsia); grand mal seizures in a woman with pre-eclampsia (eclampsia).
- 4) Incomplete abortion requiring blood transfusion: excessive bleeding from a spontaneous/induced abortion that makes the patient symptomatic (e.g. lightheadedness, vertigo, or syncope) and/or results in signs of hypovolemia (e.g. hypotension defined as mean arterial pressure <40 or systolic blood pressure 20% below baseline, tachycardia defined as heart rate >150 or 20% greater than baseline, and oliguria defined by urine output less than 30 mL per h).
- 5) Obstructed labor requiring emergency cesarean delivery: arrested labor in the first or second stage requiring transfer to the hospital for emergency cesarean to prevent further maternal/fetal morbidity/mortality.
- 6) Ectopic pregnancy requiring emergent surgery: hemodynamically unstable patient with symptoms of lightheadedness, vertigo, syncope, and/or signs of hypovolemia (e.g. hypotension, tachycardia, or oliguria) due a suspected ruptured ectopic pregnancy.

definition of severe maternal complication, but are not as detailed in that precise indices (e.g. creatinine >3.5 mg/d, or respiratory frequency <6 or >40) are not included.

Control individuals, who had had no complications meeting SAMM criteria, were recruited from the postpartum wards of the study centers. They were approached on the basis of matching criteria (maternal age, parity, and interval between index delivery and last live birth), chosen for their association with maternal mortality and to reduce masking potential associations with other factors [13–15]. Matching was performed as precisely as possible, but variance was allowed for some variables (2 years for age, one child, or 1 year between index and last delivery).

After consent had been obtained from both members of the couple, study staff administered questionnaires, which had been developed using data from a formative assessment preceding this study [16]. Separate questionnaires were administered to women and their husbands, though were essentially identical to provide insight into sex-based differences in event recall and perceptions surrounding the index pregnancy (e.g. whether the index pregnancy was desired). Analysis of obstetric history included only female reports, because men are segregated from female medical care in Afghan culture. Factors reflective of a delay in decision (e.g. planned home delivery) and destination (e.g. presenting to a separate facility before arriving at enrollment hospital) were explored. Male and female perceptions and events leading to index pregnancy admission were analyzed.

Analysis was performed with Stata Version 11 (StataCorp, College Station, TX, USA). $P \leq 0.05$ was considered statistically significant (two-sided alpha = 0.05). Cases for whom a match could not be identified had summary statistics calculated for maternal age, parity, and interval between last live birth and index delivery. For the remaining analyses, only matched data for cases and controls were used. Number of household members, monthly income, and age at marriage were analyzed as dichotomous variables, divided at the median. Number of children (living or dead), spontaneous abortions, and prior stillbirths were categorized for analysis. Matching criteria accuracy was assessed using χ^2 or t tests.

Descriptive statistics were generated by sex, with differences in select variables analyzed using t tests, χ^2 tests, or the κ statistic, as appropriate. SAMM correlates were analyzed using bivariate conditional logistic regression analysis. Multivariable models were constructed for each SAMM definition: one model (distal) considered only factors preceding the index event (e.g. previous stillbirth), whereas the other model (proximate) also included factors associated with decision or departure delays. Time to facility and cost of care were not analyzed because the decision process creating or exacerbating the complication was already underway and thus these variables do not reflect key decision points. Criteria for multivariable model entry were $P \leq 0.10$ in bivariate analysis or established epidemiologic significance. Variables significant at $P \leq 0.05$ or identified confounders were retained in the final model adjusted by enrollment site.

3. Results

A total of 321 SAMM case couples and 285 control couples were enrolled. For the 36 case couples for whom matched control couples could not be identified, mean maternal age was 31.8 ± 7.1 years (range 20–47), parity was 6.7 ± 4.2 (range 1–16), and interval from previous live birth to index delivery was 3.4 ± 3.2 years (range 0–18). For matched couples (285 cases, 285 controls), matching characteristics and enrollment site did not differ significantly (Table 1). The most frequent SAMM diagnoses were obstructed labor requiring cesarean and hemorrhage requiring transfusion (Table 1).

Most participants were Afghan nationals, lived in the Kabul area, and had not lived outside Afghani'stan in the previous 5 years (Table 2). Only 16 (2.8%) of 564 male respondents reported having more than one current wife. There were low levels of agreement between sexes for socioeconomic indicators and stated desirability of index and previous pregnancies (Table 2).

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