International Journal of Gynecology and Obstetrics 132 (2016) 170–173

Contents lists available at ScienceDirect

International Journal of Gynecology and Obstetrics

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

CLINICAL ARTICLE

Prospective observational study of near-miss obstetric events at two tertiary hospitals in Mumbai, Maharashtra, India

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ARTICLE INFO

Article history:
Received 23 January 2015
Received in revised form 19 July 2015
Accepted 5 October 2015

Keywords:
Clinical
Criteria
Dysfunction based
Hospitals
Management based
Near miss
Observational
Organ system

ABSTRACT

Objective: To review the incidence and patterns of near-miss obstetric events (defined as "A woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy"), as well as studying the classification criteria for near-miss events. *Methods:* A prospective observational study was conducted in two tertiary hospitals in Mumbai. Women with near-miss obstetric events were interviewed during the period September 2012–August 2013. *Results:* There were 884 near-miss events among 877 women, with seven patients readmitted. Clinical-criteria for near-miss events, accounting for 701 (79.3%) cases, were the commonest among the three classifications of near-miss events. Among the cases observed, hypertensive disorders of pregnancy (472 [53.4%]), severe anemia (185 [20.9%]), and postpartum hemorrhage 68 [7.7%]) were the most common causes of near-miss events. The most common problem encountered by patients prior to hospital admission for the near-miss cases was the unavailability of treatment at lower-level health facilities, affecting 598 (68.2%) of the 877 study participants. *Conclusion:* Hypertensive disorders of pregnancy, postpartum hemorrhage, and severe anemia remain important determinants in maternal morbidity. Facilities and training at first-referral units should be improved so that they can respond better to basic obstetric emergencies such as sepsis, hemorrhage, and shock.

1. Introduction

The maternal-mortality ratio in India has steadily declined during recent decades. According to 2010–12 sample registration system data, the maternal mortality ratio in India was reported to be 178 per 100 000 live births and, in Maharashtra state the ratio was reported to be 87 per 100 000 live births [1]. If the ratio is to decline further, clinical focus on near-miss obstetric events needs to be emphasized. A near-miss event is defined by the World Health Organization (WHO) [2] as, "A woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy". As near misses occur much more frequently than maternal deaths, there has been increasing interest internationally in studying these cases to complement the traditional audit of maternal mortality. Women experiencing near-miss events share important characteristics with those who die during pregnancy, childbirth, or puerperium, and constitute a proxy model for maternal death [3]. A review of these cases has the potential to highlight deficiencies, as well as the positive elements, in the provision of obstetric services in any health system.

In comparison with high-income countries, there is limited experience of employing near-miss reviews as a tool for monitoring the quality of maternity services in India. In India, very few studies are published where interviews with women who have experienced near-miss events are conducted in addition to viewing hospital records. Interviews with women who have experienced near-miss events give a clearer description of events surrounding patients' illnesses. These interviews give information about the causes and contributory factors of near-miss events, which could be useful for planning interventions to prevent maternal mortality.

Considering these issue, the objectives of the present study were to review the incidence and patterns of near-miss events during the study period, and to study the contributory factors at various levels (personal, family/community level), as well as at the selected tertiary facilities. Maternal deaths occurring during 1 year were also reviewed; however, the present study pertains to findings regarding near-miss obstetric events.

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http://dx.doi.org/10.1016/j.ijgo.2015.07.009
0020-7292/

2. Materials and Methods

A prospective observational study was conducted at two tertiary hospitals in Mumbai, Lokmanya Tilak Municipal General Hospital and Lokmanya Tilak Municipal Medical College, and Sir JJ Hospital and Grant Government Medical College in Maharashtra state, India, from April 1, 2012 to March 31, 2014, with recruitment and data collection occurring September 1, 2012–August 31, 2013. Before the initiation of the present study, a detailed protocol was approved by the Institutional Ethics Committees of the National Institute for Research in Reproductive Health, Lokmanya Tilak Municipal General Hospital, LokmanyaTilak Municipal Medical College, and Grant Government Medical College and Sir JJ hospital, Mumbai, India.

A planning meeting of study investigators was conducted at the National Institute for Research in Reproductive Health that discussed and finalized the criteria for the identification of near-miss events, a sampling plan, and tools for data collection. Patients included in the study had experienced near-miss obstetric events occurring between conception and 42 days post-delivery that exhibited the presence of any markers for the three classification criteria (clinical criteria, management-based criteria, and organ-system dysfunction-based criteria) (Supplementary Material S1). Clinical-criteria near-miss events were defined as any near-miss events related to a specific disease entity, while management-based near-miss events and organ-system dysfunction-based near-miss events were defined according to the near-miss approach outlined by WHO [2]. In addition to these criteria, severe anemia was also included as a clinical criteria owing to its prevalence in India; severe anemia was defined as a hemoglobin level of less than 60 g/L or clinical signs of severe anemia without acute hemorrhage. The inclusion of the three methods mentioned above was essential because classifying according to only one method may result in near–miss events not being included in the study.

The total number of obstetric admissions, deliveries, abortions (spontaneous and induced), ectopic pregnancies, and maternal deaths occurring at the two study hospitals during the previous 2 years was obtained. After discussion between the co-principal investigators (R.D. and Y.N.) from the two hospitals, approximately one or two cases of near-miss events were expected each day. The findings of systematic reviews and published studies performed in India and neighboring countries [4–9] suggested that the number of near–miss events identified would be approximately five- to six-times higher than the number of maternal deaths. Consequently, the number of near–miss events expected to be recorded in the two study hospitals was approximately 30–60 per month; resulting in predictions of 360–720 events over1 year at each hospital and 720–1440 events over1 year at both the hospitals.

Sensitization meetings were arranged at Lokmanya Tilak Municipal General Hospital and Sir JJ Hospital; the participants were staff from the obstetrics and gynecology, medicine, intensive care unit, anesthesia, and surgery departments. Intensive training was given to the participants at the National Institute for Research in Reproductive Health and at the two tertiary hospitals. The interview questionnaires employed were pretested at both of the study hospitals and minor changes were made on the basis of the pretest findings. The interview questionnaire included details of sociodemographic and obstetric history, details of prenatal care, and information about abortions (spontaneous and induced), ectopic pregnancy, delivery, and puerperium. Information was also collected from all women regarding problems faced before admission to hospital and during their stay in hospital. At each of the two hospitals, data collection was performed by a project research officer and a social worker, who were supervised and monitored by a senior research officer from the National Institute for Research in Reproductive Health. The research officer at each hospital identified near-miss cases from hospital registers at the time of patients' admission to the casualty, gynecology and obstetrics department, and other intensive care units in medicine and surgery on the basis of defined criteria to ensure that no cases were missed. Written informed consent in the relevant local language was obtained from the participants by social workers before the interviews were conducted with pretested questionnaires. Interviews were conducted after each participant was stable and before discharge from the hospital. Patients' relatives provided details when participants were not able to recollect all the information themselves. The study investigators from the respective hospitals supervised and monitored all study activity. Investigators at the National Institute for Research in Reproductive Health were responsible for overall supervision and monitoring of the data collection.

Data entry was performed using SPSS version 19.0 (IBM, Armonk, NY, USA). After being scrutinized for errors, omissions, and discrepancies, the data was cleaned and locked. Excel and SPSS were used to analyze the data.

3. Results

There were 884 near-miss obstetric events among 877 women (seven women were readmitted) and 94 maternal deaths during the data-collection period (September 2012–August 2013). Among a total of 19 176 obstetric admissions, there were 884 (4.6%) near-miss events. Among 15 234 deliveries, there were 646(4.2%) near-miss events; 525 (3.6%) of the 14 508 live births during the study period involved near-miss events, and among the 1444 spontaneous and induced abortions,the number of near-miss events was 28 (1.9%). The highest incidence of near-miss events was found to occur among the 186 ectopic pregnancies (115 [61.8%] near-miss events) (Table 1). The ratio of near-miss events to maternal deaths was 9.4:1. The mortality index (maternal deaths/near-miss events + maternal deaths) was found to be 0.096.

The occurrence of each classification criteria of near-miss events, both in isolation and in combination with others, is detailed in Table 2. When including co-occurrence with other classification criteria, clinical criteria were identified in 701 (79.3%) near-miss events (Table 2).

The most commonly identified conditions linked to near-miss events under the clinical-based, management-based, and organ-system dysfunction-based criteria were hypertensive disorders, exploratory laparotomy, and coagulation dysfunction, respectively (Table 3). Among the 28 abortion cases where near-miss events occurred, 14 (50.0%) were classified as meeting clinical criteria. The most commonly identified causes for near-miss events among these 28 patients were severe anemia in 12 (42.9%) patients and sepsis in 6(21.4%) cases.

The mean age of patients at the time near-miss events occurred was 25.8 ± 4.60 years, the mean age of patients when first married was 20 ± 3.77 years, and the mean age of participants at first pregnancy was 22 ± 3.53 years. There were 136 (15.5%) patients that reported being married at younger than 18 years of age and 31 (3.5%) individuals reported having their first pregnancy at younger than 18 years of age. In the present study, the majority (864 [98.5%]) of women were married, while 6 (0.7%) were unmarried, and 7 (0.8%) were widows/divorced. The participants included 678 (77.3%) women from urban areas, 190 (21.7%) individuals from rural areas, and 9 (1.0%) patients from tribal areas. Among the participants from urban areas, 377 (55.6%) resided in slums. Of the 877 study participants, 504 (57.5%) reported being educated up to secondary or higher-secondary level, 175 (20.0%) were illiterate, 141 (16.1%) has been educated up to junior-college level and above, and 57 (6.5%) were educated up to primary level. Amongst the

Table 1
Incidence of near-miss obstetric events.[a]

Details of hospital admissions	Near-miss events
Total obstetric admissions (n = 19 176)	884 (4.6)
Admitted for delivery (n = 15 234)	646 (4.2)
Live birth (n = 14 508)	525 (3.6)
Spontaneous or induced abortion (n = 1444)	28 (1.9)
Ectopic pregnancy(n = 186)	115 (61.8)

[a] Values are given as number (percentage).