Validity of Women’s Self-reported Obstetric Complications in Rural Ghana

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ABSTRACT

This retrospective study assessed the utility of women’s self-reports to identify obstetric complications in rural Ghana. All consenting obstetric and postpartum inpatients, presenting from the seventh month of gestation to 42 days postpartum, were interviewed at the Holy Family Hospital, Techiman and were asked about their signs and symptoms. A combination of clinical examination and laboratory testing of urine and blood samples was used for determining case status. Self-reported obstetric complications of 340 women were compared with the corresponding diagnostic status for their sensitivity, specificity, predictive value, and test-efficiency. Using algorithms that could not be practically applied at the community level, self-reported symptoms correctly identified the majority (75%) of complicated and uncomplicated pregnancies, but missed one-quarter of cases requiring emergency obstetric care. The positive predictive value of 50% indicates that women’s self-reported symptoms should not be used in estimating the incidence of these conditions or in identifying women requiring referral in this population.

Key words: Pregnancy; Obstetrics; Morbidity; Knowledge, Attitudes, Practice; Retrospective studies; Ghana

INTRODUCTION

Measurement of programme impact is one of the major challenges for safe-motherhood programmes. Much work has been done to develop indirect methods to measure the incidence of maternal mortality, but few evaluations use the maternal mortality ratio as an index of programme impact due to requirements of a large sample size and extended recall period (1-4). International groups have made a concerted effort to develop alternative process indicators for programme management and evaluation (5-9). The most prominent indicators include the proportion of all births that take place in essential obstetric care (EOC) facilities, the percentage of women with obstetric complications treated at the EOC facilities, the proportion of all births through caesarean sections, and case-fatality rates at the EOC facilities. The validity of these indicators depends on a number of questionable assumptions, such as the availability of accurate data on the number of deliveries occurring in the referent health service area, a 15% incidence of life-threatening obstetric conditions with little global variability, and unbiased and accurate diagnosis of complications regardless of training or availability of laboratory diagnostics (10,11).

Alternatively, some investigators prefer using self-reported symptoms of pregnancy complications as surrogate indices of the incidence of obstetric complications, while recognizing that these symptoms may be related to other conditions (12,13). If self-reported symptoms could be used for identifying most women correctly with and without life-threatening
obstetric conditions, they could serve as an indirect measure of impact of safe-motherhood programmes by estimating the proportion of pregnancies requiring and receiving special management.

Only one study, conducted in the Philippines, had investigated the accuracy of self-reported pregnancy complications for the identification of dystocia, haemorrhage, sepsis, and eclampsia (14). This large study found high sensitivities and moderate specificities of self-reported symptoms, and its results motivated many investigators to determine whether self-reported symptoms of life-threatening obstetric conditions could be used for identifying cases for referral or treatment and in estimating the proportion of pregnancies requiring and receiving special management for programme evaluation.

As part of its effort to measure the impact of improved referral and obstetric services in Ghana, the Safe Motherhood Evaluation (SME) Project was designed to measure which of various interventions addressed the greatest proportion of pregnancies requiring special management compared to a non-intervention control group. Identifying the proportion of uncomplicated pregnancies is also important, as most births are uncomplicated and require no special care. To do this, the Project needed to distinguish between complicated and uncomplicated obstetric cases accurately.

The SME Project was implemented by the Kintampo Health Research Centre in conjunction with the Health Research Unit and the Maternal and Child Health Division of the Ministry of Health, Central Hospital in Koforidua, and the Population Council. The study was conducted in Kintampo and Techiman districts, a rural area centrally located in Ghana, where approximately 70% of births occur at home, 10% in clinics, and 20% in the hospital (15,16). About 2,250 births occur annually in the Holy Family Hospital, the main hospital in the area (15). The overall institutional complication rate, based on clinicians’ diagnosis, is 18%, and the institutional maternal mortality is about 1% (15). Since so many births occur at home in the project area, the SME Project planned to use information from the results of community-based interviews with postpartum women to identify those who did or did not experience life-threatening obstetric complications.

This study was designed to identify questions about pregnancy-related experiences that could be used in community-based interviews to determine whether self-reported symptoms validly indicate the presence or absence of the conditions to which most maternal mortality is attributed, including antenatal haemorrhage, eclampsia, dysfunctional labour, postpartum haemorrhage, and puerperal infection. The investigators felt that it was important to design and conduct the study in the project area in Ghana as the recognition of symptoms of obstetric complications may vary across cultures and require culture-specific verification. The Philippines study had a very different population consisting of patients from a large urban public hospital in Manila and used events recall period ranging from one to four year(s).

MATERIALS AND METHODS

Ideally, a cross-sectional, community-based survey should be conducted to ensure the generalizability of results in the project area. It would be logistically impossible, however, to conduct a community-based study of the validity of self-reported pregnancy complications, as the diagnostic capability (sufficient clinicians and the required equipment, supplies, storage system, and transportation) would have to be present for all home deliveries as they occur within a defined period of time. Such capability generally does not exist in rural areas in countries with high maternal mortality. Validation studies, such as this one, can only be conducted as hospital-based assessments in remote rural areas where clinical and laboratory diagnoses are available. Hospital-based studies may include women who are more aware of their case status due to contact with hospital personnel and may recognize symptoms more often (or differently) than those who give birth at home or at the midwife’s home/clinic. There is a very limited socioeconomic variability in Kintampo and Techiman. However, women who live in two towns in the project area are more likely to give birth at the hospital than those living in the villages. Given these limitations and the fact that clinical judgment varies between providers, great care was taken in the development of the questionnaire, staff training, and laboratory selection to minimize these biases.

Over a period of almost two months in 1995, the investigators interviewed all consenting eligible women, i.e. obstetric and postpartum inpatients presenting from the seventh month of gestation to 42 days postpartum at the Holy Family Hospital, Techiman (the main referral hospital in the project area) for self-reported signs and symptoms. A uniform set of clinical
Self-reported obstetric complications in rural Ghana

and laboratory procedures was applied to each patient. Urine and blood samples were collected from each patient. Wound or cervical swabs were to be collected from patients with clinically-diagnosed wound or endometrial infections and from comparison patients, but such infections were not observed. These data were gathered to attain at least 50 complications, and 340 women were interviewed and assessed. The study was designed to test whether questions or combinations of questions asked to women delivering in the project area’s hospital could correctly identify the occurrence of life-threatening obstetric complications 80%±5% of the time (test-efficiency), with an α error=0.05 (required n=246, increased to 333 to attain ≥50 cases assuming an estimated complication rate of 15%). The study was reviewed and approved by the Population Council’s internal review board, the Ghanaian Ministry of Health, and the SME in-country project advisory group.

Many items of the Philippines instruments (14) and the set of demographic health survey questionnaire (17) were modified to form a pre-coded structured data-collection instrument which was subsequently pre-tested and used for this study. Interviews were conducted postpartum prior to discharge by interviewers, blind to the case status of each woman. Since interviewing women prior to discharge might elicit information reflecting what the healthcare staff told women about their conditions, the interview was developed to elicit symptoms experienced separate from reasons for coming to the hospital to deliver or clinicians’ judgments about their conditions. For example, the women were asked why they came to the hospital, whether they experienced any of the following signs or symptoms, and later asked what the doctors/health staff said. Over one hundred questions were asked to identify the symptoms experienced. Data-collection forms were checked on-the-spot by a supervisor who was employed by the study to ensure its smooth implementation. A small random sample of the patients interviewed was observed in an unobtrusive manner, and the study coordinator conducted a blind re-interview of a 5% random subsample of patients.

The hospital staff identified eligible women and conducted clinical and laboratory examinations. Laboratory data included blood (complete blood count with differential, haemoglobin, percent corpuscular volume, parasitaemia for malaria, sickling and sedimentation rate) and urine (protein) samples, which were labelled and stored in the refrigerator at ≤4 °C (blood and urine samples) or incubator at ≤37 °C (blood cultures) and were transported weekly to the leading medical laboratory in Ghana, Komfo Anokye Teaching Hospital (KATH), Kumasi, for analysis. Laboratory specimens were taken twice on 5% of the sample to compare the consistency of the laboratory results. Treatment and/or referral were provided to all subjects who required it.

Data were entered into computer using Epi Info within two days of collection. Double data entry was done by two data clerks, and verification and consistency checks were run. Analyses were conducted using SPSS-PC+. All data-verification procedures (re-interview, laboratory and data entry consistency checks) indicated the discordance rates below 5%.

The following criteria were used for defining case status:

*Antepartum haemorrhage (APH):* Vaginal bleeding >28 and ≤42 weeks.

*Eclampsia:* Women with high blood pressure (>140/90) and proteinuria and non-epileptic convulsions, regardless of oedema.

*Dysfunctional labour:* <1 cm progress dilatation/hour in active phase, or no progress to delivery despite several hours of pushing after full dilatation, or transverse lie, or clinical diagnosis of dysfunctional or prolonged labour, or cephalo-pelvic disproportion.

*Postpartum haemorrhage:* ≥500 mL intra- or postpartum blood loss measured or estimated by clinician.

*Sepsis:* Positive cultures (blood, wound or cervical swab), or temperature ≥38 °C on admission with elevated white blood count (WBC >8.5), or clinician’s diagnosis of septic shock or sepsis with elevated WBC, or pelvic inflammatory disease (PID) on initial examination, or clinician’s diagnosis of septic infection, laceration, or surgical wound.

The sensitivity, specificity, and false positive rates of the self-reported symptoms were reviewed. Combinations of questions with the best sensitivities and specificities and the lowest false positive and false negative rates were cross-tabulated by case status. Questions with the highest agreement (test-efficiency) were used in combination for determining the maximum percentage of complicated and uncomplicated cases that could be correctly identified by the symptoms (18).
RESULTS

Using hospital diagnosis as the gold standard, 67 (20%) women were identified with life-threatening obstetric conditions, including 8 cases of antepartum haemorrhage, no eclampsia, 50 cases of dysfunctional labour, 10 cases of postpartum haemorrhage, and 4 cases of sepsis. Excluding responses about why women came to the hospital and what the hospital staff told them about their conditions (most generalizable to information likely to be obtained from community-based interviews), the questions that most accurately could identify major obstetric complications were:

**Antepartum haemorrhage** (8 cases): “During this pregnancy, did you have any vaginal bleeding at any time starting from five months’ pregnancy to the time of delivery?” (sensitivity 50%, specificity 97%).

**Eclampsia** (no cases): “Did you or anyone assisting you think having fits or convulsions during labour and/or delivery or within 1-2 day(s) after delivery was a problem?” and “Were you referred somewhere else when the fits/seizures occurred?” (sensitivity NA, specificity >99%).

**Dysfunctional labour** (50 cases): “Did you or anyone assisting you think this [labour lasting longer than one day and one night] was a problem?” (sensitivity 50%, specificity 94.5%).

**Postpartum haemorrhage** (10 cases): “Did you and/or anyone who was assisting you think that the amount of bleeding was excessive?” (sensitivity 60%, specificity 88.5%).

**Sepsis** (4 cases): “During labour and/or delivery, did you have a very high fever?” (sensitivity 50%, specificity 88%).

Self-reported symptoms that correctly identified most cases (high sensitivity) often had high false positive rates. For example, 70% of the women who considered their babies ‘very big’ or ‘bigger than average’ had dysfunctional labour, but 62% of those who did not experience dysfunctional labour also considered their babies to be large. Eight women (80%) with postpartum haemorrhage reported that they lost a lot of blood during labour or delivery or within 1-2 day(s) after delivery, but 103 (31%) of those without postpartum haemorrhage also thought they lost a lot of blood. Similarly, self-reported symptoms that correctly identified most women without complications (high specificity) missed classifying many true cases (had high false negative rates). For example, 90% of the women without dysfunctional labour were correctly classified if the ‘hard, regular labour pains’ were reported to last for less than 24 hours in nulliparous or less than 12 hours in multiparous women, but 22 (43%) of the 51 cases were incorrectly classified as uncomplicated by these same criteria.

Questions about why the patient presented to the hospital (and that could only be used in institution-based assessments) correctly identified complicated and uncomplicated cases better for antepartum haemorrhage (sensitivity 63%, specificity 95%) and dysfunctional labour (sensitivity 56%, specificity 89%). These questions were not useful in identifying postpartum haemorrhage (sensitivity 100%, specificity 0%) and were poor for infection (the best were those regarding severe lower abdominal pain, where sensitivity was 75%, but specificity was only 33% for a false negative rate of 67%).

The table presents the sensitivity, specificity, positive and negative predictive values, and test-efficiency for each condition and for overall case status (having any of the five major obstetric complications) using the best combinations of self-reported symptoms to identify case status (i.e. have the best test-efficiency).

Reports of any vaginal bleeding between the 28th week of gestation and delivery correctly classified 96% of the women with antepartum haemorrhage. No cases of eclampsia were observed. Three true negatives had seizure, but not the one case of pre-eclampsia that was clinically misdiagnosed as eclampsia. Symptoms of hard, regular labour pains lasting for more than 12 hours in multiparous women or more than 24 hours in nulliparous women, or if the woman or anyone assisting her thought this (length of labour) was a problem, or if she was referred somewhere else when it was recognized that labour was taking too long, or if this pregnancy ended in a caesarean section correctly identified 82% of the women with dysfunctional labour. Bleeding around the time of labour considered excessive by the most qualified person present, or referral for excessive bleeding, or a blood transfusion at any time during labour or delivery or after, or decision to deliver at the hospital, because she ‘had problems’ in labour or delivery correctly identified 90% of the women with postpartum haemorrhage. Self-reported jaundice during
pregnancy, combined with a very high fever during labour and/or delivery, correctly identified 98% of the women with sepsis.

As the study was designed to estimate the validity of a single algorithm that could pragmatically be used for identifying overall EOC need (and unmet need) effectively—a key safe motherhood indicator that must be easy to measure if it is to prove useful for evaluating safe-motherhood programmes (11)—and for improving community-based referral, the study did not estimate the validity of self-reported symptoms to identify individual life-threatening obstetric conditions, and the sample did not have the power to do so. The women with any of the above complications were considered to have a life-threatening obstetric condition. Those with any of the predictive symptoms listed above were considered positively symptomatic for the analysis that identified women as having or not having a life-threatening obstetric condition. In all, 67 (20%) women experienced these conditions. Seventy-six percent of the complicated and 75% of the uncomplicated cases were correctly identified by the above self-reported symptoms, for a test-efficiency of 76%. The positive and negative predictive values were 43% and 93% respectively.

**DISCUSSION**

The results cast skepticism on whether self-reported symptoms can be used for identifying life-threatening obstetric conditions validly. In this study, self-reported symptoms commonly used in programme evaluation did not adequately discriminate complicated from uncomplicated obstetric cases in a hospital setting where the study results may actually over-estimate the extent to which self-reported symptoms can be used for identifying life-threatening obstetric conditions. As the study was designed to identify a single and simple algorithm that could be pragmatically used in estimating EOC need (the percentage of women with any obstetric complication) and improving referral of life-threatening obstetric conditions by community-based delivery attendants, the study did not intend to and was too small to assess the correct identification of each major obstetric complication adequately. No true cases of eclampsia were encountered. The results of the overall validity are influenced by the composition of the complications encountered in the hospital sample. The criteria for case-classification of infection may be very stringent, with only four (1%) women identified as positive. Misclassification might have been different in a community-based sample where the relative proportion of women experiencing obstetric complications could be different from those observed in the hospital sample. The magnitude of misclassification, however, is consistent with those of the few other rural studies that have evaluated the validity of self-reported symptoms to identify the prevalence of life-threatening obstetric conditions (19,20). A single study that measured the prevalence of life-threatening obstetric conditions in an urban hospital sample, with a considerably longer-term recall period, reported greater validity (21).

Questions commonly used in other evaluations were not useful in this setting, either because they missed
identifying too many cases, or because they misidentified too many uncomplicated cases. These included questions about pain and bleeding (everyone said they had it), oedema, dizziness, fainting, blurry vision, severe headache, foul-smelling discharge, and feeling cold or clammy. Simple individual questions were not very predictive of case status, and the combinations of questions to best identify case status were too complex to be useful in identifying individuals for the purposes of referral or treatment.

The ability to identify women with these conditions comes at the cost of incorrectly identifying many women as cases who do not have these conditions for screening tools with poor predictive ability. Overall, self-reported symptoms correctly identified most complicated (51 of 67) and uncomplicated (206 of 273) pregnancies. These criteria miss 24% of complicated cases even when applied most accurately and misclassify as many (67) women as complicated cases as those who truly had these conditions. The positive predictive value (and conversely, false positive rate) of 50% indicates that self-reported symptoms should not be used for estimating the prevalence of these conditions in this population. The magnitude of incorrect identification is very similar to that found in the two studies conducted in rural areas that measured the prevalence of life-threatening obstetric complications (19,20).

The algorithms developed do provide a better-than-chance indication of the need for institutional treatment around delivery, although their validity as a community-based tool to improve referral is unknown. Although patients probably perceive each complication differently, symptoms that best identify each obstetric complication vary across cultures. For example, excessive bleeding was predictive of postpartum haemorrhage in some studies but not in others (19-21). Therefore, such algorithms would need to be locally developed and tested and would be constrained by similar design caveats in areas where many deliveries are non-institutional, and the ability to identify these conditions is uncertain. However, measurement of impact continues to be problematic for safe-motherhood programmes.

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REFERENCES


