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Article

A validation study of maternal self reports of obstetrical complications implications for health surveys

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Abstract

Objective The purpose of this study was to determine the validity of maternal self reports of obstetrical complications, which are commonly used in estimating the prevalence of complications. These estimates vary greatly between countries and could either reflect true differences or reporting bias. *Methods* A cross-sectional study was conducted among 1027 women in two Bolivian maternity hospitals. A questionnaire recorded mothers' perceptions of obstetrical complications while hospital medical records and physical examinations established their clinical condition. Sensitivity, specificity, predictive values, and percent agreement were obtained for obstetrical conditions. *Results* In general, women's reports of obstetrical complications did not match medical diagnoses. The highest agreement was obtained for reporting eclampsia, with less agreement for labor disorders, postpartum hemorrhage and malpresentation. *Conclusions* Maternal self reports in this study did not provide a valid estimate of the prevalence of obstetrical complications. Health surveys based on maternal self reports must be interpreted with consideration of this limitation. © 1998 International Federation of Gynecology and Obstetrics

Keywords Obstetrical complication, Self reporting, Validation, Maternal child health

1 Introduction

Worldwide, it is estimated that 45% of child-births occur in the mother's home attended by an

untrained birth attendant [1]. An estimated 555 000 maternal deaths occur each year, the majority in settings with poorly developed infrastructure [2]. The main causes of death include obstructed labor, hemorrhage, eclampsia, sepsis, and complications of induced abortion.

The estimated prevalence of major obstetrical complications in less industrialized countries

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ranges from 5.9 to 21.0%, with great variation between countries [2]. These prevalence estimates are often obtained through maternal self reports, yet little is known about their validity or the conclusions which can be drawn from this type of data. As a result, it is difficult to determine whether differences in country rates reflect true variation in the percentage of complications or whether variations result from differences in reporting.

Many childbearing women in developing countries do not utilize formal medical systems, and community-based surveys have been used to obtain information on their pregnancy and childbearing experiences. Several validation studies of maternal self reports of obstetrical events have been conducted but most focus on perinatal events, such as birth weight, gestational age, or congenital malformations and they have been conducted in developed countries [3–8]. In general, these studies found good correlation of maternal reports of birth weight and gestational age with hospital records. One study [9] evaluating maternal recall of obstetrical complications in the Philippines found good maternal identification of labor dystocia (defined as $< 1 \text{ cm h}^{-1}$ dilation or bearing down $> 2 \text{ h}$) and hemorrhage, but evaluation of maternal recall of sepsis and eclampsia was limited by small numbers.

Bolivia is a developing country in which an estimated 57.2% of childbirths occur in the home [10]. In general, many women only go to the hospital when obstetrical complications arise [11]. Unlike many developing countries, there is limited use of traditional birth attendants, and the husband or another family member usually attends women [12,13]. Giving birth under these conditions has resulted in an estimated infant mortality rate of 75/1000 to 105/1000 and a maternal mortality ratio of 399 deaths per 100,000 live births [10].

In a review of maternal morbidity in developing countries, Liskin [14] stated that identifying the prevalence of pregnancy complications is limited due to methodologies such as inadequate validation of self reported data. This present study addresses this limitation by attempting to validate the accuracy of maternal self reports of obstetri-

cal complications among women in a developing country and by evaluating the appropriate applications for this type of survey.

2 Materials and methods

This study was a large hospital-based cross sectional study of 1027 women who attended one of two Bolivian referral hospitals, Hospital de la Mujer in La Paz and Hospital G. Urquidí in Cochabamba from September 1995 to May 1996. Participants in the study included women who attended these hospitals for childbirth, were admitted for acute complications resulting during home delivery, or were re-admitted the month following hospitalization for childbirth. Women with scheduled cesarean sections or those who indicated they would leave the hospital immediately after birth and thus could not complete a questionnaire were excluded from the study. Participants included mestizo women (mixed European and indigenous ancestry) as well as women from two indigenous ethnic groups, Quechua and Aymara.

2.1 Data collection

Physicians were trained to complete an expanded hospital record form especially designed for this study. Physicians were also trained to utilize a partograph which provided an extensive record of the progress of labor and delivery and which was used for identifying problems with the progress of labor [15].

Questionnaires were administered to mothers on the day they left the hospital. Mothers were asked general questions about obstetrical complications and specifically if they had any problems with labor or delivery (labor disorders), the position of the baby (presentation), any seizures (eclampsia), excessive bleeding (postpartum hemorrhage), or an infection (sepsis). Mothers who stated they had a given condition were asked more specific questions about symptoms they experienced. For example, questions about extended labor or bearing down were asked concerning labor disorders. For hemorrhage, women were asked if they bled so much they

thought they would die, and if they had fainted or had a rapid pulse from blood loss. For sepsis, women were asked about an elevated temperature, purulent vaginal discharge, or pelvic pain. For eclampsia, they were asked about the presence of seizures. For malpresentation, they were asked the position of the baby on two occasions: on admission and after delivery.

2.2 Identification of cases

Specific obstetrical complications were identified from results of the medical exam, partograph, and outcome of the mother's labor and delivery. Collectively, these data were used as the 'gold standard' to evaluate the validity of mothers' perceptions of their obstetrical complications. Cases for specific obstetrical complications met the following requirements:

- **Labor disorders** Women who were monitored for at least 2 h by partograph and who dilated $< 1 \text{ cm h}^{-1}$, bore down (pushed) for $> 2 \text{ h}$, or had a uterine rupture without having had a previous Cesarean section.
- **Postpartum hemorrhage** Women with a documented blood loss of $> 1000 \text{ cm}^3$ or who had reported a postpartum hemorrhage at home in conjunction with either a clinically diagnosed retained placenta or cervical lacerations.
- **Eclampsia** Women with clinically observed convulsions without a history of non-pregnancy-related convulsions.
- **Sepsis** Women with a body temperature $> 38^\circ\text{C}$ and either uterine pain or purulent discharge.
- **Malpresentation** Women with an infant in a non-vertex presentation.

Women symptomatic of a particular reproductive condition but who did not meet the full case definition were considered to have a milder form of the condition and were excluded from the validation analysis.

2.3 Identification of controls

Controls included women with a normal progress of labor and delivery and no evidence of any obstetrical complication. The control group was defined as women admitted to the hospital who had a normal labor, delivery, and immediate postpartum period. Controls met the following conditions: a pregnancy of at least 38 weeks, no elevation of temperature $> 37.5^\circ\text{C}$, no blood pressure reading $> 140/90$, a blood loss $< 500 \text{ cm}^3$, and no symptoms of shock or unconsciousness. Women who had a Cesarean section or extensive tears and lacerations requiring suturing were eliminated as controls.

2.4 Statistical analyses

Comparisons were made in the sensitivity, specificity, positive predictive value (PPV), and percent agreement for responses to each question [16]. Sensitivity refers to the percent of women with a diagnosed complication who correctly reported they had a given complication. Specificity refers to the percent of women without a diagnosed complication who correctly reported they did not have a given complication. Positive predictive value refers to the percent of women reporting they had a complication who were in fact diagnosed with that complication. Percent agreement refers to the percent of responses in which mothers' self reports corresponded to the clinical diagnosis. Confidence intervals (95%) were obtained for the sensitivity and specificity values. Data were entered in Epi-Info 6 and specific statistics were obtained in SPSS or SAS. Exact confidence intervals were obtained utilizing tables presented in Beyer [17].

3 Results

The response rate for this study was $> 98\%$. The most common reported maternal complications were labor disorder and malpresentation (Table 1). Sepsis was very rare and was documented in only three cases. Participants who had

Table 1
Distribution of participants into subcategories based on case definition for each obstetric complication ($n = 1027$)

Obstetrical complications	Met case definition			
	Yes (cases)	No (controls)	Partially	Insufficient information
Malpresentation	106	863	0	53
Labor disorder	106	273	130	518 ^a
Hemorrhage	34	800	49	144
Eclampsia	22	563	323	119
Sepsis	3	548	133	343 ^b

^aWomen who arrived at hospital < 2 h prior to delivery and could not be sufficiently monitored for labor progress

^bWomen for whom data on postpartum infection was not recorded

some symptoms of an obstetrical condition but less than was required for the full case definition were placed in a separate classification of 'partially' meeting the case definition and were excluded from the analysis. Case definitions were not mutually exclusive and women could be cases for multiple conditions.

Comparisons were performed between cases and controls (Table 2). There were 257 (25.0%) women who were defined as cases for at least one condition and 428 (41.7%) controls and 342 (33.3%) women who did not meet the full case definition nor the criteria for controls. The fact that approx 25% of women met the case definition for at least one of the obstetrical conditions was not unexpected as approx 80% of Bolivian women in the study area have home births and would only have utilized the hospital in case of an emergency. Analysis of labor disorders only included women who arrived at the hospital 2 h prior to childbirth to allow for evaluation of the progress of labor by partograph.

3.1 Demographics

A comparison of socio-economic variables and demographic factors for cases and controls indicated that SES differed significantly between groups (Table 2). SES was based on level of maternal education, type of floor, presence of electricity, and whether family owned a television,

Table 2
Comparison of demographic and obstetric characteristics between case and control groups

Variable	Cases n (%)	Controls n (%)	P value
Age			0.104
< 18	30 (11.7)	31 (7.2)	
18–35	200 (78.1)	359 (83.9)	
> 35	26 (10.3)	38 (8.9)	
Married/living with partner	201 (78.2)	349 (81.5)	0.289
Mother's educational level			0.115
None	21 (8.2)	25 (5.8)	
Basic	100 (38.9)	139 (32.5)	
Intermediate	55 (21.4)	96 (22.4)	
Technical/university	81 (31.5)	168 (39.3)	
Able to speak Spanish	245 (95.3)	413 (96.7)	0.357
Low SES	121 (50.4)	177 (41.7)	0.031
Primipara	131 (51.0)	170 (39.8)	0.004
Received prenatal care	183 (71.2)	326 (76.2)	0.150

refrigerator, or car. This variable was dichotomized into low and high SES. Age differed between the three groups with cases more likely than controls to be in the higher risk categories, < 18 and > 35, and controls were more likely to be married, more highly educated, and more likely to speak Spanish, but these differences were not significant. Cases were significantly more prone to be primiparas than controls, however, there was no significant difference between cases and controls in whether or not they had received prenatal care.

3.2 Obstetrical complications

Four parameters (sensitivity, specificity, positive predictive value, and percent agreement) were used to evaluate the agreement of maternal self reports of obstetrical conditions with the hospital gold standard (Table 3). Overall, the sensitivity for most questions was low, ranging from 3.7 to 95.9%. The lowest sensitivities were for questions relating to labor disorders and the highest for postpartum hemorrhage and malpresentation. Furthermore, with the exception of labor disorders and malpresentation, sensitivity values were based on small numbers as few women had the specific disorders. Thus, confidence intervals

Table 3

Comparison of sensitivity, specificity, positive predictive value, and percent agreement for maternal identification of major obstetrical conditions by question

Complication	Sensitivity value (95% CI)	Specificity value (95% CI)	PPV	% Agreement
Malpresentation				
Identified before delivery	36.5 (24.7-49.6)	95.2 (93.2-96.8)	45.1	89.6
Reported after delivery	95.9 (89.9-98.9)	70.1 (66.7-73.4)	29.4	73.1
Labor disorders				
Labor/delivery problems	21.0 (13.2-28.8)	90.3 (86.1-94.5)	53.7	66.0
Extended labor	3.7 (-0.4-7.8)	98.7 (96.9-100)	60.0	65.7
Extended pushing	21.2 (11.3-31.1)	90.4 (85.4-95.4)	51.9	67.8
Both	18.6 (10.4-26.8)	91.0 (86.6-95.4)	51.6	66.3
Eclampsia				
Any seizures	50.0 (28.2-71.8)	98.6 (97.5-99.7)	64.7	96.2
Postpartum hemorrhage				
Excess bleeding	51.6 (34.0-69.2)	75.7 (71.5-79.9)	14.0	74.0
Thought she would die	86.7 (59.5-98.3)	78.0 (69.9-86.1)	37.1	79.1
Fainted	68.8 (41.3-89.0)	88.9 (82.7-95.1)	50.0	86.1
Rapid heart rate	78.6 (49.2-95.3)	67.7 (58.5-76.9)	25.6	69.0
Sepsis				
Presence of infection	NC ^a	99.3 (98.5-100)	NC	98.8
Elevated temperature	NC	86.7 (83.5-89.9)	NC	86.3
Purulent discharge	NC	88.3 (85.2-91.4)	NC	87.9
Pelvic pain	NC	40.4 (35.7-45.1)	NC	40.4

^aNC = Not calculated due to small number of septic cases ($n = 3$)

were wide. Specificity values were based on higher numbers resulting in more narrow confidence intervals.

All questions relating to labor disorders and eclampsia had high specificity values. In addition, one question relating to sepsis (whether a mother thought she had an infection) as well as one for hemorrhage (bled so much she fainted) had high specificity values. Women were less likely to incorrectly identify fetal malpresentation prior to birth than after birth.

A poor showing for PPV resulted for all categories indicating that the majority of women who stated they had a particular complication did not meet the full case definition. Percent agreement values were low showing the highest agreement for whether the mother felt she had a vaginal infection or a seizure.

In general, these results show only fair correlation between maternal reports of complications and the hospital gold standard with the possible exception of eclampsia and sepsis. However, the small number of cases limits analysis of sepsis,

and even for eclampsia, the sensitivity was only 50%.

Since SES differed between cases and controls in the bivariate analyses, measures of sensitivity, specificity, PPV, and percent agreement were obtained stratifying data by SES. There were slightly higher measures of percent agreement among women of higher socio-economic status than for women in the lower groups with the exception of eclampsia (data not shown). However, all differences were relatively small and all confidence intervals overlapped between the two groups. Thus, there was no evidence supporting differences in validation of maternal complication by SES.

4 Discussion

In general, there was only fair agreement between maternal reports of obstetrical complications and hospital records. The highest agreement was obtained for eclampsia. Limited ability of mothers to accurately report on obstetrical com-

plications may be due to the fact that many complications reflect extreme values on a continuum, e.g. labor > 12 h, blood loss > 1000 cm³. Other complications have poorly differentiated symptoms, such as elevated body temperature or abdominal pain in the case of sepsis. In contrast, seizures associated with eclampsia are fairly uncommon but more easily detectable. Thus, while a woman may have difficulty determining what constitutes an abnormal blood loss, it may be easier for her to report a condition like eclampsia.

Maternal self-reported surveys are currently being used to estimate prevalence of obstetrical complications, target women for health services, or provide a denominator of women with self-reported complication to evaluate health behaviors. Each of these potential uses is discussed with respect to their validity and limitations.

4.1 Prevalence estimates of obstetrical complications

Positive predictive values determine how accurately maternal self reports estimate the prevalence of a condition. In this study, PPV ranged from 32.4 for hemorrhage to 84.6 for eclampsia. In addition, positive predictive values are highly affected by prevalence rates. Since the prevalence of specific obstetrical complications in the general community is much rarer than those found in the hospital setting, community-based PPV would be even lower. Thus, based on the measure of PPV, study results do not support maternal self reports of obstetrical complications in a community based survey as a valid estimate of the prevalence of such conditions.

4.2 Targeting women for health services

Low sensitivity values for malpresentation, labor disorders, and eclampsia demonstrate that utilizing self reports to detect complications would result in a large number of missed cases. Furthermore, given the low prevalence of any specific obstetrical complications in these communities, even questions for which there is relatively high specificity, there would be a large number of false positives. In communities with limited medical facilities, high numbers of false positives could

overwhelm the current systems. Results of missing true cases and inflating the numbers of false positives indicate the health care needs of the communities may not be met.

4.3 Evaluation of health behavior

Although maternal self reports may not reflect the actual prevalence of obstetrical complications, they can provide a means for identifying health behaviors. For example, these surveys could evaluate the percentage of women with self reported complications who gave birth in a hospital setting. Surveys could also be used to evaluate health campaigns by measuring changes in the behavior, attitudes or knowledge of those who reported complications before and after the campaign.

4.4 Limitations

The fact that the study population was limited to women who gave birth only in hospitals presents a selection bias as 80% of women in this area had home births. Women's childbirth experiences in the community differ from those in the hospital and, therefore, it is difficult to know if results of a hospital based study can be generalized to births occurring in the community. While this was a recognized limitation even before the study began, it was not feasible to develop a gold standard for deliveries occurring in the community. However, there are potential limitations in the 'gold standard' utilized. Events occurring prior to hospital admission could not be fully evaluated. For example, many women arrived at the hospital in very advanced labor which did not allow sufficient time for full partographic evaluation of labor disorders.

Since women were interviewed at the end of their hospital stay, this study did not evaluate recall. Previous research has found differing recall of obstetrical events over time [18]. Thus, self-reports of obstetrical complications may be even less valid if women are asked about an event which occurred some time in the past.

Determining the validity of maternal self reports of sepsis was limited due to the fact that there were only three identified cases in the sub-

ject population of > 1000. This study was conducted on women birthing in hospitals where sepsis is less common than for home births. Even though sepsis may occur after women leave the hospital, the inclusion of readmitted women should have identified these cases. Qualitative research conducted in conjunction with this study, identified that while women were familiar with and concerned about sepsis (*sobrepardo*), they did not feel it was a condition warranting medical treatment (Verónica Kaune, personal communication). Consequently, women with sepsis were often treated at home and did not enter into the medical system.

Overall, there were differences between case and control groups in terms of socio-economic status and demographic characteristics. These results have implications in terms of utilization of health services. Since cases are of lower SES, cases may be more representative of poorer women who came to the hospital for delivery as a result of the complications they experienced. In contrast, controls may be more representative of women in the community with better access to 'modern' health care and represented a group of women who were more likely to plan a hospital delivery. Thus, it is possible that most cases were from the population of women (80%) who would have had home births had there been no complications. In contrast, controls may be from the population of women (20%) who had intended a hospital birth as well as women who may have perceived they had a complication when in fact they did not. However, no significant differences were detected in the validation of maternal responses when stratified by SES.

One goal of the WHO Safe Motherhood Initiative includes decreasing maternal morbidity and mortality through emergency obstetrical care for pregnant women [19]. Improvements in hospital care have been shown to increase the number of women utilizing hospitals [20]. Using maternal self reports of complications in conjunction with questions regarding health-seeking behavior (e.g. place of childbirth, delivery attendants) provides a means of evaluating improvements in obstetrical care. It may be that the important question to ask is not 'Does a woman have an obstetrical compli-

cation?' but rather, 'Given that a woman reports she has a complication, what does she do about it?' Self reports of obstetrical complications can be of great value in answering this question but they must be appropriately interpreted with full consideration of their limitations.

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