International Journal of Gynecology and Obstetrics xxx (2014) xxx–xxx

Contents lists available at ScienceDirect

International Journal of Gynecology and Obstetrics

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

www.figo.org

CLINICAL ARTICLE

Obstetric competence among primary healthcare workers in Mali

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ARTICLE INFO

Article history:
Received 15 August 2013
Received in revised form 20 December 2013
Accepted 26 March 2014

Keywords:
Clinical vignette
Emergency obstetric care
Obstetric knowledge
Primary healthcare
Sub-Saharan Africa

ABSTRACT

Objective: To determine individual and contextual factors associated with emergency obstetric and neonatal care (EmONC) competency among primary healthcare staff in Mali. *Methods:* Between November 2011 and April 2012, a competency test was administered to 196 healthcare workers in 65 community health centers in Mali. The test was scored from 0 to 100, and differences among 5 areas of EmONC were assessed. A multilevel linear regression model was used to determine individual and contextual factors associated with score. *Results:* The mean score was 66.7 (minimum, 15.9; maximum, 97.7). Knowledge was most deficient for postpartum infection and hypertensive complications. Type of health worker, years of experience, number of days absent, and availability of guidelines for management of obstetric complications within the health center were positively associated with test score ($P < 0.05$). Availability of guidelines was associated with higher competency of physicians, health technicians, and obstetric nurses ($P < 0.001$), and seemed to influence the competency of healthcare workers with fewer than 10 years of experience in particular. *Conclusion:* Guidelines must be developed that will facilitate standardization of the management of postpartum infection and other less common complications for which healthcare workers show low competence. Strategies to increase use of these guidelines will be necessary.

1. Introduction

Reducing maternal mortality and morbidity requires a fully functioning health system where women have access to a comprehensive continuum of care for reproductive health including family planning, prenatal care, emergency obstetric care, and postpartum care [1,2]. A severe shortage of trained personnel is one of the greatest impediments to improving quality of care in Sub-Saharan Africa. In addition, the knowledge and skills related to opportune diagnosis and appropriate management of obstetric complications among existing healthcare workers often do not meet the standards required in these settings with high maternal mortality [3,4]. A recent review highlighted the importance of human resources in explaining high maternal mortality, specifically with regard to poor training and poor skills mix, leading to inadequate obstetric care [5].

The competence of healthcare workers is determined by individual characteristics such as professional qualification and years of experience. However, some variability exists within the same professional cadre among individuals working in different settings [4]. Studies have shown that characteristics of the work environment can also have an impact on the competency of healthcare workers [6–8]. These characteristics include the distance of the health center to the referral hospital; the competence of coworkers; access to the internet; availability of equipment, drugs and supplies; level of activity; and leadership style [6–8]. In a study in Mali, the presence of a physician in community health centers (CHCs) was found to be associated with significantly better mother–newborn outcomes, possibly indicating that the presence of a physician improves the competence of the surrounding staff [9].

Mali has one of the highest maternal mortality ratios in the world, estimated at 540 maternal deaths per 100 000 live births [10]. In CHCs, where basic emergency obstetric and neonatal care (EmONC) is provided, the level of training and numbers of human resources vary considerably. Basic EmONC consists of essential lifesaving services that must be performed during obstetric complications including the administration of antibiotics, oxytocic drugs or anticonvulsants, manual removal of placenta and other products, assisted delivery including vacuum or forceps extraction, and newborn resuscitation [11]. Owing to shortages of personnel, maternal care in CHCs continues to be mainly provided by community-based birth attendants (known as matrons), who are recruited locally. Matrons undergo a few months of internship and some theoretical training in a maternity unit, but do not require a

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http://dx.doi.org/10.1016/j.ijgo.2014.01.012
0020-7292/

particular level of schooling [9]. Other healthcare workers found in CHCs are health technicians and obstetric nurses who undergo 3 years of specialized training after primary school, senior health technicians and midwives who undergo 3 years of (different) specialized training after the Malian baccalaureate diploma, and physicians who undergo 7 years of medical training after the baccalaureate diploma.

In a previous study in the same region, a majority of maternal deaths were attributed to the inability of healthcare workers to respond adequately and in a timely manner to obstetric complications once women reached the health center [12]. The quality of care also varied greatly among health centers. The aim of the present study was, therefore, to assess the level of EmONC competency among primary healthcare workers across CHCs in 2 regions of Mali and to determine whether workplace factors are associated with better competency. In a separate study [13], the competency of obstetric care providers was assessed in referral health centers in the same districts in Mali.

2. Materials and methods

The present cross-sectional survey was conducted among healthcare workers in CHCs in 2 distinct areas in Mali, the Kayes region and the capital Bamako, between November 1, 2011, and April 30, 2012. The study was approved by the ethics committees of the Research Centre of the University of Montreal Hospital, Montreal, Canada, and the Faculty of Medicine, Pharmacy and Odonto-Stomatology of the University of Bamako, Bamako, Mali. Informed consent was obtained from all participants.

Among the 232 CHCs in the Kayes region, a random sample of 60 CHCs was selected after the CHCs were stratified by skills mix (i.e. those with only a community-based birth attendant and a health technician; those with a midwife or obstetric nurse and a health technician; and those with a physician). Five CHCs from a borough in Bamako (Commune V) were randomly selected from the total of 10 CHCs in the city, ensuring the selection of CHCs of different sizes for the study.

In each CHC, an EmONC competency test was administered to all personnel who were involved in maternal healthcare and who had performed at least 1 delivery in the past month. Because they have the same level of training and because the sample size was small, health technicians and obstetric nurses were grouped together in 1 category, and senior health technicians and midwives in another. The test consisted of 4 basic knowledge questions and 7 clinical vignettes, and covered 5 areas related to the main complications in the last months of pregnancy (hemorrhage and uterine rupture, hypertensive complications, prolonged or obstructed labor, and sepsis), in addition to the Apgar score (Supplementary Material S1). The test was developed by Canadian and Malian obstetrician gynecologists and was based on the Malian Ministry of Health guidelines on obstetric care services [14]. It was tested in a pilot study outside the study sample and reviewed accordingly. The same local interviewer administered the tests verbally in French or Bambara, and performed all data collection.

A score was calculated on the basis of staff answers to the test. Between 1 and 5 items were expected for each answer, but a total of 1 point was given per question. The total score was converted into a percentage and assessed as a continuous variable.

Participant characteristics were collected before the test. Data on CHC characteristics were collected via a structured questionnaire that was developed in Burkina Faso and adapted to the Malian context [15]. The 12 variables collected reflected the study's hypotheses that distance, proximity to other skilled healthcare workers, availability of guidelines, drugs and supplies, quality of infrastructure, and workload might be associated with competency level in addition to training, experience, and attitudes. Data on the number of deliveries made and the number of women transferred to the district's referral center for major obstetric interventions by each CHC in the past year were obtained from the regional department of health's records.

Statistical analysis was performed with Stata version 12 (StataCorp, College Station, Texas, USA). After ensuring that no multicollinearity was present, bivariate analyses were conducted to estimate the association between independent variables and score. All independent variable were tested simultaneously in a random-effects multilevel linear regression model [16]. The multilevel data included 196 individuals nested within 65 CHCs. The model was built in a stepwise fashion; variables with a P value of less than 0.05 were included in the final model. Three interactions were tested: years of experience and type of health worker, availability of guidelines and type of health worker, and years of experience and availability of guidelines.

3. Results

All maternal healthcare workers in the CHCs selected for the study were interviewed except for 1 physician who was absent. In total, 196 healthcare workers (91 matrons; 49 health technicians, including 17 obstetric nurses; 33 senior health technicians, including 16 midwives; and 23 physicians) were recruited. The individual characteristics of the respondents are described in Table 1. Bivariate analysis showed an association between competency score and type of health worker ($P < 0.05$).

Fig. 1 shows the average score per area of knowledge and type of healthcare worker. The total mean score was 66.7 out of 100 (minimum, 15.9; maximum, 97.7; median, 66.4). Among all types of health worker, respondents scored highest for dystocic labor (mean, 87.1), followed by Apgar score (mean, 71.6), hemorrhage and uterine rupture (mean, 61.2), and hypertensive complications (mean, 59.5); and respondents scored lowest for postpartum infection (mean, 38.7). Although the mean score increased with the level of qualification of healthcare workers from 61.0 for matrons to 79.5 for physicians, there were irregularities in certain areas of assessment. For vignettes related to prolonged or dystocic labor, all types of health worker answered similarly and matrons answered slightly better than health technicians and even physicians (Fig. 1). For postpartum infection, senior health technicians (including midwives) scored higher than physicians. On average, matrons also had better knowledge of the Apgar score compared with health technicians.

Table 2 shows data collected on the characteristics of CHCs, and their bivariate association with test score. Many essential pieces of equipment and supplies were missing, and 44 CHCs (67.7%) were lacking at least 1 of 14 essential drugs required for obstetric care. Regarding the infrastructure, 39 CHCs (60.0%) had a number of beds considered as insufficient, 19 (29.2%) had no source of drinking water, 18 (27.7%) had no electricity, and 10 (15.4%) had no means of communication at the CHC itself. The median travel time to the referral center was approximately 50 minutes. The median number of women evacuated per CHC for major obstetric interventions in 2011 was 6, and staff

Table 1
Individual characteristics of primary healthcare staff and bivariate association with the competency score.

Characteristic	Value (n = 196)[a]	Mean score (%)	P value
Type of health worker			
Community-based birth attendants (matrons)	91 (46.4)	61.0	<0.001[b]
Health technicians and obstetric nurses	49 (25.7)	64.6	
Senior health technicians and midwives	33 (16.8)	76.5	
Physicians	23 (11.7)	79.5	
Years of experience	11.1 ± 9.0		
≤10 y		65.9	0.85[c]
>10 y		67.7	
Days absent in past 3 months	6.4 ± 9.5		
≤5 d		65.3	0.07[c]
>5 d		68.6	

[a] Values are given as mean ± SD or number (percentage) unless stated otherwise.
[b] By F statistic.
[c] By Pearson correlation.

Please cite this article as: Traoré M, et al, Obstetric competence among primary healthcare workers in Mali, Int J Gynecol Obstet (2014), http://dx.doi.org/10.1016/j.ijgo.2014.01.012