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CLINICAL ARTICLE

Task shifting and sharing in Tigray, Ethiopia, to achieve comprehensive emergency obstetric care

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ABSTRACT

Objective: To assess the contribution of nonphysician clinicians (NPCs) to comprehensive emergency obstetric care (CEmOC) in Tigray, Ethiopia. **Methods:** We conducted a retrospective review of the obstetric records of all women treated from January 1, 2006, to December 31, 2008, at the 11 hospitals and 2 health centers with CEmOC status in Tigray. Data were collected using 2 questionnaires, one concerning the facility and the other concerning the patient. **Results:** During the studied period 25,629 deliveries and 11,059 obstetric procedures (3369 of which were major surgical interventions) were performed at these 13 institutions. Overall, NPCs performed 63.3% of these procedures, which included 1574 (55.5%) of a total of 2835 cesarean deliveries. Whereas the cesarean deliveries performed by physicians were more often elective, those performed by NPCs were more often indicated by an emergency. Maternal deaths, fetal deaths, and length of hospital stay did not statistically differ by type of attending staff. **Conclusion:** Not only do NPCs perform a significant proportion of emergency obstetric procedures in Tigray, but the postoperative outcomes achieved under their care are similar to those attained by physicians. Strengthening NPC training programs in emergency obstetric surgery should further reduce maternal and fetal mortality and morbidity in Ethiopia.

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1. Introduction

Maternal morbidity and mortality are high in Sub-Saharan Africa, a region of the world where half of all maternal deaths occur [1]. Along with insufficient access to emergency obstetric care (EmOC), a scarcity of conventionally trained physicians greatly contributes to poor maternal outcome in this region [2–4]. *Basic EmOC* refers to a set of drugs (mainly, antibiotic, oxytocic, and anticonvulsant agents) and interventions (mainly, manual removal of retained products of conception and manual extraction of the placenta) available at a health facility to manage obstetric complications. *Comprehensive EmOC (CEmOC)* refers to the same drugs and interventions, plus the capacity to perform blood transfusions as well as major obstetric surgery (mainly, instrumental, cesarean, and destructive deliveries) [2]. Efforts to ensure timely obstetric interventions are necessary in Sub-Saharan Africa, where surgically treatable complications such as obstructed labor, ruptured uterus, and vesicovaginal fistula contribute to the persistently high rates of maternal and perinatal mortality and morbidity, and therefore pose major public health concerns [5–10]. With an estimated maternal mortality ratio of 590 deaths (confidence interval, 358–932 deaths) per 100,000 live births, Ethiopia carries a

large portion of the global burden of maternal deaths [1]. Yet, many of these deaths could be averted with the sustained commitment to improve the availability and use of CEmOC for the management of obstetric complications.

The shortage of trained health workers is greatest among the most deprived populations, where maternal mortality is the highest, and therefore the challenge of providing these populations with CEmOC is enormous [11]. In many parts of Sub-Saharan Africa there are fewer than 5 physicians for every 100,000 people [12]. This shortage is magnified in rural areas, where many health professionals have been leaving their posts to work in urban areas or other countries [13,14]. In Ethiopia, there are 3 physicians and 21 nurses for every 100,000 people [15]. Moreover, the 2005 Demographic Health Survey (DHS) reported that in Ethiopia less than 6% of all women delivered at a health facility, and that only 2.7% of the women residing in rural areas delivered in the presence of a skilled birth attendant (a situation indicating a considerable difference in the services accessible to urban and rural women) [16]. The 2005 DHS report also noted that only 1% of Ethiopian women who delivered in the 5 years preceding the survey underwent a cesarean and that most of these cesarean deliveries took place in urban areas, even though 93% of births occurred in rural areas [16]. These numbers are striking, even for a Sub-Saharan African country [11].

Training nonphysician clinicians (NPCs) in the skills needed to provide CEmOC, and deploying the trained clinicians where they

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are most needed, is one part of the solution to this crisis. Studies have shown that training less specialized health workers to perform tasks ordinarily reserved for physicians maximizes available human resources and increases CEmOC coverage [17–21]. Given the scarcity of trained surgeons, NPCs now perform most obstetric interventions in many Sub-Saharan countries [18]. They perform more than 90% of cesarean deliveries at district hospitals in Malawi and, respectively, 84% and 92% of cesarean deliveries, hysterectomies, and laparotomies for ectopic pregnancy in Tanzania and Mozambique, with post-operative outcomes similar to those obtained by specialists in all 3 countries [17,19,20].

Task shifting has also improved the availability of CEmOC in Ethiopia. In 1999, the Regional Health Bureau of Tigray began training NPCs in response to the evidence that delayed CEmOC was a leading cause of maternal death and disability [8–10,22,23]. Since then, NPCs have performed obstetric interventions, including cesarean deliveries, vacuum extractions, and forceps deliveries, at 11 district hospitals and 2 health centers in the Tigray region. To the best of our knowledge, this is the first study documenting the proportion of obstetric interventions conducted by NPCs in the Tigray region of Ethiopia and comparing their performance with that of physicians.

2. Methods

This retrospective study was conducted from May 20 through June 15, 2009. We examined Tigray registries and other official records regarding the deliveries and obstetric interventions performed from January 1, 2006, through December 31, 2008, at the 11 hospitals and 2 health centers with CEmOC status (they all received this status at least 3 years prior to the beginning of this retrospective study). Overall, the CEmOC personnel consisted of 4 obstetricians and 11 NPCs, the latter being defined as health officers with 3 years of training in public health and clinical medicine plus 6 to 9 months in EmOC services, including obstetric surgery.

Data were collected using 2 questionnaires, one concerning the CEmOC facility and the other concerning the patient. Data were extracted from registries, operating theater books, and other relevant charts. The questionnaire concerning the facility was used to determine the total number of obstetric interventions performed at each facility during the studied period according to type of staff (NPC or physician). The other questionnaire was designed to include only information on women who had undergone a cesarean delivery. Variables such as place of residence, indication for the cesarean delivery, maternal and fetal outcome, and duration of hospital stay were extracted from the patient's record.

The study was conducted with permission from the Tigray Health Bureau. As personal identifiers were not collected, informed consent was not necessary. The data were entered in an Epi-Info spreadsheet (freely available at <http://www.cdc.gov/epiinfo>) and analyzed using Stata software, version 10 (Stata, College Station, Texas, USA). Cross-tabulations were performed and comparisons according to type of provider were made using the Pearson χ^2 test. The *t* test was used to compare proportions and the Fisher exact test to compare maternal and fetal outcomes. $P < 0.05$ was considered significant.

3. Results

From January 1, 2006 to December 31, 2008, a total of 25,629 deliveries and 11,059 obstetric interventions (3369 being major interventions) were registered at the 13 CEmOC facilities. Table 1 shows the types and numbers of obstetric interventions performed during the studied period according to type of staff. During the studied period, NPCs conducted 63.3% of the 11,059 obstetric interventions scrutinized. Whereas physicians performed significantly more hysterectomies than did NPCs, the latter performed significantly more cesarean deliveries, uterine evacuations, and manual placenta removals. No

Table 1

Procedures performed from January 1, 2006, through December 31, 2008, at the 13 CEmOC facilities in Tigray, Ethiopia, by type of staff.^a

Procedure	Overall No.	Physician	NPC	<i>P</i> value
Type of delivery				
Cesarean	2835	1261 (44.5)	1574 (55.5)	<0.001
Instrumental	1582	803 (50.8)	779 (49.2)	0.53
Destructive	54	28 (51.9)	26 (48.1)	0.78
Laparotomy	276	152 (55.1)	124 (44.9)	0.09
Uterine evacuation ^b	4881	1551 (31.8)	3330 (68.2)	<0.001
Manual removal of placenta	1173	111 (9.5)	1062 (90.5)	<0.001
Uterine repair	179	92 (51.4)	87 (48.6)	0.71
Hysterectomy	79	57 (72.2)	22 (27.8)	<0.001
Total	11,059	4055 (33.7)	7004 (63.3)	<0.001

Abbreviation: NPC, nonphysician clinician.

^a Values are given as number (percentage) unless otherwise indicated.

^b The procedures were dilation and curettage or manual vacuum aspiration.

statistical differences between type of staff were found regarding the numbers of laparotomies, uterine repairs, instrumental deliveries, and destructive deliveries performed.

According to the Population Census Commission, the Tigray population was 4,314,456 in 2009, with an estimated crude birth rate of 43 per 1000 [24]; and from the records of the patients treated at the 13 CEmOC facilities during the studied period, 2835 (11.1%) of the 25,629 deliveries performed at those facilities were cesarean. Using the Census data and the number of cesarean deliveries at CEmOC facilities, we estimated that there were 376,738 births in the Tigray region during the studied period, for a cesarean delivery rate of 0.75%. We then calculated that NPCs and physicians respectively performed 55.5% and 44.5% of the cesarean procedures, and that the difference was significant (Table 1). Characteristics of the women who underwent a cesarean delivery are shown in Table 2. However, whereas 93% of all births occur in rural areas in Ethiopia [16], only 69% of the cesarean deliveries performed by NPCs and 60% of those performed by physicians were on women from rural areas. This finding suggests that CEmOC is much more accessible to women from urban areas.

Table 3 shows the indications for cesarean section by type of staff. Physicians performed 63.9% of elective cesarean deliveries, NPCs performed 55.9% of emergency cesarean deliveries, and these differences between the 2 staff groups were significant. Obstructed labor, fetal distress, and hemorrhage were among the most common indications for emergency cesarean delivery, which NPCs handled, respectively, in 62.7%, 55.3%, and 61.5% of cases. These findings

Table 2

Age, parity, and place of residence of the women who underwent a cesarean delivery in Tigray, Ethiopia, from January 1, 2006 through December 31, 2008.^a

Characteristic	Overall No.	Physician	NPC	χ^2 statistic <i>P</i> value
<20	560	203 (16.1)	357 (22.7)	29.15
20–24	452	186 (14.8)	266 (16.9)	<0.001
25–29	720	346 (27.4)	374 (23.8)	
30–34	553	279 (22.1)	274 (17.4)	
35–39	438	197 (15.6)	241 (15.3)	
≥40	112	50 (4.0)	62 (3.9)	
Parity				
0	924	261 (20.7)	663 (42.1)	159.61
1	544	251 (19.9)	293 (18.6)	<0.001
2	444	253 (20.1)	191 (12.1)	
3	327	172 (13.6)	155 (9.8)	
4	211	115 (9.1)	96 (6.1)	
≥5	385	209 (16.6)	176 (11.2)	
Place of residence				
Urban	1021	391 (31.0)	630 (40.0)	24.71
Rural	1814	870 (69.0)	944 (60.0)	<0.001

Abbreviation: NPC, nonphysician clinician.

^a Values are given as number (percentage) unless otherwise indicated.

Table 3

Indications for cesarean delivery by type of staff who performed the procedure at the 13 CEmOC facilities in Tigray, Ethiopia, from January 1, 2006 through December 31, 2008.^a

Indication	Overall No.	Physician	NPC	P value
Obstructed labor	914	341 (37.3)	573 (62.7)	<0.001
Fetal distress	351	157 (44.7)	194 (55.3)	0.048
Malpresentation	486	212 (43.6)	274 (56.4)	0.005
Hemorrhage	182	70 (38.5)	112 (61.5)	0.003
Previous cesarean	239	150 (62.8)	89 (37.2)	<0.001
Other	663	331 (49.9)	332 (50.1)	0.86
Total	2835	1261 (44.5)	1574 (55.5)	<0.001

Abbreviation: NPC, nonphysician clinician.

^a Values are given as number (percentage) unless otherwise indicated.

demonstrate the important role of NPCs in providing comprehensive emergency obstetric care.

The mean postoperative hospital stay was 7.3 days for women regardless of the type of staff who performed the cesarean delivery. Moreover, as indicated in Table 4, there was no association between type of staff and cesarean delivery outcome. There were 17 maternal and 506 fetal deaths during the studied period, with no statistical differences in mortality by type of attending staff.

4. Discussion

The Tigray region has a population of approximately 4.5 million. With 13 health institutions providing CEmOC during the studied period, the ratio of CEmOC facilities to the entire population was 1:346,153, which exceeded the United Nations benchmark of 1:500,000 [25]. Consistent with evidence from other countries [17–21], our findings demonstrate that task shifting in the provision of CEmOC, particularly for obstructed labor and major obstetric surgery, effectively increases the availability of emergency services. As in Malawi, Mozambique, and Tanzania [17,19,20], NPCs performed the bulk of obstetric interventions during the 2-year period studied, including surgical interventions, and performed significantly more emergency cesarean deliveries than physicians.

Only 4 physicians performed emergency obstetric surgical procedures before task shifting was implemented in Tigray, and the addition of 11 NPCs is obviously making a difference in the availability of quality CEmOC. We report similar maternal and fetal outcomes, including mean postoperative hospital stay (the latter being an indirect indicator of postoperative morbidity) and maternal or fetal mortality rates. These findings provide strong evidence that NPCs can effectively perform surgical obstetric procedures and have an important role in the delivery of CEmOC in Ethiopia. Further, they suggest that training and deploying NPCs will reduce the risk of maternal death by making emergency obstetric care more available wherever there is a shortage of specialists.

This was the case in Tigray, where the presence of NPCs largely extended CEmOC services to rural women. Unlike physicians, who tend to leave these areas, NPCs are likely to continue having a crucial role in meeting the needs of rural women [13,14,19]. The discrepancy in cesarean delivery rates, which the 2005 DHS estimated at 9.4% for

Table 4

Length of hospital stay and maternal and fetal deaths among the women who underwent a cesarean delivery by type of staff who performed the procedure at the 13 CEmOC facilities in Tigray, Ethiopia, from January 1, 2006 through December 31, 2008.^a

Variable	Overall No.	Physician	NPC	P value ^b
Hospital stay, d	7.27 ± 3.04	7.26 ± 2.92	7.28 ± 3.13	—
Maternal deaths	17	8 (47.1)	9 (52.9)	0.80
Fetal deaths	506	212 (41.9)	294 (58.1)	0.20

Abbreviation: NPC, nonphysician clinician.

^a Values are given as mean ± SD or number (percentage) unless otherwise indicated.

^b By the Fisher exact test.

urban areas and 0.3% for rural areas in Ethiopia, illustrates the desperate need [16].

Although the number of CEmOC facilities is officially adequate in Tigray, the population-based estimation of the cesarean delivery rate in the Tigray region was 0.75%, which is considerably less than the lower limit of the UN-recommended 5%–15% range [25]. Moreover, the 2005 DHS reported that 90% of births occurred at home in Ethiopia, and that in rural areas only 2.7% of births were assisted by a skilled birth attendant [16]. Rather than indicating an inability of CEmOC facilities to meet basic levels of care, these rates suggest that women in labor face overwhelming hurdles when they need emergency care. Further studies are needed to identify barriers to accessing CEmOC services.

This study contributes to the body of evidence demonstrating that sharing and shifting surgical tasks is feasible and can substantially increase availability, quality, and equity in obstetric care. A review of 47 Sub-Saharan African countries highlighted the crucial role of NPCs in clinical medicine, including minor surgery, in 25 of those countries [18]. Whereas the tasks performed by NPCs included obstetric procedures in many of the countries investigated, NPCs performed cesarean deliveries in only 4. Strengthening programs to advance the training of NPCs in CEmOC would contribute much to meeting the minimum standard of care and improve maternal health in Ethiopia and other parts of Sub-Saharan Africa similarly challenged by an acute shortage of physicians, especially in rural areas.

Conflict of interest

The authors have no conflicts of interest.

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