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CLINICAL ARTICLE

Ambulance referral for emergency obstetric care in remote settings



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ABSTRACT

Objective: To evaluate the functionality of an ambulance service dedicated to emergency obstetric care (EmOC) that referred pregnant women to health centers for delivery assistance or to a hospital for the management of obstetric complications. **Methods:** A retrospective study investigated an ambulance referral system for EmOC in a rural area of Ethiopia between July 1 and December 31, 2013. The service was available 24 h a day and was free of charge. Women requesting referral were transported to nearby health centers. Assistance was provided locally for uncomplicated deliveries. Women with obstetric complications were referred from health centers to a hospital. **Results:** A total of 528 ambulance referrals were recorded. The majority of patients (314 [59.5%]) were transported from villages to health centers. The remaining individuals were brought to a hospital, having been referred from health centers (179 [33.9%]) or were referred directly from villages owing to hospital proximity (35 [6.6%]). Of the 179 patients referred to the hospital from health centers, 84 (46.9%) were diagnosed with major direct obstetric complications. No maternal deaths were recorded among patients using the ambulance service. The cost of the ambulance service was US\$ 18.47 per referred patient. **Conclusions:** An ambulance service dedicated to EmOC that interconnected health centers and a hospital facilitated referrals and better utilized local resources.

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1. Introduction

Maternal mortality ratios are alarmingly high in much of Sub-Saharan Africa. Ethiopia has consistently demonstrated one of the highest maternal mortality ratios in the world, estimated at 871, 673, and 676 deaths per 100 000 live births in 2000, 2005, and 2011, respectively [1–3].

Lack of access to emergency obstetric care (EmOC) is thought to be a significant factor contributing to high maternal mortality [4]. Efforts to improve access to EmOC have focused on establishing a minimum number of EmOC facilities, improving the quality of care in such facilities, and mobilizing communities to encourage women to use these services [4]. However, overcoming transport barriers is another relevant aspect that is frequently neglected [5]. Timely access to quality comprehensive EmOC for is recognized as being essential to reduce maternal mortality [6,7].

It is noteworthy that ambulances are available in most Sub-Saharan settings, but are often poorly managed, badly maintained, and have frequent breakdowns [5]. Also of interest in the provision and use of

ambulance services in Sub-Saharan Africa is the impressive diffusion and acceptance of cell phones in remote settings, a recent and widespread phenomenon that offers a unique and previously inconceivable way to ensure prompt communication and intervention [8–10].

In these settings, ambulance services for EmOC are poorly used and their effectiveness remains largely unevaluated. Pilot studies have supported the validity of these interventions but current evidence is sparse and the confirmation of existing evidence in different contexts is warranted [5,11–15].

The aim of the present study was to evaluate data from an EmOC ambulance service that covers a vast catchment area of the Southwest Shoa zone of Oromia region, Ethiopia.

2. Materials and methods

The present retrospective study included data from patients who received an ambulance referral for obstetric reasons between July 1 and December 31, 2013 in the catchment area of St. Luke Catholic Hospital, Wolisso, Ethiopia. The catchment area of the hospital included four woredas (the Ethiopian third-level administrative division) in the Southwest Shoa zone of the Oromia region of Ethiopia (Wolisso Rural, Goro, Wonchi, and Wolisso Town). The study population consisted of all patients who experienced an obstetric indication for an ambulance referral during the study period. The study protocol was approved by

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the local Institutional Review Board. Obtaining informed consent was waived by the Institutional Review Board because the present study was a retrospective analysis of routine program data.

According to local data from the South West Shoa zone Health Department (unpublished data), the combined population of the four woredas during the present study was 397 573 (Woliso Rural: 178 633, Goro: 55 195, Wonchi: 113 088, and Woliso Town: 50 657). The expected number of deliveries per year in the complete study area was 13 518 (6759 during the 6-month study period). Health care for the entire area was provided by one hospital and 18 health centers. St. Luke Catholic Hospital was a unique comprehensive EmOC facility in the study area. None of the health centers fulfilled the classification criteria of a basic EmOC facility. In the health centers, obstetric care for uncomplicated deliveries was provided by nurses and midwives. Pregnant women experiencing any obstetric complications were referred to the St. Luke Hospital maternity unit, which was staffed by a team of midwives, general practitioners with surgical skills, anesthetists, and an obstetrics and gynecology specialist. Blood transfusions and a surgical theater were available 24 h per day. Further, the hospital had a separate neonatology unit that was staffed by a neonatologist and other staff specifically trained in neonatal care.

In March 2013, the study hospital began operating a 24-h free-of-charge ambulance referral system for transferring pregnant patients from villages to health centers and, if required, from the health centers to St. Luke Hospital. Communication was performed primarily using cell phones. When a patient or family member called for an ambulance, an ambulance was dispatched from St. Luke Hospital to the relevant village. Patients were transported to health centers or the hospital if it was the closest healthcare facility. Health-center staff could refer patients to the hospital in the event of obstetric complications. The ambulance service itself was managed exclusively by the ambulance drivers. No healthcare providers with training in the management of pregnancy deliveries accompanied the ambulance. All connecting roads in the area had rough road surfaces.

Data were collected from records of all of the study sites, including delivery registers, delivery logbooks, prenatal registers, referral registers, and death registers. Additionally, data were collected from the ambulance database and logbook. Records in the database were then validated by cross-checking the records with registers at the study sites. Patients brought to health centers and immediately diverted to the hospital owing to obstetric complications were classified as referrals to the hospital from health centers. The recorded information included patient demographic information, what facilities patients were referred to and from where, the reason the ambulance was contacted, the number of deliveries that occurred inside and outside study sites, and Apgar scores for live births. Additionally, data on the number of deliveries that occurred inside and outside study sites during the 18 months prior to the study were recorded. Major obstetric complications that occurred during the study period were classified according to WHO recommendations [4]. Cost data were recorded for the ambulance itself (vehicle maintenance, insurance, taxes, fuel, personnel, and cell-phone communication). Costs were reported in Ethiopian birr (ETB) and were converted into US dollars (US\$) (1 ETB = US\$ 0.049).

The hospital, health centers, and ambulance service were partly supported by the international non-governmental organization Doctors with Africa CUAMM, through a project aimed at improving the accessibility of maternal, perinatal, and neonatal services in the study area.

3. Results

A total of 528 ambulance referrals were recorded during the study, an average of 2.9 referrals per day. During the study period, the total distance covered by the ambulance was 19 439 km. Of the patient referrals, 406 were for patients aged 20–34 years (76.9%). There were 35 (6.6%) patients younger than 20 years and 87 (16.5%) patients older than 35 years in the study population. A significant majority of 464 (87.9%)

referrals originated in rural areas. Of the patient referrals recorded, 314 (59.5%) were from villages to health centers; 179 (33.9%) patients were referred to St. Luke Hospital from health centers and 35 (6.6%) referrals to the hospital were directly from villages owing to hospital proximity. Of the 528 referrals, 513 (97.2%) were for advanced pregnancy complications or delivery-related complications; the remaining 15 (2.8%) patients were referred for spontaneous abortion-related care. Overall, 2113 deliveries occurred in healthcare facilities during the study period (966 in health centers and 1147 in St. Luke Hospital); among these individuals, 513 (24.3%) had been referred by ambulance owing to advanced pregnancy complications or delivery-related complications. During the study period, among the total number of deliveries that occurred in the Woliso Rural, Goro, Wonchi, and Woliso Town regions, 10.7%, 19.2%, 16.1%, and 17.7% occurred in health centers, respectively.

When considering data from before the ambulance program began, there was a considerable increase in the number of deliveries that occurred in health centers, with 966 deliveries taking place in health centers during the study period (July–December 2013) compared with 304 deliveries that took place in health centers during the same 6-month period in 2012. Table 1 details the number of institutional and home deliveries, stillbirths, and maternal deaths that occurred during four 6-month periods between 2012 and 2013.

Demographic data for the 179 patients referred to the hospital from health centers through the ambulance program are shown in Table 2. Of these patients, 84 (46.9%) were diagnosed with at least one major direct obstetric complication. These 84 patients experienced a combined 100 direct major obstetric complications, accounting for 25.4% of the 393 major direct obstetric complications that were recorded in the hospital during the study period. Of these 179 patients, 111 (62.0%) had a spontaneous vaginal delivery, 13 (7.3%) underwent instrumental delivery (forceps or vacuum), 40 (22.3%) underwent a cesarean delivery, and 15 (8.4%) received for spontaneous abortion care. No maternal deaths were recorded among patients who received ambulance referrals. In total, 20 patients had twin pregnancies; consequently, 199 neonates were recorded among the study participants referred to the hospital from health centers. No perinatal deaths were recorded among these 199 neonates and Apgar scores at 5 min were at least 7 for 170 (85.5%) neonates, 4–6 for 10 (5.0%) neonates, and 3 or lower for 19 (9.5%) neonates.

The costs of operating the ambulance service are detailed in Table 3. The total 6-month cost for running the program was 199 059 ETB (\$9 754), which is equivalent to 377 ETB (\$18.47) per referred patient.

4. Discussion

The present study emphasized some relevant outcomes of implementing an ambulance service specifically dedicated to support EmOC in a remote setting. An increase in the number of deliveries that occurred in healthcare facilities was observed and the per-referral cost of implementing the system was low.

Some important observations of the program were recorded. First, no maternal deaths occurred among patients referred by ambulances.

Second, the proportion of deliveries that occurred at healthcare facilities was higher during the study period than during the three preceding 6-month periods examined. A prospectively planned, formal comparison including data from before the service was implemented would have been more informative; however, it is noteworthy that there was a threefold increase in the number of deliveries that occurred at healthcare centers compared with the same 6-month period 1 year previous, that 24.3% of all deliveries that occurred in healthcare facilities occurred among patients referred using the ambulance service for advanced pregnancy complications or delivery-related reasons, and that 31.3% of the estimated total number of births that occurred in the study area during the study period occurred in a healthcare facility (2113 out of an estimated 6759 deliveries) (unpublished data from

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