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Availability and readiness of health facilities to provide emergency obstetric care in eight low- and lower-middle-income countries: insights from nationally representative health facility surveys

Abu Sayeed ,[1] Nondo Saha ,[1] Md Refat Uz Zaman Sajib ,[2] Emily C Keats ,[3] Hassan Rushekh Mahmood,[1,4] Lubna Hossain,[1] Ema Akter,[1,5] Nuruzzaman Lucky,[1] Esrat Jahan,[6] Sahar Raza,[1] Fariya Rahman,[1] Shams El Arifeen ,[1] Ahmed Ehsanur Rahman,[1] Anisuddin Ahmed [1,7]

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For numbered affiliations see end of article.

Correspondence to
Abu Sayeed;
abu.sayeed1@icddrb.org;
shuvo.nfs.pstu@gmail.com

ABSTRACT

Background Despite progress in reducing global maternal mortality in recent decades, low- and lower-middle-income countries (LLMICs) continue to face major challenges. To reduce preventable maternal deaths, the WHO recommends emergency obstetric care (EmOC) in health facilities (HFs). However, up-to-date multi-country evidence on availability and readiness in LLMICs remains very limited. Hence, we analysed EmOC service availability and readiness in HFs across eight LLMICs.

Methods We did a multi-country facility-based analysis of data from nationally representative Service Provision Assessment (SPA) surveys conducted between 2014 and 2022 in eight LLMICs (Afghanistan, Bangladesh, Democratic Republic of the Congo, Ethiopia, Haiti, Nepal, Senegal and Tanzania). A total of 4,382 facilities offering normal delivery services were included in the analysis. Service availability was assessed using seven signal functions for basic EmOC (BEmOC) with an additional two for comprehensive EmOC (CEmOC). The readiness score was calculated across three equally weighted domains—staff training and guidelines, essential equipment and supplies and essential medicines, resulting in a total score of 100. Descriptive statistics and multivariable regression were used to analyse the data.

Results The average availability of BEmOC services was 13%, ranging from 2% in Nepal to 47% in Ethiopia. For CEmOC, average availability was 5%, ranging from 2% in Nepal to 19% in Afghanistan. Among facilities providing caesarean delivery services, 11% lacked blood transfusion services on average—this was highest in Bangladesh (20%), followed by Tanzania (12%) and Afghanistan (11%). Overall, the mean EmOC readiness score was 47, ranging from 40 in Tanzania to 60 in Ethiopia.

Conclusion The availability of BEmOC and CEmOC services and the related readiness of HFs were low. This study reveals critical gaps in selected LLMICs, including where facilities perform caesarean deliveries without having blood transfusion services. If not addressed, these gaps will limit the contribution of EmOC to reducing maternal mortality in LLMICs.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ There is limited multicountry evidence on emergency obstetric care (EmOC) availability and readiness using standardised, nationally representative facility survey data.

WHAT THIS STUDY ADDS

⇒ The availability and readiness of basic and comprehensive EmOC services were low across the low- and lower-middle-income countries (LLMICs), irrespective of facility type, location and ownership.

⇒ The substantially lower readiness observed in the medicines and commodities domain indicates a critical gap in service delivery capacity.

⇒ This study also revealed a critical gap where facilities provide caesarean deliveries without access to blood transfusion services.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ The limited availability and readiness of EmOC services in LLMICs highlight the need for stronger commitment from governments and global health development partners to ensure timely, life-saving maternal care and accelerate progress toward Sustainable Development Goal 3.1.

INTRODUCTION

Maternal mortality continues to pose a major public health challenge globally and is widely recognised as a key indicator of the quality

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and accessibility of healthcare services for women. Despite a 40% decline in maternal mortality globally between 2000 and 2023, an estimated 700 women died each day in 2023 from complications related to pregnancy and childbirth.[1 2] In 2023, over 90% of all maternal deaths occurred in low-income and lower-middle-income countries (LLMICs).[1] Timely access to quality emergency obstetric care (EmOC) plays a critical role in preventing maternal deaths and improving birth outcomes.[3 4]

The World Health Organization (WHO) developed the EmOC framework as a standardised set of life-saving interventions to manage pregnancy-related complications.[3] The first 24 hours after birth are the most critical, accounting for 45% of maternal deaths—most of which are preventable.[5] Ensuring the availability and readiness of EmOC services in delivery facilities is essential to reducing these preventable deaths.[6] Studies show that effective EmOC services can prevent up to 74% of maternal deaths;[7] however, despite global commitments to achieve Sustainable Development Goal (SDG) 3.1 and national efforts to strengthen maternal health services, many health facilities (HFs) in resource-limited settings still face substantial barriers in delivering life-saving care during obstetric emergencies.[8–10]

SDG 3.1 aims to reduce the global maternal mortality ratio to fewer than 70 deaths per 100 000 live births by 2030.[11] Achieving this target necessitates substantial improvements in the availability, accessibility and quality of maternal healthcare services, particularly in LLMICs.[11] A key first step is to assess, monitor and evaluate the availability and quality of these services.[3]

Some previous studies have used Service Provision Assessment (SPA) surveys, which are nationally representative HF assessments conducted to evaluate service availability and readiness using standardised tools in Bangladesh,[12] Ethiopia,[13] Nepal[14] and Tanzania[15] to report on the availability and readiness of basic EmOC (BEmOC) and comprehensive EmOC (CEmOC) services. In addition, Kanyangarara *et al* linked SPA/Service Availability and Readiness Assessment (SARA) facility data with Demographic and Health Survey (DHS)/Multiple Cluster Indicator Survey household survey data across 17 low- and middle-income countries to assess obstetric service availability, readiness and coverage.[16] However, existing studies mainly focus either on individual countries (Ethiopia, Nepal, Tanzania) or use outdated SPA data (Bangladesh), and multicountry evidence across LLMICs remains very limited for EmOC service availability and readiness using standardised facility survey data from recent survey rounds, particularly those conducted predominantly from 2015 onward. This constrains a broader understanding of EmOC service availability and readiness across LLMICs with recent nationally representative surveys. Filling this gap will provide critical evidence on the availability and readiness of EmOC services, guiding policies and practices to strengthen maternal care systems in LLMICs, where the majority of maternal deaths occur—and accelerate progress toward SDG 3.1. Given this gap in EmOC service literature and possible policy implications of the findings, we analysed the most recent SPA survey data from eight LLMICs to assess the availability and readiness of BEmOC and CEmOC services among HFs that offer normal delivery services.

METHODS

Study design, setting and data sources

In this study, we used data from nationally representative SPA surveys. Given that this study is a secondary analysis of cross-sectional data, we followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.[17] To date, the SPA surveys have been conducted in 18 countries. To align with the SDG era (2015 onwards), we excluded SPA surveys conducted entirely before 2015 and therefore have included only eight countries. As the Tanzania SPA survey (2014–2015) had a data collection period spanning from October 2014 to February 2015, it was included because part of the fieldwork was conducted in 2015. Among these, based on the World Bank's 2023–2024/2024–2025 fiscal year classification, Bangladesh, Haiti, Nepal, Senegal and Tanzania were categorised as lower-middle income countries, while the Democratic Republic of the Congo (DRC), Ethiopia and Afghanistan were classified as low-income countries.[18] For countries with multiple SPA surveys conducted within this timeframe, we included only the most recent survey data to ensure that our findings reflect the most current health system conditions for EmOC service availability and readiness.

All datasets used in our analysis were obtained from the publicly accessible USAID's DHS Programme, following registration on their website except Bangladesh. For this study, the Bangladesh dataset was accessed through icddr,b, which provided technical assistance at every stage of the survey including monitoring the field work and data collection and the full survey report is currently available on the DHS portal. We analysed the most recent available SPA datasets from eight countries to reflect recent health system conditions: Afghanistan (2018–2019), Bangladesh (2022), the DRC (2017–2018), Ethiopia (2021–2022), Haiti (2017–2018), Nepal (2021), Senegal (2019) and Tanzania (2014–2015). In Bangladesh, Ethiopia, Nepal, Senegal and Tanzania, data were drawn from nationally representative samples of HFs. In contrast, data from Afghanistan, DRC and Haiti were based on the facility census approach.

Stratified random sampling strategies for each SPA are designed to allow for indicators to be representative at the national and regional levels. From an initial sampling frame of 74,260 HFs, 8,839 were selected for interview and 8,349 were successfully interviewed. The final analytic sample included 4,382 facilities that provided normal delivery services with complete information. A total of 112, 412, 1,328, 217, 361, 805, 243 and 905 HFs offering normal delivery services were included from Afghanistan,

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EmOC Signal Functions	BEmOC[a]	CEmOC[b]
1. Administration of parenteral[1] antibiotics	✓	✓
2. Administration of uterotonic drugs[2] (i.e. parenteral oxytocin)	✓	✓
3. Administer parenteral anticonvulsants for pre-eclampsia and eclampsia (i.e. magnesium sulfate)	✓	✓
4. Perform assisted vaginal delivery (e.g. vacuum extraction, forceps delivery) (AVD)	✓	✓
5. Manually remove the placenta (MRP)	✓	✓
6. Remove retained products (e.g. manual vacuum extraction, dilation and curettage) (MVA)	✓	✓
7. Perform basic neonatal resuscitation (e.g. with bag and mask)	✓	✓
8. Perform surgery (e.g. caesarean section)	✗	✓
9. Perform blood transfusion	✗	✓

[a] A basic emergency obstetric care facility is one in which all functions 1 to 7 are performed.
[b] A comprehensive emergency obstetric care facility is one in which all functions 1 to 9 are performed.

[1] Injection or intravenous infusion.

[2] Uterotonic drugs are administered both to prevent and to treat postpartum haemorrhage. A recent WHO technical consultation (Nov 2008) to develop guidelines for interventions for preventing postpartum haemorrhage, reviewed all available evidence, and identified parenteral oxytocin as the recommended choice of drug for prevention of postpartum haemorrhage. Parenteral ergometrine (2nd line) and misoprostol (3rd line) are options that should only be used where oxytocin is not available.

Figure 1 Signal functions of Basic and Comprehensive Emergency Obstetric Care (EmOC) services. The figure outlines the nine signal functions that define Basic EmOC (BEmOC) and Comprehensive EmOC (CEmOC). BEmOC facilities are expected to perform signal functions 1–7, whereas CEmOC facilities should provide all nine signal functions, including the two additional comprehensive services (signal functions 1–9). AVD, assisted vaginal delivery; MVA, manual vacuum aspiration.

Bangladesh, DRC, Ethiopia, Haiti, Nepal, Senegal and Tanzania respectively. The detailed sampling process has been outlined in online supplemental figure S1. The surveys were conducted over periods ranging from three to eleven months, spanning one or two calendar years. The SPA surveys employed four main types of data collection instruments: facility inventory questionnaire, health worker interview questionnaire, observation protocol of client-provider consultations for selected services and exit interview questionnaire for clients of these services. The current analysis used almost all variables from the facility inventory questionnaire and only one variable on staff training derived from the health worker interview questionnaire. The comprehensive details on sampling design, fieldwork processes and respondent characteristics are available in the respective SPA reports.[19]

Signal functions of EmOC

A set of medical interventions known as "signal functions" is used in the treatment of obstetric complications as part of EmOC services.[3] These signal functions serve to classify HFs as providers of either BEmOC or CEmOC, depending on whether the respective functions were performed within the preceding 3 months (figure 1).

Outcome and explanatory variables

In this study, availability of BEmOC and CEmOC services was the primary outcome. BEmOC and CEmOC service availability at a facility was assessed based on whether the required seven (for BEmOC) or nine (for CEmOC) signal functions had been performed at least once in the past 3 months.[3] The 3 month reference period follows the standard approach used in SPA surveys,[19] which emphasise demonstrated performance of signal functions rather than reported or theoretical capacity, thereby providing a more accurate reflection of a facility's functional capacity to deliver EmOC. For the blood transfusion component of CEmOC, the SPA framework captures this as a service availability item based on the facility's report of whether it offered blood transfusion services.

The secondary outcome, readiness of EmOC services, was evaluated using the WHO-SARA framework.[20] Readiness was assessed across three domains: staff and guideline components (2 indicators), equipment and supplies components (6–13 indicators) and essential medicines and commodities (5–12 indicators). Each domain contributed equally to the total score (33.33 points each, assuming a maximum of 100 points). This equal weighting approach within the domains follows the WHO-SARA framework,[20] which aggregates domain-specific indicators into a composite readiness index to ensure consistency and comparability across settings. The selection of the indicators was determined based on their inclusion in the countries' SPA surveys.[19] Although the specific tracer items varied slightly across countries depending on SPA questionnaire modules, only indicators available in each country dataset were included. Missing or non-available indicators were not imputed or replaced. The overall EmOC readiness score for each facility was calculated by summing the domain-specific proportions. The full list of tracer items and the calculation method for each country are detailed in online supplemental tables S6a–h.

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The selected explanatory variables included facility type (primary or referral), ownership (public or private) and location of facilities (rural or urban) within each country. Country-specific classification of primary-level facilities (typically health centres staffed by midwives) and referral-level facilities (hospitals staffed by doctors) are detailed in online supplemental table S1.[21 22]

Statistical analysis

We calculated country-level statistics for both primary-level and referral-level facilities that provided delivery services, applying survey-specific facility sample weights. Sample weights accounted for stratification, typically by subnational geographic units (such as region or province) and administrative categories (such as facility type or managing authority), as outlined in each country's report.[19] Adjustments were also made for oversampling of specific facility types, non-response and facility closures. Descriptive analyses were conducted for both continuous and categorical variables. Continuous variables were summarised using means and SD, while categorical variables were reported as frequencies and proportions, and results were presented in tables and graphs. Estimates were disaggregated by country, facility type (primary vs referral), ownership (public vs private) and location (urban vs rural), and presented with 95% confidence intervals (CIs). Differences in EmOC availability across groups were assessed using χ^2 tests or Fisher's exact test where applicable, particularly in subgroup analyses with small cell counts or sparse data, and differences in readiness scores were assessed using t-tests. To examine factors associated with EmOC service availability and readiness, we conducted multivariable regression analyses. Logistic regression models were fitted to estimate adjusted odds ratios (AORs) with 95% CIs for BEmOC and CEmOC availability (binary outcomes), and linear regression models were used to estimate coefficients with 95% CIs for readiness score (continuous outcome). In addition, multilevel regression models accounting for clustering within countries were conducted as sensitivity analyses to assess the robustness of the findings. To further explore the relative contribution of explanatory variables to variation in EmOC readiness, decomposition analysis using the Shapley value decomposition approach with the Lindeman-Merenda-Gold method was performed. Statistical significance was set at $p<0.05$ (two-sided). Facility-level weights were applied to ensure that the contribution of each facility type reflected the actual distribution of HFs within each country. These weights were incorporated prior to analysis to maintain the representativeness of the sample. To account for the complex sampling design of the SPA surveys, Stata's *svy* command was used. Each country's dataset was analysed independently, and additionally, a pooled analysis across countries was also conducted. For the pooled analysis, survey weights were de-normalised following DHS analytical guidelines to ensure proper representation of the population sizes (facility counts) of individual countries.[23] All analyses were conducted using Stata V.17.0 (Stata, College Station, Texas, USA). The BMJ Global Health Author Reflexivity Statement is included as online supplemental file 2.

RESULTS

Table 1 displays the distribution of surveyed HFs providing normal delivery services based on their background characteristics. The overall mean availability of BEmOC and CEmOC services was 13% and 5%, respectively, among facilities providing delivery services and it varied across countries and facility levels (figure 2). BEmOC service availability ranged from 2% to 47% among the studied countries, while CEmOC availability ranged from 2% to 19%. Ethiopia had the highest availability of BEmOC services (47%), followed by Afghanistan (36%) and Senegal (28%). For CEmOC services, the availability was highest in Afghanistan (19%), followed by Bangladesh (13%) and Haiti (10%). Ethiopia had the highest BEmOC availability among primary level facilities at 42%, though this still represented less than half of its facilities. Additionally, no primary-level facility in Nepal

Table 1 Distribution of surveyed facilities offering normal delivery services according to background characteristics

	Types of facilities		Ownership of facilities		Location of facilities		
Countries	Primary N (%)	Referral N (%)	Public N (%)	Private N (%)	Urban N (%)	Rural N (%)	Total N (%)
Afghanistan	67 (59.7)	45 (40.3)	9 (8.4)	102 (91.6)	111 (99.4)	1 (0.6)	**112**
Bangladesh	209 (50.7)	203 (49.3)	245 (59.4)	167 (40.6)	192 (46.6)	220 (53.4)	**412**
DRC	1196 (90.1)	132 (9.9)	822 (61.9)	505 (38.1)	289 (21.8)	1039 (78.2)	**1328**
Ethiopia	193 (89.0)	24 (11.0)	198 (91.3)	19 (8.7)	85 (39.0)	132 (61.0)	**217**
Haiti	296 (82.0)	65 (18.0)	221 (61.1)	140 (38.9)	145 (40.1)	216 (59.9)	**361**
Nepal	702 (87.2)	103 (12.8)	743 (92.3)	62 (7.7)	345 (42.8)	460 (57.2)	**805**
Senegal	231 (95.2)	12 (4.8)	216 (89.1)	27 (10.9)	227 (93.5)	16 (6.5)	**243**
Tanzania	861 (95.2)	44 (4.8)	756 (83.6)	149 (16.4)	132 (14.6)	773 (85.4)	**905**
Pooled	**3754** (85.7)	**628** (14.3)	**3210** (73.3)	**1172** (26.7)	**1525** (34.8)	**2856** (65.2)	**4382**

DRC, Democratic Republic of the Congo.

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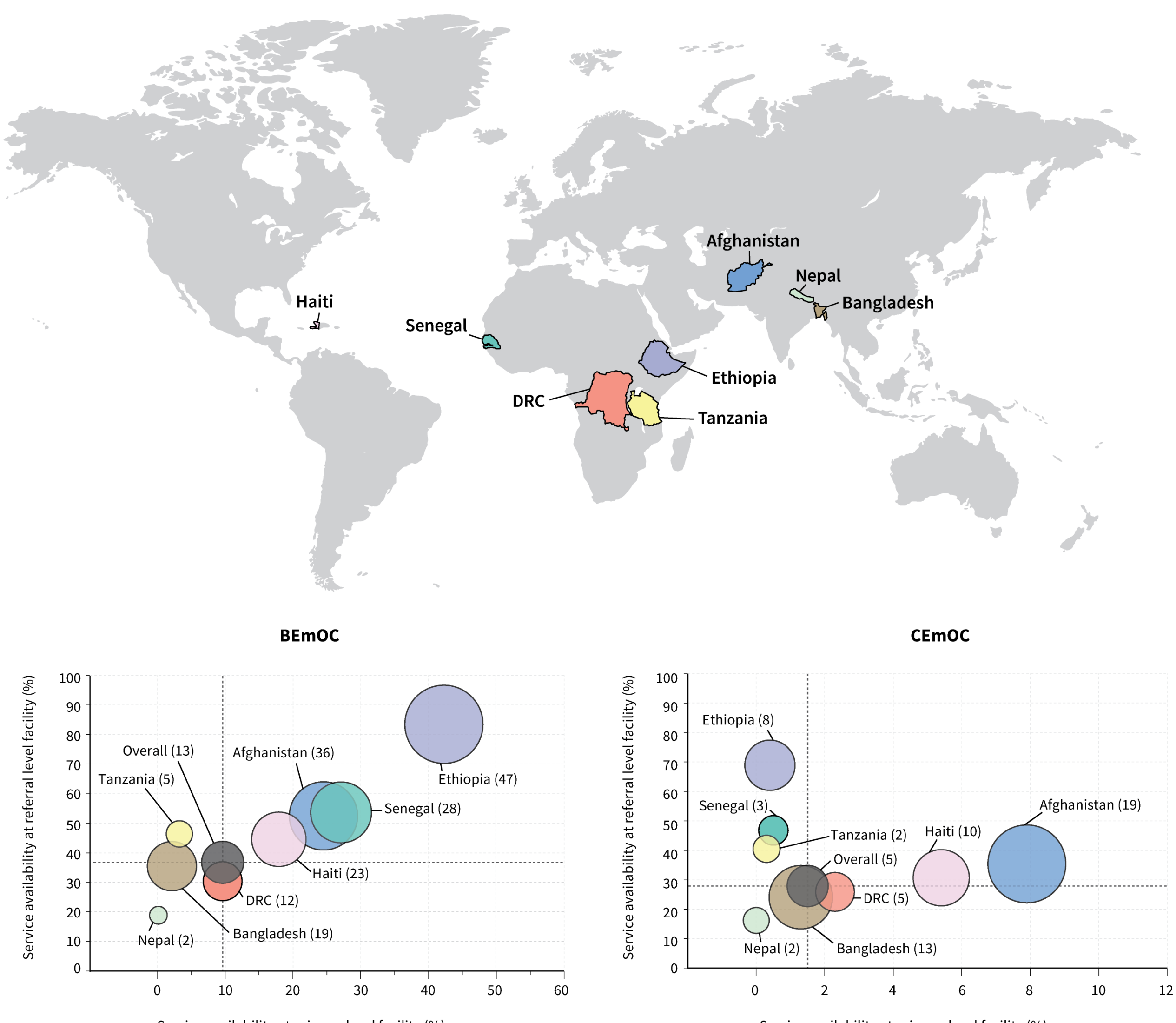

Figure 2 Availability of BEmOC and CEmOC services among facilities offering normal delivery services by facility type and country. Each circle's size indicates overall service availability (%), with values shown in brackets beside each country. The x-axis indicates the percentage of service availability at primary-level facilities, while the y-axis shows the percentage at referral-level facilities.

provided CEmOC services. BEmOC availability at the referral level was below 50% in five of the eight countries, while CEmOC availability at the referral level was below 50% in seven of the eight countries (online supplemental table S2).

Overall availability of parenteral antibiotics was relatively high (>70%) in most of the countries except Bangladesh (58%), Nepal (37%) and Tanzania (34%). Additionally, a clear gradient by facility level was observed, with referral-level facilities consistently demonstrating high availability (>70%) across all countries, while availability in primary-level facilities was substantially lower (<35%) in several settings (Bangladesh, Nepal and Tanzania). Parenteral oxytocin was the most widely available signal function across overall, primary and referral-level facilities. In contrast, the availability of parenteral anticonvulsant was low for all countries and particularly in primary-level facilities, with only Afghanistan and Ethiopia reporting rates above 50%. In Nepal, the availability of assisted vaginal delivery (8%), manual removal of placenta (37%), removal of retained product (MVA) (26%) and neonatal resuscitation (30%) was low, whereas other countries showed comparatively better availability (figure 3 and online supplemental table S3). In the pooled analysis across all eight countries, 11% of facilities providing caesarean delivery services lacked blood transfusion services. Senegal was the only exception, where all facilities offering caesarean deliveries also had blood transfusion services available. In Afghanistan and Bangladesh, approximately 20% of referral-level facilities providing caesarean delivery services did not have access to blood transfusion services (figure 4). Among private facilities, a significant proportion lacked blood transfusion capability despite offering caesarean delivery

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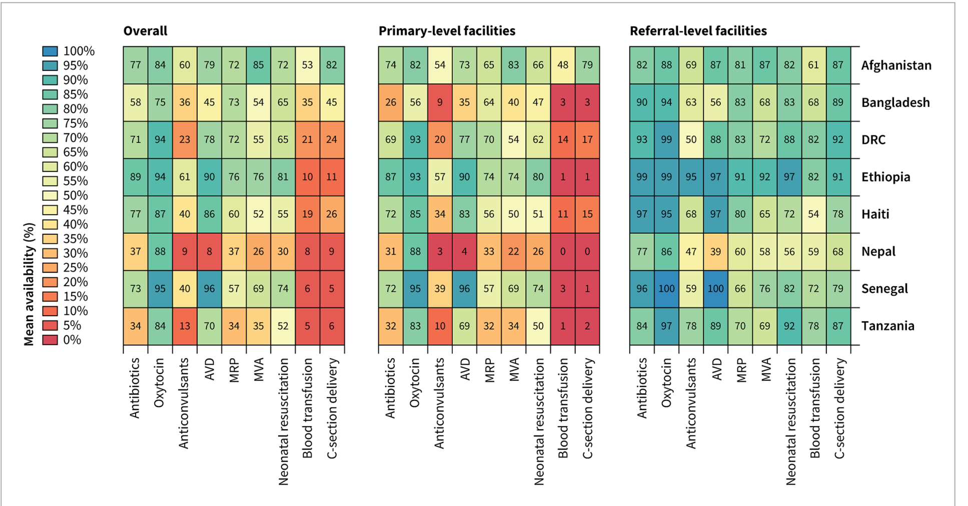

Figure 3 Availability of EmOC signal functions by facility type and country. The heat map illustrates the percentage of facilities that performed the EmOC signal functions at least once during the three months preceding the survey across eight countries, disaggregated by overall, primary-, and referral-level facilities. Percentages shown within each cell indicate the availability of each signal function. Colour intensity corresponds to mean availability, with darker shades indicating higher availability. AVD, assisted vaginal delivery; DRC, Democratic Republic of the Congo; EmOC, emergency obstetric care; MRP, manual removal of placenta; MVA, manual vacuum aspiration.

services—12% in Afghanistan, 21% in Bangladesh and 15% in Tanzania (online supplemental table S4).

Among the facilities studied, the mean EmOC readiness score was 47 out of 100, comprising 20 out of 33.33 for staff and guidelines, 20 out of 33.33 for equipment and supplies, and only 7 out of 33.33 for medicines and commodities, indicating substantially lower readiness in the medicines and commodities domain. The mean readiness score was highest in Ethiopia (60), followed by Senegal (59) and Nepal (53). Except for Afghanistan and Senegal, a significant difference in mean readiness scores was observed between primary- and referral-level facilities (figure 5). A significant difference in mean readiness scores between public and private facilities was observed in Afghanistan, Bangladesh, DRC, Ethiopia and Tanzania. Regarding facility location, mean readiness scores were significantly higher in urban areas compared with rural settings across most countries, except Ethiopia and Nepal, where no significant differences were observed (online supplemental table S5).

Multivariable analyses highlighted that facility type and location were significantly associated with EmOC service

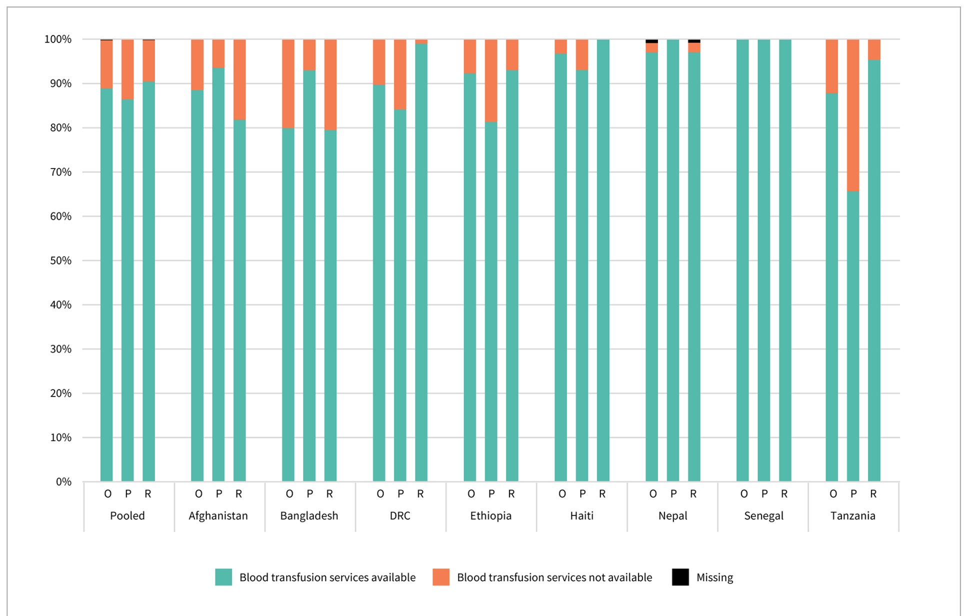

Figure 4 Stacked bar charts showing the distribution of facilities providing caesarean delivery services, categorised by the availability of blood transfusion services, across facility types and countries. O=Overall, P=Primary, R=Referral. DRC, Democratic Republic of the Congo.

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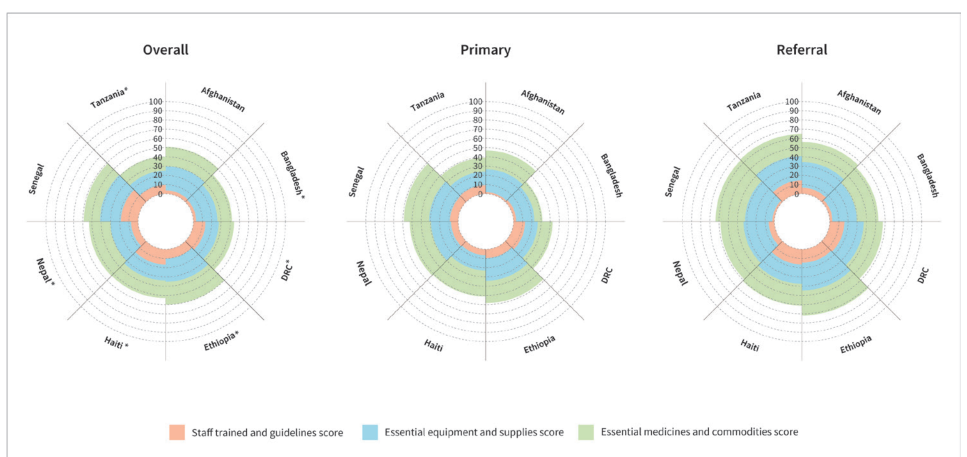

Figure 5 Mean readiness score to provide emergency obstetric care (EmOC) services among facilities offering normal delivery services. The radar chart displays the mean readiness score (out of 100) of health facilities to provide EmOC services across eight countries. Readiness is assessed using three domains (each domain contributes a score ranging from 0 to 33.33): staff and guidelines (orange), equipment (blue) and medicines (green). Each arc represents an incremental score of 10 on a 0–100 scale. Radar charts compare overall and subgroup readiness by facility type (primary vs referral). Higher radial values indicate better readiness scores. Asterisk (*) denotes a significant difference in mean readiness score between primary- and referral-level facilities. DRC, Democratic Republic of the Congo.

availability and readiness (table 2). Referral-level facilities had significantly higher odds of providing BEmOC (AOR: 6.19; 95% CI 4.54 to 8.43) and CEmOC (AOR: 20.49; 95% CI 11.60 to 36.12) services compared with primary-level facilities, and also demonstrated substantially higher readiness scores (coefficient: 12.33; 95% CI 10.35 to 14.31). In contrast, rural facilities were significantly less likely to offer BEmOC (AOR: 0.45; 95% CI 0.33 to 0.62) and CEmOC (AOR: 0.39; 95% CI 0.25 to 0.60) services relative to their urban counterparts, alongside lower readiness scores (coefficient: −3.94; 95% CI −5.90 to −1.99). The findings reveal substantial disparities across the eight LLMICs in the availability of BEmOC and CEmOC services, as well as in EmOC readiness (online supplemental table S7). While country-specific descriptive comparisons showed significant differences in readiness scores between public and private facilities in several countries (online supplemental table S5), these differences were not consistent in direction across countries and ownership was not significantly

Table 2 AORs and regression coefficients for factors associated with BEmOC and CEmOC availability and EmOC readiness

	BEmOC availability		CEmOC availability		EmOC readiness	
Variables	**AOR**	**(95% CI)**	**AOR**	**(95% CI)**	**Coefficient**	**(95% CI)**
Facility types (ref: primary)						
Referral	**6.19**	**(4.54 to 8.43)**	**20.49**	**(11.60 to 36.12)**	**12.33**	**(10.35 to 14.31)**
Ownership (ref: public)						
Private	0.73	(0.53 to 1.00)	0.89	(0.61 to 1.30)	0.93	(−1.28 to 3.13)
Location (ref: urban)						
Rural	**0.45**	**(0.33 to 0.62)**	**0.39**	**(0.25 to 0.60)**	**−3.94**	**(−5.90 to −1.99)**
Country (ref: Afghanistan)						
Bangladesh	**0.33**	**(0.15 to 0.75)**	0.48	(0.18 to 1.28)	**−7.36**	**(−13.13 to −1.59)**
DRC	0.60	(0.25 to 1.43)	0.99	(0.34 to 2.90)	0.58	(−5.39 to 6.55)
Ethiopia	**3.84**	**(1.58 to 9.35)**	1.38	(0.49 to 3.86)	**15.75**	**(9.62 to 21.88)**
Haiti	0.99	(0.42 to 2.35)	1.25	(0.43 to 3.67)	**7.74**	**(1.73 to 13.74)**
Nepal	**0.07**	**(0.03 to 0.16)**	**0.21**	**(0.08 to 0.56)**	**8.78**	**(2.87 to 14.69)**
Senegal	1.20	(0.49 to 2.93)	0.44	(0.13 to 1.48)	**13.63**	**(7.48 to 19.78)**
Tanzania	**0.28**	**(0.11 to 0.66)**	0.62	(0.22 to 1.73)	−1.90	(−7.90 to 4.09)

Bold represents statistical significance.
AOR, adjusted odds ratio; BEmOC, basic emergency obstetric care; CEmOC, comprehensive emergency obstetric care; DRC, Democratic Republic of the Congo; EmOC, emergency obstetric care.

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associated with readiness score in the pooled adjusted analyses. Findings from multilevel models accounting for clustering within countries were consistent with the main results, confirming the strong influence of facility type and location on EmOC availability and readiness (online supplemental table S8). Decomposition analysis further showed that facility type was the primary driver of readiness variation, explaining the largest proportion of variance, followed by country-level differences (online supplemental table S9).

DISCUSSION

This study is one of the few multicountry analyses using standardised, nationally representative data, and a signal functions approach from the WHO-SARA framework to assess the availability and readiness of HFs to provide EmOC services. Although BEmOC is an essential component of delivery services, only 10% or fewer of primary-level facilities in four countries and <50% of referral-level facilities in five countries had the capacity to provide BEmOC services. Additionally, <50% of referral-level facilities in seven out of eight countries had the capacity to provide CEmOC services. Our findings of lower availability of EmOC services are consistent with a previous multicountry study in Argentina, Ghana and India[24] and country-specific studies conducted in Cameroon,[25] DRC,[26 27] South Africa,[28] Tanzania,[29 30] Zambia,[31] Haiti,[32] Afghanistan[33] and Senegal,[34] which also documented important gaps in EmOC availability and readiness. The observed variation across countries may partly reflect differences in health system organisation and investment. For example, relatively higher availability of BEmOC services in Ethiopia may reflect sustained investments in primary healthcare systems, including the expansion of community-based services and mid-level providers.[35 36] In contrast, countries such as Nepal and Tanzania, where availability was lower, may continue to face challenges related to geographic barriers, inequitable workforce distribution and supply chain constraints affecting essential medicines and equipment.[37 38] However, our operational definition of EmOC availability, based on signal functions performed within the previous 3 months, may underestimate actual facility capability. A signal function may not have been performed during the reference period because no patient required it or because of low case volume, rather than because the facility lacked the capacity to provide it. Therefore, our estimates are more likely to reflect recent functional service delivery than the full underlying capability of facilities to provide EmOC when needed.

EmOC is essential for safeguarding the health and lives of mothers during pregnancy, childbirth and the postpartum period. It plays a critical role in preventing maternal deaths caused by complications such as haemorrhage, eclampsia, sepsis and obstructed labour, which can be life-threatening without timely and appropriate interventions like BEmOC and CEmOC. In emergency situations, primary-level HFs are often the most geographically accessible, especially for women in rural or low-income urban areas. However, this study found that primary-level facilities are especially ill-equipped. In such contexts, limited readiness at the primary level may contribute to delays in receiving appropriate care for obstetric complications, which has been shown in previous studies to increase the risk of adverse maternal outcomes.[39–41] Our study indicates that in many countries, most women are unlikely to receive adequate BEmOC at the nearest available primary-level HFs where delivery is being conducted. Our study also shows that most facilities providing BEmOC services are concentrated in urban areas, with the exception of Afghanistan and Ethiopia. As a result, pregnant women in rural areas may face limited access to appropriate maternal healthcare at nearby facilities when needed. Moreover, even those who reach referral-level/urban facilities, whether through a formal referral system or by bypassing primary care, may not be assured of receiving appropriate and timely management of their complications. These findings suggest that addressing urban–rural disparities should be a key policy priority to ensure equitable access to quality EmOC services. The lack of blood transfusion services in facilities providing caesarean delivery was a consistent finding across most countries included in the study, with the notable exception of Senegal, where all such facilities had blood transfusion capabilities. This pattern may reflect a more coordinated national transfusion system in Senegal, where the Centre National de Transfusion Sanguine (CNTS) is mandated to implement the national transfusion policy, coordinate regional transfusion structures and help ensure the availability of blood products nationwide.[42] More recent WHO reporting also suggests ongoing efforts to sustain blood supply through CNTS-led donor mobilisation, with blood donations increasing by 11% between 2020 and 2021;[42] however, these factors should be interpreted as plausible system-level explanations rather than direct causal evidence for the pattern observed in our survey data. The availability of caesarean delivery without concurrent access to blood transfusion service raises serious concerns about system readiness to manage obstetric emergencies such as postpartum haemorrhage, a leading cause of maternal death following caesarean delivery.[43] Studies from Pakistan[44] and Nigeria[45] reported that 11.5% and 20.8% of women undergoing caesarean sections required blood transfusions, underscoring the frequency and importance of this service in surgical deliveries. The absence of blood transfusion support in such facilities may contribute to avoidable maternal deaths, particularly in LMICs, where the risk of intraoperative complications during emergency caesarean sections is significantly higher—up to 17 times more than in high-income settings such as the UK.[46] The persistent lack of readiness, including inadequate transfusion services, may also reflect broader systemic and provider-level incentives influencing caesarean section practices rather than as part of a safe and comprehensive EmOC package. Evidence from several LMICs suggests that caesarean deliveries are sometimes performed beyond clinical need due to financial incentives, provider convenience and perceived social prestige associated with surgical births.[47 48] These findings

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highlight the urgent need to improve facility-level preparedness by ensuring that critical services like blood transfusion are in place wherever caesarean deliveries are provided, in order to reduce preventable maternal deaths and improve overall quality of care. Additionally, the substantial gap in blood transfusion services in facilities performing caesarean deliveries necessitates targeted strategies to reduce maternal risk. Where on-site transfusion is not feasible, strengthening referral and transport systems, supply chain management and regional blood banking networks can improve timely access to safe blood products.[49]

The readiness score of HFs to provide EmOC services across eight LLMICs showed significant variation by country, facility level, ownership and location, and the readiness score remained comparatively low in multiple countries, particularly in Bangladesh and Tanzania. Referral-level facilities demonstrated consistently higher readiness scores compared with primary-level facilities across most countries. This pattern was similarly observed in national surveys from Kenya,[50] where referral-level facilities outperformed primary-level facilities. In Tanzania, a facility-based study reported gaps in readiness to provide comprehensive emergency obstetric and neonatal care, particularly in lower-level facilities.[30] This may reflect higher patient acuity at referral-level facilities, where more complex obstetric cases are concentrated, leading to greater allocation of infrastructure, staffing and clinical resources. Nevertheless, primary-level facilities often serve as the first point of contact within the health system and therefore require adequate lifesaving EmOC capacity to manage obstetric emergencies before referral can be arranged. Importantly, the substantially lower readiness observed in the medicines and commodities domain indicates a critical gap in service delivery capacity. This pattern suggests that supply chain constraints may act as a major bottleneck in delivering effective EmOC services, even in settings where trained staff and basic infrastructure are available. Evidence from the WHO-SARA shows that essential medicines are frequently less available than other readiness components in low resource settings, reflecting systemic weaknesses in procurement and distribution systems.[16,51]

Although this study includes nationally representative data from eight LLMICs across diverse settings, the findings may not be fully generalisable to all LLMICs. Differences in health system structure, resource availability, service delivery models and the timing and design of SPA surveys may limit the direct applicability of results to other contexts. However, the consistency of observed gaps across countries suggests that similar challenges in EmOC availability and readiness are likely present in other resource-constrained settings. Additionally, the included SPA surveys were conducted over a wide time range (2014–2015 to 2022), which may introduce temporal heterogeneity in health system conditions across countries. Although we restricted the analysis to the most recent available SPA for each country to reflect contemporary national estimates, differences in survey timing may still affect cross-country comparability. Therefore, observed differences between countries should be interpreted with caution, as they may partly reflect temporal variation in health system development in addition to true structural differences. In addition, some subgroup analyses included small sample sizes for specific country–strata combinations, such as rural facilities in Afghanistan and rural and referral facilities in Senegal. This may limit the representativeness and precision of certain estimates; therefore, these findings should be interpreted with caution.

In addition to the above considerations, this study has several other limitations. The tracer items used to calculate EmOC readiness varied slightly across countries (online supplemental table S6a–h), which may affect cross-country comparability. The presence of staff trained in delivery and EmOC does not necessarily ensure their availability around the clock to provide EmOC services. We employed a simple summative measure of tracer items to assess EmOC readiness, as it offers easier interpretation and greater utility for policy-making. The study focused solely on the availability and readiness of facilities, without evaluating population-level accessibility; if patients cannot access these facilities, the availability of services becomes irrelevant. The cross-sectional nature of the data limits our ability to assess temporal changes or causal relationships. The analysis relied on facility-reported information, including the reported availability of blood transfusion services, which was not independently verified through direct observation and may therefore be subject to reporting bias. As a result, these data may not fully reflect real-time availability, service functionality, clinical readiness, or the quality and safety of transfusion services. Finally, the SPA surveys primarily assess service availability and structural readiness rather than actual clinical processes, quality of care or outcomes; therefore, this study could not directly evaluate the quality or effectiveness of care delivered, nor its impact on maternal and newborn health outcomes.

CONCLUSION

Our findings have important policy implications. The availability and readiness of EmOC services remain poor across many LLMICs, despite longstanding global commitments to universal access. This raises critical questions about the effectiveness of current resource allocation strategies to improve EmOC coverage and quality. Strengthening EmOC services in LLMICs requires urgent action from both national governments and global health development partners to improve their availability and readiness. In addition, integrating EmOC readiness indicators into existing Health Management Information System (HMIS) would enable more regular monitoring, rather than relying solely on periodic HF surveys conducted years apart. With WHO's surgical subgroup currently developing recommendations on caesarean section provision, this study provides valuable baseline evidence, highlighting the existence of facilities performing caesarean deliveries without blood transfusion services in LLMICs. Ensuring that all facilities performing caesarean deliveries are equipped with functional blood transfusion services should be a priority for national health

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systems and development partners, so that the expansion of caesarean delivery services is matched by adequate system readiness to prevent maternal complications and improve outcomes in LLMICs. Future research is essential to expand on this study's findings by testing targeted strategies to improve EmOC readiness, including provider training and supportive supervision, stronger supply chains, improved referral systems and ensured blood transfusion capacity, and by examining how such improvements affect maternal and newborn health outcomes. Overall, the evidence underscores the need to align political commitments to maternal health with effective policy and health system actions to strengthen facility readiness to provide life-saving care for women.

Author affiliations
[1]Maternal and Child Health Division (MCHD), International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b), Dhaka, Bangladesh
[2]Department of Health & Kinesiology, University of Illinois Urbana-Champaign, Urbana, Illinois, USA
[3]Department of International Health, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland, USA
[4]Department of Health Research Methods, Evidence and Impact (HEI), Faculty of Health Sciences (FHS), McMaster University, Hamilton, Ontario, Canada
[5]Department of Biostatistics and Data Science, Tulane University, New Orleans, Louisiana, USA
[6]School of Psychology, Faculty of Science, University of Sydney, Glebe, NSW, Australia
[7]Global Health and Migration Unit, Department of Women's and Children's Health, Uppsala University, Uppsala, Sweden

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ORCID iDs
Abu Sayeed https://orcid.org/0000-0003-0745-1755
Nondo Saha https://orcid.org/0000-0002-6790-9900
Md Refat Uz Zaman Sajib https://orcid.org/0000-0002-9445-0568
Emily C Keats https://orcid.org/0000-0002-1354-7086
Shams El Arifeen https://orcid.org/0000-0002-5372-5932
Anisuddin Ahmed https://orcid.org/0000-0001-6030-0468

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