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Preparedness of health facilities and their midwives for emergency obstetric and neonatal care services in Accra, Ghana: A multicenter cross-sectional study

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Abstract

Background: Emergency Obstetric and Neonatal Care (EmONC) provides comprehensive medical care to women and their newborns during pregnancy, childbirth, and the immediate postnatal period. The timely provision of EmONC can prevent most maternal and early neonatal deaths. In sub-Saharan Africa, including Ghana, maternal and neonatal mortality rates remain unacceptably high, largely because of a lack of access to quality healthcare and poorly prepared health systems. A recent EmONC assessment of public and private health facilities in Ghana revealed capacity gaps in basic pre-referral procedures at the referring health facilities, resulting in maternal deaths.

Objective: The study sought to determine the preparedness of health facilities and their midwives for EmONC services in Accra, Ghana.

Methods: A multicenter analytic cross-sectional study was conducted in Accra, Ghana, from 1st June to 31st July 2020. A total of 194 randomly selected midwives answered a self-administered questionnaire to assess their knowledge and preparedness for EmONC. The factors associated with the preparedness of the midwives for EmONC procedures were determined using chi-square analysis and logistic regression. P-value of <0.05 at 95% confidence interval was considered statistically significant. Availability of EmONC signal functions in health facilities was scored.

Results: Eighty-seven (45%) of midwives had adequate knowledge of EmONC, while only 19% (n = 36) were adequately prepared for EmONC. The factors associated with being prepared for EmONC services were currently working at the labour ward (aOR, 3.43; 95% CI, 1.49 – 7.91) and being a senior midwifery officer or higher (aOR, 6.00; 95% CI, 1.01 – 35.75). Both facilities A and B had a high availability of essential medicines, protocols, and equipment of 90.7%, while facility C had a significantly lower availability of 69.8%.

Conclusion: Despite well-equipped facilities for EmONC, midwives' limited knowledge and preparedness for EmONC can compromise maternal and neonatal outcomes. A thorough review of the midwifery curriculum, clinical training, and the implementation of regular, mandatory training are crucial to ensure their skills align with best practices.

Keywords: Preparedness, health facilities, midwives, emergency, obstetric, and neonatal care

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INTRODUCTION

The concept of Emergency Obstetric and Newborn Care (EmONC) was introduced by the World Health Organization (WHO), United Nations International Children's Fund (UNICEF), and United Nations Population Fund (UNFPA) in 1997 as an organizing framework for the delivery of evidence-based clinical services, and as a critical component to reduce maternal and newborn mortality[1]. EmONC comprise all the care given to women during pregnancy, delivery, and post-natal period as well as the care given to the newborn [2]. Most maternal and neonatal deaths can be prevented by the timely provision of EmONC, particularly in women

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who develop major direct obstetric complications [3]. A stall in the global reduction of maternal mortality since 2016 has led to intensified efforts to meet the Sustainable Development Goals in maternal and newborn health from a recent World Health Organisation report [4].

A systematic review of literature at the level of health centres in developing countries reported that poor skills of the health providers and lack of essential equipment and medicines were partly to be blamed for the lack of quality EmONC service delivery [5]. A recent EmONC assessment of public and private health facilities in Ghana revealed capacity gaps in basic pre-referral procedures at peripheries, resulting in maternal deaths [6]. These gaps included poor validation of the knowledge and competencies of staff engaged in obstetric care, lack of protocols or wall charts on neonatal resuscitation, as well as lack of logistics at health facilities, among others [7]. The noted capacity gaps constitute a major public health threat to maternal health in the country. As part of the overall public health efforts to improve maternal and neonatal health in the country, efforts must be made to ensure maternal and neonatal survival by ensuring the preparedness of health facilities as well as the health care providers, particularly the midwives who conduct over 60% of all deliveries in the country [8].

Nonetheless, there is a paucity of information regarding the capacity of health facilities and the midwives in the country to offer EmONC. Furthermore, anecdotal evidence indicates that many midwives in Ghana are not able to perform manual removal of placenta and vacuum delivery. Inadequate knowledge and skills of the midwives who are at the forefront of skilled delivery in the country, particularly in the rural areas of the country, could derail the country's quest to improve maternal and neonatal health and reduce maternal and neonatal mortality. This study was conducted to determine the preparedness of health facilities and their midwives for EmONC services in the Tema Metropolis as well as Ledzokuku and Ashaiman Municipalities in the Greater Accra Region of Ghana, as a basis for targeted interventions to improve maternal and neonatal health. The facilities selected were a mix of primary and secondary level facilities. The study sought to capture preparedness, resource availability, and midwife competencies across the continuum of care. Understanding preparedness would help optimise referral pathways and emergency response coordination.

MATERIALS AND METHODS

Study design

This was a multicentre analytic cross-sectional study conducted in selected health facilities within the Tema Metropolis, as well as Ledzokuku and Ashaiman Municipalities. The health facilities' capacities, as well as midwives' knowledge on key EmONC services, were assessed to determine the preparedness for EmONC.

Study setting

The study was conducted at three health facilities in the Tema Metropolis, Ledzokuku and Ashaiman Municipalities respectively. These facilities were strategically selected as health facilities placed in high-population areas with high volumes of pregnancy-related complications. Emergency Obstetric and Neonatal Care services were provided in all three facilities. The first facility (facility A), located in Tema, is a 399-bed capacity hospital with 109 doctors and 430 nurses, including 143 midwives. The hospital accounted for 64.5% of the 9902 deliveries in the Tema Metropolitan Area in 2018. Of these deliveries, 6276 were live births, with 3890 delivered via spontaneous vaginal delivery and six by vacuum delivery performed by only the doctors. Four hundred and fifty cases of manual vacuum aspiration were done on account of incomplete miscarriage. Fifty-one cases of postpartum haemorrhage due to uterine atony and 374 cases of neonatal asphyxia at the Neonatal Intensive Care Unit were recorded in the year 2019. Only 10 cases of retained placenta were recorded in the year 2019, for which manual removal of the placenta was done mostly by the doctors.

The second facility (facility B) located in the Ledzokuku Municipality, is a 100-bed capacity hospital that with a clinical staff made up of 22 Doctors and over 200 Nurses, including 87 midwives. Of all the 4157 deliveries in Ledzokuku municipality in 2019, 2345 were from facility B, resulting in 2343 live births, 968 of the deliveries were via caesarean section, and the rest were by spontaneous vaginal delivery. There were 79 incomplete miscarriages recorded in 2019, for which manual vacuum aspiration was done for all of them. The number of postpartum haemorrhages due to uterine atony and neonatal asphyxia recorded in the year 2019 was 7 and 72, respectively. Facility C, on the other hand, is a 20-bed capacity health facility with a total of 72 midwives. In 2019, 3552 deliveries were conducted, of which 3460 were live births and 2987 were by spontaneous vaginal delivery. Five vacuum deliveries were conducted by the medical doctors. The number of incomplete miscarriages recorded was 84, for which manual vacuum aspiration was done for all of them. The number of postpartum haemorrhage cases due to uterine atony and neonatal asphyxia recorded in the year 2019 was 10 and 55, respectively.

Study population and eligibility criteria

There were two types of participants for the study. First, the unit heads of the maternity, laboratory, and theatre were purposely selected to answer questions about the facility in terms of the availability and functionality of essential equipment, medicines, and protocols for EmONC. Secondly, all midwives in the three facilities who had worked in the facility for at least three months were deemed eligible to participate in the survey to assess their preparedness for EmONC. Three months was used because it gave a glimpse of how the facility is functioning in recent times and minimises recall bias. It is

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also known that people begin to lose their skills in performing EmONC procedures after three months of inactivity [9]. Midwives were chosen because maternity care in Ghana is midwife-led, and midwives conduct over 60% of all deliveries and almost all supervised vaginal deliveries in Ghana [8]. While EmONC is a team effort, the study justifiably focused on midwives as they play a central role that offers the most direct measure of the system's ability to save lives. Midwives who were not at post at the time of data collection were excluded.

Sample size calculation for the midwives

The minimum sample size required was determined as 177 midwives, using Yamane's formula for calculating sample size for a finite population [10].

$$n = \quad N/\ 1+N\ (e)\ 2$$

Where,
n = minimum sample size
N = population size (the total number of midwives in the three facilities, which is 302)
e = margin of error at 5%

This assumed that the proportion of midwives with adequate knowledge on EmONC as 50% and 95% confidence level. Adjusting for 10% of incomplete questionnaires, a total sample size of 177 x 1.1 =194 midwives was recruited.

The number of midwives selected from each of the facilities was proportional to the total number of midwives in the facility. Therefore, 91, 56, and 47 midwives from facilities A, B and C, respectively, were recruited. Information on the sociodemographic characteristics of the midwives was obtained via a questionnaire. They also answered questions on their knowledge of EmONC and their practice of EmONC procedures in the past 3 months and 1 year and the confidence with which they did those procedures. The in-charges of the maternity, pharmacy, laboratory, and theatre were also recruited to answer some questions on the preparedness of their facilities for EmONC. The preparedness of the facilities was assessed on 3 themes, namely:

1) availability of essential medicines,

2) availability and functionality of essential equipment, and

3) availability and functionality of a theatre and protocols. These themes were adapted from WHO document on monitoring emergency obstetric care. A reference handbook.[9}

Sampling technique

A list of all employed midwives was obtained from the human resources department of each selected hospital. In each facility, computer-generated random numbers were given to all the midwives and recruitment was done using the assigned numbers till the sample size was obtained. The selected midwives were looked up on the duty roster to ascertain their availability at work. They were traced to the respective work units and recruited to answer the questionnaire. If a selected midwife did not meet the eligibility criteria or refused to partake in the study, she was replaced by the next available midwife picked via balloting. This procedure was replicated in all selected facilities to achieve an overall sample size of 194.

Data collection tools and methods

The midwives were interviewed, and the health facilities were assessed using tools adapted from a set of standard Averting Maternal Disability and Death modules[10]. The midwives answered a self-administered questionnaire, whereas the facility was assessed with a checklist with the help of the heads of the laboratory, theatre, pharmacy and maternity or anyone appointed by the heads of these units. Data was collected from 1st June 2020 to 31st July 2020 using a self-administered questionnaire that was distributed to the midwives by the first author and two trained research assistants. The forms were given at their workplace after informed consent had been obtained. The filled questionnaires were collected at the close of their shift or at an agreed time. The questionnaire was structured into three sections. Section A sought information on the socio-demographic characteristics of the respondents (midwives), Section B delved into the knowledge of the midwives on EmONC, and Section C elicited information on their practice of EmONC signal functions.

The level of knowledge of EmONC was assessed by the response to the eight questions on eight signal functions of EmONC: namely, administration of parenteral antibiotics, uterotonic drugs and antibiotics. Others were manual removal of placenta, assisted vaginal delivery, removal of retained products of conception using the manual vacuum aspiration, newborn resuscitation using mask and bag and blood transfusion. Steps involved in performing these signal functions were randomly arranged, and the participants were asked to rearrange them chronologically. If a midwife was able to correctly arrange the order in which the signal function is performed, she was scored one (1) and zero (0) if she could not correctly arrange them. We did not include caesarean sections because, as of now, caesarean section in Ghana is performed by only medical doctors. An aggregate score was calculated for each midwife. A midwife who scored at least six (6) out of the maximum of eight (8) (i.e., 75%) was classified as having adequate knowledge, while those who scored less than six (i.e. < 75%) were considered as having inadequate knowledge as described by a number of studies [11,12]. Given the complexity and critical consequences of maternal and neonatal emergencies, a 75% knowledge threshold is necessary to ensure proficiency, moving beyond a standard of mere knowledge for safe practice.

The practice of EmONC was assessed through eight questions on the eight signal functions stated above. For each signal function, participants were asked 1) their

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ability to perform the signal function, 2) whether they had performed the signal function within the last 1 year 3) their confidence in performing the signal function. The responses were "Yes" or "No". One was said to be adequately prepared if one had the ability to perform all 8 signal functions confidently and had done so in the last 1 year. Performing all 8 functions confidently means the individual possesses the complete skill set necessary to manage the majority of obstetric and neonatal emergencies.

The assessment of the availability of essential medicines, protocols, and functional equipment in readiness to provide EmONC services was done using a facility checklist adapted from the UNFPA checklist [9]. This was applied in three areas: 1) the labour ward, 2) the theatre, and 3) the pharmacy units. The checklist was divided into 3 sections. Section A was concerned with the equipment, Section B dealt with the essential medicines and Section C looked at the theatre and protocols. Section A had 15 items and sections B and C had 14 items each. A survey was done using the walk-through technique. The head of each unit or any person delegated by the head of the unit, or the management of the facility, took the interviewer through the relevant units as stated earlier. These individuals were identified as the most suitable to provide answers to the facility assessment checklist. The assessment was done only once. A "Yes" and "No" answer was used to assess the availability and functionality of the items on the checklist. A score of one (1) was given for each item that was physically present and functional, and zero (0) if physically present but not functional or when the item was absent. The availability of medicines, protocols and equipment at each of the three health facilities was scored as a percentage of the total expected.

Study variables

The dependent variable of interest in the study is the preparedness of health facilities and midwives to deliver prompt EmONC services. Independent variables were grouped into staff characteristics (sociodemographic factors), knowledge about EmONC, facility characteristics and clinical care.

Quality control

To ensure the validity of the data, a two-day training of research assistants was organised on data collection, entry and validation procedures relevant to the study as well as the ethics of research. Pretesting of the questionnaires and checklists was done in three private facilities in the Tema Metropolis.

Data analysis

Data was entered into Microsoft Excel and cleaned up. Data was then exported to STATA Version 15 for analysis. Sociodemographic data were analysed descriptively using frequencies, percentages, means and standard deviations. A descriptive statistical method was used to analyse the knowledge and preparedness of the midwives as well as the availability and functionality of equipment, medicines, and protocols in the health facilities. Chi-square test was used to determine the factors associated with midwives' preparedness for EmONC services. Multiple logistic regression was used to determine the level of strength of the factors associated with preparedness for EmONC. The variance inflation factor (VIF) was used to identify multicollinearity between independent variables, and a rule of thumb of VIF values exceeding 5 suggested high multicollinearity. In all analyses, a p-value of less than 0.05 was considered statistically significant at a 95% confidence interval.

RESULTS

In all, 194 midwives took part in the study, and they were all included in the analysis. One hundred and five (54.1%) of them were between the ages of 28 - 37, the majority (n = 187, 96.4%) were females, 124 (63.9%) were married and most (159, 82%) were Christians. Again, 101 (52.1%) had a diploma in midwifery. Table 1 shows the details of the socio-demographic characteristics of the respondents.

Knowledge of EmONC procedures was measured by a midwife's ability to indicate the right order in performing each of the eight EmONC signal functions. Those who were able to accurately arrange the order of at least six

Table 1. Socio-demographic characteristics of respondents

Variables	Frequency (n)	Percent (%)
Age group		
18-27	44	22.7
28-37	105	54.1
>38	45	23.2
Sex		
Male	7	3.6
Female	187	96.4
Marital status		
Married	124	63.9
Unmarried (Single/divorced/separated)	70	36.1
Religion		
Christian	159	82
Muslim	35	18
Educational qualification		
Diploma in midwifery	101	52.1
Post basic diploma in midwifery	52	26.8
BSc nursing midwifery	39	20.1
Masters in midwifery	2	1
Rank of participant		
Staff midwife	79	40.7
Senior staff midwife	53	27.3
Midwifery officer	37	19.1
Senior Midwifery officer or higher rank	25	12.9
Work experience		
3 years	86	44.3
4 – 6 years	36	18.6
7 years or more	72	37.1

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signal functions were deemed to have adequate knowledge. Overall, the midwives had adequate knowledge in the steps involved in performing neonatal resuscitation 156 (80.4%) and blood transfusion 151 (77.8%). The least knowledge was in administering anticonvulsants (n = 83, 42.8%) and manual removal of placenta 90 (46.4%). The details of the adequacy of knowledge are as shown in Table 2.

Out of the 194 midwives, 45% (n = 87) of midwives had adequate knowledge of Emergency Obstetric and Neonatal Care procedures. The most reported signal function practiced was the administration of parenteral antibiotics (85.1%, n = 165), followed by administration of uterotonic drugs (81.4%, n = 158). The least performed procedures were assisted vaginal delivery and the removal of retained products with manual vacuum aspiration, which were performed by 85 (43.8%) and 76 (39.2%) of the participants, respectively, within 3 months prior to the study. A similar assessment was done for the past 1 year. This is shown in

Proportion of respondents in the three facilities that were adequately prepared for EmONC in terms of practice. For all the 194 midwives interviewed only 36(19%) of them were adequately prepared for EmONC in terms of practice. The rest were inadequately prepared. Table 4 below shows the reasons why midwives were not performing EmONC procedures in the last year. Training and policy issues were the most reported reasons for midwives' inability to perform the EmONC procedures, with an average of 43.6% and 22.2% respectively (Table 4).

A bivariate analysis was conducted to identify factors associated with preparedness for EmONC among midwives. The factors significantly associated with preparedness for EmONC services at bivariate analysis include marital status, current station of work, work experience, rank and overall level of knowledge. After adjusting for all other variables, analysis showed that the midwives who were stationed at the labour ward during the time of the study had significantly 3.43 times the odds of being adequately prepared for EmONC compared to

Table 2. Midwives' knowledge on EmONC signal functions

(n=194)

EmONC procedure	Frequency(n)	Percent (%)
Perform newborn resuscitation	156	80.4
Perform blood transfusion for mother	151	77.8
Administer parenteral antibiotics	139	71.6
Perform assisted vaginal delivery	139	71.6
Administer uterotonic drugs	136	70.1
Perform removal of retained products with MVA	93	47.9
Perform manual removal of placenta	90	46.4
Administer parenteral anticonvulsants forpre-eclampsia and eclampsia	83	42.8

Table 3. Midwives' reported ability to perform EmONC signal functions

Signal function	Reported ability to perform the signal function Frequency (%)	Reported ability to perform the signal function with confidence Frequency (%)	Practiced in the last 3 months Frequency (%)	Practiced in the last 1 year Frequency (%)
Parenteral Antibiotics	165(85.1)	161(83.0)	149(76.8)	153(78.
Uterotonics	158(81.4)	156(80.4)	146(75.3)	155(79.9)
Blood transfusion	157(80.9)	153(78.9)	140(72.2)	156(80.4)
Parenteral anticonvulsants for	144(74.2)	130(67.0)	130(67.0)	142(73.2)
Newborn resuscitation	135(69.6)	130(67.0)	125(64.4)	130(67.0)
Manual removal Of placenta	121(62.4)	80(41.2)	112(57.7)	120(61.9)
Assisted vaginaldelivery	85(43.8)	63(32.5)	80(41.2)	83(42.8)
Removal of retained products with MVA	76(39.2)	54(27.8)	71(36.6)	74(38.1)

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midwives who were stationed at other units during the time of the study (aOR (adjusted odds ratio) = 3.43; 95% CI = 1.49 – 7.91) (Table 5). Also, being a senior midwifery officer or a higher rank had significantly 6 times the odds of being adequately prepared for EmONC compared to midwives who ranked less than a senior midwifery officer (aOR (adjusted odds ratio) = 6; 95% CI = 1.01 – 35.75) (Table 5).

The facilities were assessed based on 43 items as shown in the Supplementary Material. At facility A, out of the 15 items used to assess the availability and functionality of equipment, the hospital had 13 (86.7%) of the equipment, all of which were functional. There was the absence of a newborn bag and a facemask size 0. Of all the 14 essential drugs, facility A had 13 (92.9%) essential drugs, none of which had expired. Only calcium gluconate injectable was unavailable. Regarding the theatre and protocols, 10 (71.4%) of the items were available at facility A. Protocols for adult resuscitation and retained placenta management were not available. Overall assessment of facility A showed that the hospital had 39 of the 43 items, which represent 90.7%. At facility B, 13 (86.7%) of the required equipment was available and functional. However, newborn bag and facemask size 1 for term babies and size 0 for preterm babies were not available. Facility B had 13 (92.9%) of the essential medicines available and they were all not expired. Calcium gluconate was the only essential medicine not available. Ten (71.4%) of items in section C were available at facility B. Protocols for adult resuscitation and retained placenta management were not available. Facility B had an overall assessment score of 90.7% being a score of 39 out of 43.

At facility C, out of the 15 items in section A of the facility assessment tool, 12 (80%) of the equipment were available and functional, with the absence of an examination light, newborn resuscitation table and a

Table 4. Midwives' reason for non-performance of EmONC procedures

EmONC procedure	Reason	n (%)
Administer parenteral antibiotics	Training issues	13(44.8)
Supplies, equipment, drug issues		3(10.3)
	Management issues	5(17.2)
	Policy issues	6(20.7)
	No indication	2(6.9)
Administer uterotonic drugs	Training issues	10(27.8)
Supplies, equipment, drug issues		8(22.2)
	Management issues	7(19.4)
	Policy issues	9(25.0)
	No indication	2(5.6)
Administer parenteral anticonvulsants for pre-eclampsiaand eclampsia	Training issues	22(44.0)
Supplies, equipment, drug issues		8(16.0)
	Management issues	0(0.0)
	Policy issues	10(20.0)
	No indication	10(20.0)
Perform manual removal ofplacenta	Training issues	45(61.6)
Supplies, equipment, drug issues		4(5.5)
	Management issues	0(0.0)
	Policy issues	20(27.4)
	No indication	4(5.5)
Perform removal of retainedproducts with MVA	Training issues	58(49.1)
Supplies, equipment, drug issues		25(21.2)
	Management issues	5(4.2)
	Policy issues	20(16.9)
	No indication	10(8.5)
Perform assisted vaginal delivery	Training issues	59(54.1)
Supplies, equipment, drug issues		3(2.8)
	Management issues	4(3.7)
	Policy issues	40(36.7)
	No indication	3(2.8)
Perform blood transfusion formother	Training issues	8(21.6)
Supplies, equipment, drug issues		3(8.1)
	Management issues	6(16.2)
	Policy issues	5(13.5)
	No indication	15(40.5)
Perform new-born resuscitation	Training issues	27(45.8)
Supplies, equipment, drug issues		14(23.7)
	Management issues	2(3.4)
	Policy issues	10(16.9)
	No indication	**6(10.1)**

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newborn bag and facemask size 0 for preterm babies. With section B, facility C had 12 (85.7%) essential medicines, none of which had expired. Dexamethasone injection and calcium gluconate injectable were not available. With section C, facility C had only six (42.9%) of the items available. Protocols for adult resuscitation, eclampsia, retained placenta management and active management of the third stage of labour were not available. Other sources of electricity were not available at facility C. An overall assessment score of 30 (69.8%) out of 43 for facility C.

At facility C, out of the 15 items in section A of the facility assessment tool, 12 (80%) of the equipment were available and functional, with the absence of an examination light, newborn resuscitation table and a newborn bag and facemask size 0 for preterm babies. With section B, facility C had 12 (85.7%) essential medicines, none of which had expired. Dexamethasone injection and calcium gluconate injectable were not available. With section C, facility C had only six (42.9%) of the items available. Protocols for adult resuscitation, eclampsia, retained placenta management and active management of the third stage of labour were not available. Other sources of electricity were not available at facility C. An overall assessment score of 30 (69.8%) out of 43 for facility C. The 43 items were grouped under three subclasses of availability and functionality of equipment, essential medicines and protocols.

Table 5. Table Socio-demographic characteristics of midwives and preparedness for Emergency Obstetric and Neonatal Care

Variables	Preparedness for Emergency Obstetric and Neonatal Care			
	Inadequately prepared (n)%	Adequately prepared (n)%	χ2	p-value
Age group			2.056	0.561
18 – 24 years	14(87.5)	2(12.5)		
25 – 31 years	76(84.4)	14(15.6)		
32 – 38 years	45(76.3)	14(23.7)		
> 38 years	23(79.3)	6(20.7)		
Sex			1.655	+0.352
Male	7(100)	0(0)		
Female	151(80.7)	36(19.3)		
Educational qualification				+0.629
Diploma in midwifery	84(83.2)	17(16.8)	2.003	
Post basic diploma in midwifery	43(82.7)	9(17.3)		
BSc nursing midwifery	29(74.4)	10(25.6)		
Masters in midwifery	2(100)	0(0)		
Current station of work			9.377	0.002*
Labour ward	61(71.8)	24(28.2)		
Other units	97(89.0)	12(11.0)		
Work experience			12.593	0.002*
1 – 3 years	76(91.9)	7(8.1)		
4 – 6 years	24(66.7)	12(33.3)		
7years or more	55(76.4)	17(23.6)		
Rank of participant			13.338	0.004*
Staff midwife	72(91.1)	7(8.9)		
Senior staff midwife	43(81.1)	10(18.9)		
Midwifery officer	28(75.7)	9(24.3)		
Senior Midwifery officer or higher rank	15(60.0)	10(40.0)		
Marital status			5.306	0.021*
Married	95(76.6)	29(23.4)		
Unmarried (Single/divorced/separated)	63(90.0)	7(10.0)		
Religion			1.436	0.231
Christian	127(79.9)	32(20.1)		
Muslim	31(88.6)	4(11.4)		
Overall knowledge			4.728	0.030*
Inadequate knowledge	93(86.9)	14(13.1)		
Adequate knowledge	65(74.7)	22(25.3)		

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Table 6. Logistic regression of factors associated with preparedness for EmONC in the selected health facilities

Variables	cOR(95% CI)	p-value	aOR(95% CI)	p-value
Marital Status				
Married	1.00			
Unmarried	0.36(0.15 – 0.88)	0.025*	0.67(0.23 – 1.98)	0.468
Employment status				
Full time	1.00		1.00	
Part time	1.56 (0.44 – 5.43)	0.489	2.16(0.51 – 9.07)	0.294
Rotation	0.27 (0.09 – 0.83)	0.021*	0.82(0.19 – 3.52)	0.785
Current station of work				
Other units	1.00		1.00	
Labour ward	3.18 (1.48 – 6.82)	0.003*	3.43(1.49 – 7.91)	0.004*
Work experience				
1 – 3 years	1.00		1.00	
4 – 6 years	5.64(1.998 – 15.93)	0.001*	3.12(0.84 – 11.57)	0.089
7 years or more	3.49(1.36 – 8.98)	0.010*	0.90(0.197 – 4.15)	0.897
Rank of participant				
Staff midwife	1.00		1.00	
Senior staff midwife	2.39(0.85 – 6.75)	0.099*	1.17(0.299 – 4.59)	0.819
Midwifery officer	3.31(1.12 – 9.73)	0.030*	2.16(0.45 – 10.27)	0.332
Senior Midwifery officer or higher rank	6.86(2.25 – 20.90)	0.001*	6.00(1.01 – 35.75)	0.049*
Overall knowledge				
Inadequate knowledge	1.00		1.00	
Adequate knowledge	2.25(1.07 – 4.72)	0.032*	1.82 (0.76 – 4.36)	0.178

DISCUSSION

This study was carried out to determine the preparedness of health facilities and their midwives for the performance of EmONC services in Accra, Ghana. The findings from this study showed a significant gap between the knowledge and practice of EmONC services. Close to 50% of the midwives had adequate knowledge of how to perform EmONC procedures, though only 19% of the midwives were adequately prepared in terms of their practice of the EmONC procedures. Furthermore, some essential resources were absent in the health care facilities.

Only close to 50% of the midwives involved in this study had adequate knowledge of EmONC. This finding is consistent with a systematic review of literature in sub-Saharan Africa, which concluded that knowledge on EmONC was insufficient among health care workers [13]. Similarly, studies done in Malawi and Nigeria also showed low levels of knowledge of EmONC [14,15]. This knowledge gap is a critical concern because having adequate knowledge is the crucial first step in saving lives. Having adequate knowledge of EmONC will enable these midwives to identify cases that require EmONC services and also activate the right protocols for them. Without adequate knowledge, there could potentially be delays in identifying and managing these conditions that could result in maternal and neonatal morbidity and mortality. A thorough review of the midwifery curriculum and clinical training given to them will be essential so they can receive adequate knowledge on EmONC. In addition, regular in-service training will help equip the midwives with the requisite knowledge and skills on current best practices.

This current study also showed that only 19% of the midwives were adequately prepared in terms of the practice of EmONC services, which is significantly lower than the 49% who had adequate knowledge. This gap means that even when equipped with adequate knowledge, these midwives may not be able to provide the necessary services at critical times, which may lead to loss of lives. Ghana, like other developing countries, is bedevilled with high rates of maternal and neonatal deaths resulting from poor quality of EmONC services [16]. Because 62.3% of all deliveries in Ghana are conducted by midwives [8], their ability to perform the signal functions will be crucial in reducing maternal and newborn deaths towards achieving the Sustainable Development Goal 3. As per their training, midwives are required to have adequate knowledge of all the EmONC procedures[17]. To address the gap between knowledge and practice, there is an urgent need to prioritise practical, hands-on training and regular drills, continuous professional development and facility support. This approach will ensure that midwives can effectively translate their theoretical knowledge of Emergency Obstetric and Neonatal Care (EmONC) into life-saving actions when it matters most.

Midwives are supposed to know how to perform all the signal functions for EmONC, as they cannot predict what emergency case they may have to manage. In this study, the reported signal functions most practised and done more confidently were the administration of parenteral antibiotics and uterotonics. This is expected as these

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procedures constitute the commonest procedures done in hospitals. The least reported practised signal function in this study was the removal of retained products of conception using the manual vacuum aspiration. The possible explanation for this is that there are not many patients who require this procedure, and the medical doctors perform the procedure for the few cases that are reported. In Ghana, some midwives have been trained to perform manual vacuum aspiration in the bid to increase access to safe abortion care [18]. However, all midwives must be trained in manual vacuum aspiration for the purposes of post abortion care. Furthermore, in most of the health facilities in the rural areas, the midwives are the skilled providers of maternal health care. Therefore, inability to perform the removal of retained products of conception with manual vacuum aspiration could lead to septic abortion and haemorrhage, which are major causes of maternal mortality in Ghana [8].

The midwives who had not performed specific signal functions in the past 1 year cited training and policy issues as the main reasons. This emphasises the need for training of midwives on the EmONC procedures. It is possible that the lack of knowledge and practice in instrumental delivery could potentially increase maternal and neonatal morbidity and mortality, particularly in settings without medical doctors. Midwives are rotated through the various sections (antenatal, lying-in wards, gynaecology, postnatal) of the maternity unit. Since these skills could be lost if not practised for long periods, competency-based training through simulations could be useful. This is especially important for midwives not stationed at the labour ward, who may not have access to labour and delivery cases. The use of simulated emergency drills, standard checklists, mentorship, regular refresher courses and appropriate polices are some of the strategies that can be used to bridge the gap between theoretical knowledge and clinical practice.

The health facilities were generally well stocked with essential medicines, equipment, and protocols for quality EmONC service delivery, except for the absence of a few items, such as calcium gluconate and a newborn facemask. Calcium gluconate is a critical medicine for EmONC services because it is an antidote for magnesium sulphate toxicity [19,20]. Given that magnesium sulphate is the anticonvulsant of choice for the management of preeclampsia/eclampsia, the absence of calcium gluconate in the facilities was worrying. Newborn bags and facemasks size 0 were also absent at all the facilities assessed. Considering that respiratory distress syndrome resulting from prematurity or birth asphyxia is among the top five causes of neonatal mortality in Ghana [21], the absence of this equipment was concerning. studies done in Nigeria and some low-and middle-income countries revealed similar findings such as lack of essential equipment, medicine and protocols, resulting in poor quality of EmONC services [5,13,22]. Despite well-equipped facilities for EmONC in this study, the midwives had limited knowledge and preparedness for the provision of these services. This could be due to systemic issues such as training and policies concerning this practice. Although not statistically significant, it is clinically worthy to note that midwives who had adequate knowledge on how to perform EmONC signal functions had about twice the odds of being adequately prepared for EmONC services as compared to midwives who had inadequate knowledge. There is therefore a need to ensure that nurses have adequate knowledge of EmONC signal functions. This could be done by organising regular refresher training for all midwives. In contrast, a Nigerian study reported that midwives who had average knowledge of emergency obstetric care procedures when assessed were unable to put this knowledge into practice [23]. It must be noted, however, that in this study, the practice of EmONC procedures was self-reported. Other studies in different parts of Ghana and Africa have also reported similar findings, revealing gaps in midwives' knowledge and practical skills that need to be addressed [13,15,18,24-26].

The Senior midwifery officers or higher-ranked midwives were more prepared for EmONC services compared to those who were of lower rank. The senior midwifery officers were more likely to have worked for a greater number of years and would have gathered enough experience in the field of work due to the variety of cases that they would have managed. They also have more labour ward experience.

Midwives currently working in the labour ward were more prepared for EmONC services compared to others. This may be due to their daily engagements with women in labour compared to other study participants. Surprisingly, however, work experience in general was not found to have a significant association with preparedness for EmONC in this study. This can be explained by the fact that work experience may not necessarily equate to labour ward experience. From the logistic regression results, the adjusted odds ratios (aORs) for some variables, such as rank of participants, had wide confidence intervals, which may indicate imprecision, probably due to the sample size. An important limitation worth considering in the interpretation of the findings from this study is that the assessment of the confidence and ability of the midwives to perform EmONC signal functions was participant-reported, rather than through direct observation of the procedures being performed by the midwives. This was likely to have introduced social desirability bias, as the midwives were expected to overestimate their ability to perform EmONC services to appear more competent. However, the suboptimal performance is possibly a true reflection of the knowledge and skills of participants as they are likely to have overestimated their knowledge and skill compared to downgrading it.

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For future studies, using triangulation will help reduce bias and improve the validity of findings derived from self-reported observations. By examining data from several angles instead of relying on a single viewpoint, triangulation ensures a credible conclusion. Though EmONC is a team effort, this study focused mainly on midwives, as their skills and preparedness form the foundation of EmONC. Future studies should consider involving other cadres of staff, such as doctors and laboratory personnel. The cross-sectional design of this present study limits causal inference. For Future studies, using should consider involving other cadres of staff, such as doctors and laboratory personnel. The cross-sectional design of this present study limits causal inference.

Conclusion

Midwives' knowledge and preparedness for EmONC procedures were suboptimal, with a clear disconnect between knowledge and actual practice. While facilities were generally well-stocked with essential medicines and equipment, a few critical items, such as calcium gluconate and newborn bags, were not available. A thorough review of the midwifery curriculum, clinical training, and the implementation of regular, mandatory training, as well as ensuring a full stock of all essential supplies in the facilities, are crucial to reinforce the knowledge of these midwives and to translate knowledge into effective practice.

DECLARATIONS

Ethical consideration

The research was conducted in accordance with the Declaration of Helsinki. Ethical approval was obtained from the Ghana Health Service ethical review committee with approval number GHS-ERC 013/02/20. All study participants had the study explained to them and signed an informed consent form before they were included in the study.

Consent to publish

All authors agreed on the content of the final paper.

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None

Competing Interest

The authors declare no conflict of interest

Author contribution

MYA designed the study with support from ETM and KAO. Data collection and analysis were done by MYA, ETM. KAO, DKA, KM and STE drafted the manuscript, which was reviewed for intellectual content by all authors. All authors read, reviewed, and approved the final version of the manuscript.

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Availability of data

Data is available upon request to the corresponding author

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