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Potential health facility barriers to maternal and newborn health service delivery in Nadowli-Kaleo and Daffiama-Bussie-Issa districts, Ghana

Joshua Sumankuuro[1, 2] *, Judith Crockett[2], Shaoyu Wang[2]

[1]Youth Alive Ghana, P.O Box TL 1708, Tamale, Ghana.

[2]School of Community Health, Faculty of Science, Charles Sturt University, Orange, New South Wales, Australia.

*Corresponding author to: Joshua Sumankuuro; ijoshua200@gmail.com

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Abstract

Objectives: When considering explanations for poor maternal and newborn health outcomes many investigations focus on decision-making patterns and actions of expectant mothers and families, as opposed to exploring the "supply side" (health service provider) barriers. As part of a larger study on birth preparedness and complication readiness (BPCR) in Upper West Region of Ghana, this paper examines the health system factors influencing the provision of adequate and quality health care during obstetric complications, labour and the postnatal period.

Design: A combination of quantitative and qualitative data were gathered from surveys of pregnant women, individual in-depth interviews of healthcare professionals and focus group sessions with community members in 8 project sites in two districts of Upper West Region, Ghana. The survey was guided by the WHO standard procedures and Ghana's Health Ministry operational work plan for maternal and newborn care. Participants were selected using simple random, purposive and key informant sampling procedures respectively.

Setting: Nadowli-Kaleo and Daffiama-Bussie-Issa districts in Upper West Region, Ghana

Participants: Two hundred and fifty-three purposive sample comprising pregnant women (n=80), Healthcare professionals (Pharmacist, Medical doctor, two district directors of health services, Midwives, Community health and Enrolled Nurses) (n=13), and community members comprising opinion leaders, youth leaders and adult non-pregnant women (n=240).

Results: The results show that there exist significant barriers affecting the quality and appropriateness of maternal and neonatal health services in the rural communities and the Nadowli district hospital. The obstacles range from inadequate medical equipment and essential medicines, infrastructural challenges, skilled staff shortages to high informal costs,

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particularly of medicines. There was no referral management intervention to or out of the hospital. Seven of the eight sub-district health facilities received complicated obstetric cases but had inadequate or no staff and the requisite equipment to manage these cases.

Conclusion: Implementation of BPCR strategy is in its infancy at the health facility level in the study areas. Increasing resources at the health provider level are essential to achieving international targets on maternal and neonatal health outcomes and bridging inequities in access to essential maternal and newborn health care.

Keywords: Healthcare facility, birth preparedness and complications readiness, supply-side barriers, maternal and neonatal health care, Upper West Region of Ghana

Strengths and limitations of the study

- The study provides the first comprehensive assessment of maternal and neonatal health delivery on from the perspectives of community residents and healthcare providers in the two districts.
- The findings focus exclusively on participants' views from sub-district health facilities, the district hospital, health service management and community members across eight study sites.
- The study did not assess health facilities capacities to provide quality health services, instead, a component of the more extensive multisite study into community perspectives on birth preparedness and complication readiness interventions in the rural settings.
- The results represent the views of health facility managerial and another frontline healthcare professionals which may not reflect the views of all staff in the two districts.

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- Much of this component of the study is qualitative which has both strengths and limitations in terms of processing and interpretation.

INTRODUCTION

Although substantial progress has been made at the global level concerning the Millennium Development Goals (MDGs) four and five (improve maternal and newborn health services), in resource-poor settings such as sub-Saharan Africa, poor outcomes persist.[1] Globally, about 15 percent of obstetric complications occur during pregnancy, labour and childbirth and the early postnatal period,[2 3] with approximately 800 girls and women dying daily as a result of pregnancy and childbirth-related complications in 2015.[4 5] Most of these poor maternal health outcomes occur in sub-Saharan Africa.[1 4]

In 2015 the Sustainable Development Goals or Global goals negotiated new targets of reducing maternal deaths ratio to less than 70 per 100,000 live births as well as ending preventable deaths of newborns by 2030.[5] There are two maternal health care (MHC) strategies proposed in the renewed commitments to stakeholders, with the high potential for preventing avoidable obstetric deaths: skilled attendance at birth and emergency obstetric health care.[6 7] These measures are promoted through effective antenatal education and efficient management of referrals, coupled with adequate skilled healthcare professional attendance to both normal childbirths and those with obstetric complications.[8 9] In many countries, these interventions form part of the birth preparedness and complication readiness (BPCR) strategy; a component of the antenatal care (ANC) program.[4 10 11] Ghana has made some progress in this direction.[5 12 13]

Although factors such as social, economic and cultural issues impact on using ANC and implementing BPCR [12 14], there are also "supply side" (health care provider factors) barriers to improving maternal health outcomes. These include supplies/logistics (drugs and non-

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drugs consumables, medical equipment), skilled human resources, appropriate technology and the capacity to handle maternity cases.[15] Availability of accessible emergency obstetric services (such as parenteral oxytocics, antibiotics and anticonvulsants; assisted deliveries, manual extraction of the placenta, blood transfusions, and so on) are mandatory on the continuum of quality maternity healthcare. [3 16] Preference for facility-based childbirth can be high when there is the appropriate quality of care with the necessary medical facilities such as equipment for surgery and blood transfusion services.[17 18]

For childbirth to be called skilled birth, the attendant must receive training from an accredited health institution and be licensed to practice.[18 19] The inadequacy of trained health care workers, including midwives, is identified as a significant barrier to improved MNH outcomes. Although public and private sector efforts have recently increased skilled birth attendants (SBAs) on the global front, the opposite exists in some sub-Saharan African countries. There, the nurse/midwife to population ratio was estimated by the World Bank (for the periods of 2008-2014) as 0.9 per 1,000 for Ghana, [20] compared to the global standard of 2.2 per 1,000 people. [1]

Ghana began an innovative decentralised health programme in 2004 aimed at addressing problems related to utilisation of skilled birth attendants by upgrading the skills of Community Health Nurses (CHNs) to Community Health Officers (CHOs) with basic midwifery skills. The essence was to equip CHNs with the core competencies in managing labours and deliveries during emergencies.[13 21] The policy coincided with a ban on the utilisation of traditional birth attendants (TBAs) and further challenged by an ongoing shortage of physicians. For example, in 2012, Upper West Region (UWR) had 11 times fewer doctors compared to Greater Accra (nation's capital) and Ashanti region; well over 50% of all doctors live in Greater Accra with 20% in Ashanti Region. The remaining 30% resided in the other eight health/geographic regions.[22]

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Despite the implementation of the decentralised initiative, access to health facilities for delivery is still comparatively low, with approximately 44% of women in UWR giving birth in a healthcare facility.[5 13] The rate is the second lowest in Ghana, compared to about 83% in the Greater Accra Region, and 68% in the country.[22] Many women in the rural communities continue to prefer care from traditional birth attendants (TBAs).[5] In many cases, women chose other alternatives due to demand-side barriers such as decisions on choice of facility, financial and physical accessibility which frustrate utilisation of appropriate health care.[5]

There are also many supply-side barriers despite local community potentials in rural communities such as those of the Upper West Region (UWR) of Ghana, including direct bottlenecks of the health service delivery system impacting on potential service users such as physical infrastructure, drugs, equipment, finances, human resources[7 15] and appropriate transfer arrangements.[12] UWR has 174 health facilities with five district hospitals out of the ten districts and one municipality. Further, the region has the smallest number of kilometres of tarred roads compared to the other nine regions of Ghana, with only Nadowli and Jirapa having a direct link to the regional hospital via tarred road.[22] Before the study, an ex-post evaluation on the Country Programme Five (CP5) for Ghana by the United Nations Population Fund (UNFPA) found thirty-six poor performing districts within the UWR regarding MNH indicators. As a result, UNFPA implemented the Country Programme Six (2012-2016) in those locations, which included the two study districts within which this research took place (Nadowli/Kaleo and Daffiama/Bussie/Issa). Although the package included key logistics and equipment as well as skill upgrade of staff, there has not been any known investigation into the current state of maternal health care delivery services.[13 17 23] Therefore, as part of a broader study, this paper focuses on the health facility factors affecting preparedness for normal and emergency maternal and neonatal health service delivery in the study area.

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METHODS

Study setting

The study described here is part of an extensive mixed methods research project exploring barriers to preparedness for birth and complication readiness interventions in eight purposively selected study sites sin the Upper West Region of Ghana, four in Nadowli/Kaleo and four in Daffiama/Bussie/Issa. The study area had two-tier health system; the district level (the hospital) and 29 sub-district level health facilities (13 health Centre and 16 CHPS compounds are the lowest order in the Ghana Health Service structure) [24 25] (Figure 1). The CHPS compounds provide preventive services and obstetric first aid including immunisations, vaccinations, health promotion and health education activities, whilst the health centres provide both preventive and curative services to the communities. Six of these communities did not have access roads to the nearest hospital (Nadowli Hospital).

The population of Nadowli/Kaleo district was 61,561 (46.7% males and 53.3% females), constituting 8.8 percent of the region's population.[25] Daffiama/Bussie/Issa Districts also had a population of 32,827 (48.7% males and 51.3% females) representing 4.7% of the people of UWR.[24]

Figure 1. Study communities and health facilities

Study design

Given the complexity of health service related factors influencing birth preparedness and complication readiness[13 17 18 22], and the need to explore these from the perspectives of community members, expectant mothers and service providers a mixed methods approach was considered to be most appropriate, using focus groups discussions (FGDs), structured

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surveys (SS) and in-depth interviews (IDIs), respectively. The district health management provided time series data to a structured survey question on their resource capacities and logistics and referral management prospects and challenges.

Participant selection

Following appropriate ethical approvals (Charles Sturt Human Research Ethics Committee 2016/013 and H16178; Regional Health Directorate of Upper West Region) participants were selected in the following ways.

Expectant Mothers

In order to explore their previous and current experiences during pregnancy and labour, a uniform sample size of ten pregnant women in their second or third trimester (excluding the ninth month) per community was selected. A list of mothers that met the selection criteria was obtained at the ANC unit (with clearance from the Regional Health Directorate and the Director of Health Services), whilst other pregnant women that had not commenced ANC were identified with the help of the healthcare staff and community-based health surveillance volunteers. A combination of simple random and purposive and key informant procedures was adopted to determine potential participants from this pool of expectant mothers. Out of the pregnant women that consented to participate in the study, 67 had begun using antenatal care (ANC) services, and 13 were not at the time of the survey.

Focus group participants

A combination of key informant and purposive sampling procedures were adopted to identify and select convenient sample of; opinion leaders (n=80), youth leaders aged 18-35 (n=80) and nonpregnant women (who had childbirth experiences) (n=80) to provide data in 24 different group discussions, three in each community. The community representative, who is

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a nonpartisan but statutorily elected official representing each community at the District level, assisted in identifying potential participants for the FGDs. The sample sizes were pre-determined to facilitate data saturation and potential transferability of the findings to other contexts and settings.

Health care staff

Skilled healthcare staff were included in the study to provide their opinions on health services delivery and the outcomes. Upon receiving written support from the Health Directorates, the staff in charge of each of the healthcare facilities in the study area were asked to participate in the study. Three "other nurses" that were providing health services but not in managerial positions were purposively selected to submit further insights into expectant mother-ANC provider relationships and uptake of medical advice.

A summary of all participants can be found in Table 1.

Table 1: Participants groups

Participants	**Age range (years)**	**Number**	**Data type**	**Sex disaggregation**	**No. of Communities**
Opinion leaders	18-59	80	Qualitative	22 females, 58 males	8
Non-pregnant women	18-59	80	Qualitative	All females	8
Youth	18-35	80	Qualitative	40 females;	8

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				40 males	
Expectant mothers	18-49	80	Quantitative	All females	8
Healthcare staff	25-59	13	Quantitative & qualitative	11 females 2 males	10 (8 communities and two district health administrations)

Research instruments

A semi-structured survey conducted in 'Dagaare' (the local language) comprising multiple closed-ended questions and four open-ended questions was used for the expectant mothers[26]. This focused on understanding the mother's opinions on birth preparedness and complication readiness, health facility resources (staffing and logistical capacities), the potentials and challenges to service delivery related to community cooperation in the continuum of care provision and timely uptake of care, health service financing, and transport management in the study communities. The survey was pretested prior to data collection.

An interview schedule containing structured and unstructured questions were used by health professionals and encompassed staffing and logistical capacities to provide quality maternal health services, health care financing issues and preparedness for birth and complications.

A semi-structured discussion guide was utilised in FGDs, enabling the collection of community views on BP/CR interventions, the causes of maternal and neonatal morbidities

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and mortalities, sociocultural beliefs and practices impacting the use of maternal and newborn health services, and any issues emerging from expectant mothers' interviews.[26] The semi-structured interview guide were not pretested.

Data collection

Quantitative data were collected first, before the semi-structured FGDs and IDIs. This arrangement gave the chance to cross-examine relevant issues emerging from the survey of the pregnant women.

Convenient venues were arranged within the communities for the FGDs. All discussions and surveys were in the local language (*Dagaare*), as illiteracy was high.[24 25] However, the IDIs were conducted in English at scheduled locations in the health facilities. Two experienced researchers collected both quantitative and qualitative data for the study, with one carrying out the interviews and the other serving as a co-moderator, a scribe and picture-taker during the FGDs. All quantitative surveys, IDIs and FGDs, were completed as planned, thereby resulting in a higher than anticipated response rate.

Data processing

All interviews and group sessions were tape-recorded with the informed consent of the participants. To achieve accuracy and dependability of the data, all audio recordings, except those of the health professionals were first transcribed (hand-written) in "Dagaare" and then translated into English. The principal investigator is a native and writes and speaks the local dialect. However, the interviews with healthcare staff were transcribed in English. The quantitative data were checked each day for completion before leaving the community.

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Emergent issues were also noted for the few (5) semi-structured questions in each questionnaire.

Data analysis

Analysis of the qualitative data began in the field. After each interview, notes were made containing: a) emerging opinions from the participants and how they could be noted and applied to other interviews,[5] b) what went well or not-so-well; c) what should be done differently in future interviews and d) physical observations of health facilities, surface nature of roads, interactions among participants and nurses. This interim analysis enabled the researcher to add follow up questions to the interview schedule to clarify issues as they emerged.

SPSS (version 20) and Nvivo (version 7.5) were used to analyse the quantitative and qualitative data, respectively. Basic descriptive statistical tools (frequency and percentages) were used to present the quantitative data while analytical text categories and themes related to "logistics, equipment, staffing, essential medicines" emerged from a computerised coding using the Nvivo, which were complementary themes to *a priori* topics and sub-themes identified in the quantitative analysis and existing literature and experience. The different factors affecting service delivery and skilled health care utilisation emerged as significant themes from the data (interview/FGDs transcripts, right notes, field observations/reflections). They were thoroughly read and re-read to identify and index topics and categories. Participant opinions were subsequently chosen to support the themes. Finally, both the predetermined and emerged themes were pooled together to address the research question.

Conceptual framework

The monitoring and evaluation framework for accessing health facility practices in relation to the birth preparedness and complication readiness strategy (BPCR),[27] WHO standards of care

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and referral guidelines by Ghana's Ministry of Health aimed at improving maternal and newborn quality of care in facilities.[22 28 29] were adapted to guide the study (Table 2).

Table 2. Indicators for monitoring health facility practice of BPCR

Factors on BPCR of health facilities	**Definition**
Skilled human resource base of health facilities	Availability of midwives, anaesthetists and specialist's doctors
Health facility infrastructure	Ready lighting system in facilities, spacious labour rooms
Logistics and equipment availability	Health facilities are equipped with the needed logistics and equipment for providing quality and timely MNH care
Referral management	Transport or ambulance availability for efficient and effective transfer of emergency obstetric cases

Source: Adapted from existing literature and the BPCR toolkit by JHPIEGO [27]

RESULTS

Four congruent themes with the conceptual framework featured prominently in the results, and these, along with related sub-themes, are presented below.

Human resource capacities in health facilities

Nadowli district hospital

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At the time of the survey (2016), there were three resident medical doctors (1 female and two males) in the hospital (Table 3). Ten midwives provided care at the maternity ward to clients, conducting labours and deliveries including general gynaecological cases on admission. Non-midwives (Community health and Enrolled nurses) did not attend to childbirths or provide any other support in managing labour at the maternity unit (because of the definition of skilled attendance) regardless of the number of midwives that may be on-duty. Two anaesthetics nurses go on-duty in turns throughout the weekdays for eight hours daily (Table 3). The number of professional staffing has been unstable over the years (2013-2016) with the number of Midwives and Medical Doctors decreasing than increasing (Table 3).

Table 3: Available staff at Nadowli district hospital (from 2013-2016)

Year/	**2013**	**2014**	**2015**	**2016**
Core staff	**Number (%)**	**Number (%)**	**Number (%)**	**Number (%)**
Doctors (General practitioners)	1 (1.72)	2 (2.25)	3 (2.54)	3 (2.86)
Physician Assistants	1 (1.72)	2 (2.25)	2 (1.69)	3 (2.86)
Midwives	4 (6.91)	8 (8.98)	13 (11.02)	10 (9.52)
Registered General Nurses	20 (34.48)	30 (33.71)	39 (33.05)	39 (37.14) [3, 7.7% on study leave]

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Enrolled nurses	31 (53.45)	46 (51.69)	59 (50.00) [11, 18.6% on study leave]	48 (45.71)
Anaesthetists	1 (1.72) [on duty for 8 hours daily]	1 (1.12) [on duty for 8 hours daily]	2 (1.70) [1 on duty at a time for 8 hours daily]	2 (1.90) [1 on duty at a time for 8 hours daily)
Total (%)	**58 (100.00)**	**89 (100.00)**	**118 (100.00)**	**105 (100.00)**

Source: Field survey, May 2017.

Effects of staff shortages on service delivery

The professional staff shortages at Nadowli hospital were found to be contributing to staff role stress and unnecessary referrals of pregnancy and newborn cases to other hospitals (mostly to Wa or Jirapa hospitals).

> *It is only two anaesthetists that are in the hospital. Sometimes, one will be on leave leaving only one. We could call the anaesthetist, and it [the phone] is switched off. Other times, he will tell us he is very far away. The doctors too are sometimes few, maybe the doctor is gone on official duty and very far away from the hospital or maybe throughout the day and night; the doctor might have worked so hard that if he tries to attend to the next case, the outcome may be severe. Therefore, it is referred out of the facility [IDIs, other nurses].*

Midwife shortages prolong the time mothers spend accessing ANC services.

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Due to a shortage of midwives, pregnant women can spend the full day seeking care [at the hospital], which discourages the very distant communities from seeking care [IDIs, other nurses].

Staffing at the sub-district health facilities

Data from the eight sub-district health facilities indicated shortages of skilled healthcare staff was a persistent challenge to health care management. Among the surveyed health facilities, 62.5% (5) (3 health centres and 2 CHPS compounds) had resident midwives while Nanvilli health centre, Duang and Jimpensi CHPS compounds (JCHPS) had no midwife. Jang Health centre (JHC) had two midwives (but one at post). The midwife was assigned to each health facility to provide all MNH services to clients - ANC, labour, childbirth care, other general ailments from the populace, in addition to performing administrative roles as facility head.

Almost all health facilities had Community Health Nurses (CHNs) (13 in total) and Enrolled nurses (ENs) (6 in total). There was also one Registered General Nurse, one Physician Assistant, two field technicians and one mental health professional located in the region.

Effects of staffing situation on skilled attendance at birth

The World Health Organisation's definition of "skilled attendance" at birth denotes employing the services of a midwife or doctor, which is a significant challenge in rural Ghana. The staffing challenges motivate the health service management at the district level to endorse Community Health Nurse and Enrolled Nurse supervised delivery as skilled birth, even if they had no midwifery training.

How about the CHNs we put at the CHPS compound and ask them, when a woman is delivering, they should catch (receive)? Therefore, I [DoN] think any delivery that is supervised by a trained health worker should be considered skilled delivery. So, the

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CHNs are forced to always refer to facilities with midwives, and considering the distances, we record poor outcomes or home births. Will they go? [IDIs, other nurses, DoN, male, DBID].

The number of midwives in the Daffiama/Bussie/Issa district was deemed inadequate to serve the numbers of pregnant women:

The district has five health centres and twelve CHPS compounds. However, we currently have seven (7) midwives at the post which is inadequate to provide maternal health care to many pregnancy issues we face each day. Even the district capital, Issa needs more than one midwife; but we are forced to make do with just one. [IDIs, other nurses, DoN, male, DBID].

The midwives themselves agree with the above assessment:

I am the only midwife and always stressed up. Whenever I have two or three labour cases at the same time, it is stressful working all the time. Also, if I am conducting ANC and a labour case is brought in, I suspend the ANC and attend to that one. Sometimes, expectant mothers default ANC when it happens that way, and it becomes difficult tracing them because I am alone [IDIs, In-charge, midwife, WCHPS].

The skills shortage affects the quality of prenatal and postnatal services delivery:

We do not have enough skilled staff. Therefore, the expectations of clients are sometimes not met. As I said earlier, one midwife is unable to explain certain issues clearly for pregnant women to understand because she has limited time to carry out all education and detail[ed] explanations [IDIs, Other nurses].

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The IDIs with the Directors of Nursing (DoN), often called "district director of health services" in the Ghanaian context, suggested that while slow progress has been achieved towards training skilled staff for MNH care, the districts still need more midwives.

> *It is better now than in the past; some CHPS zones even have midwives. We are still not enough as desired because some midwives at a point attend funerals or other pressing issues leaving the facility. When clients go for care during midwife's absence, the CHNs and ENs have to refer [IDIs, other nurses, DoN, female, NKD].*

Nurses -client relationships

Negative attitudes of nurses towards pregnant women can act as a deterrent to expectant mothers:

> *Expectant mothers receive cheeky words from the nurses, so some do not receive maternal health care at the clinic because they have received enough of the insults. They are afraid to divulge the truth for fear of receiving worse treatments in subsequent attendance [FGDs, non-pregnant women, Naro/Korinyiri].*

Discussants in another community suffered similar treatments:

> *I have not been to other clinics, but the nurses in our clinic do not give us attention at all whenever we seek care at night or evening. They might not even utter a word, before going back into their residences. When the client or family insist, they just write a referral letter. Given the odd hour, how are we going to manage the case to Wa or Nadowli hospital? [FGDs, non-pregnant women, Jang].*

Although health centres and CHPS compounds are expected to provide a 24-hour service to communities, some clients were denied care.

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Some nurses would even tell us they do not run shifts and so will not work after 2 pm [FGDs, non-pregnant women, Jang].

Basic and emergency obstetric case management at sub-district health facilities

As illustrated in Table 4, among the eight sub-district health facilities (health centres and CHPS compounds), 7 (85.5%) regularly only received primary obstetric cases, and 1(12.5%) received both basic and comprehensive emergency obstetric cases. However, half of the health facilities managed one comprehensive emergency obstetric case each in three years (2013-2015) preceding the study; two health centres confirmed they had managed five or more obstetric complications in the same time frame. Three-quarters of the sub-district healthcare settings did not have the necessary skilled staff to manage obstetric cases (Table 4).

Table 4: Obstetric histories and health facility capacities

Category	**Number health facilities**	**% of health facilities**
Type of obstetric care		
Usually providing basic obstetric care	5	62.5
Able to provide comprehensive obstetric care	2	25
Not providing obstetric care	1	12.5

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Available staff to provide basic emergency obstetric care		
Yes	2	25
No	6	75
Number of comprehensive emergency obstetric cases received		
One case	4	50
Two cases	1	12.5
Five cases and above	2	25
Sub-total	**7**	**87.5**

Health facility infrastructure

Service space in maternity units

Nadowli district hospital was the only public hospital serving the two districts and was the highest referral facility. It had 76 beds, including 12 beds for the maternity ward and two delivery beds in the labour section.

> *For the labour ward, we have only three beds, out of which only two are used. We use the third bed as a last resort, although it is not meant for childbirth. It is for examination. In critical situations, we are forced to conduct delivery in the manual vacuum aspiration (MVA) room [IDIs, Other Nurses].*

Availability of water

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None of the sub-district health facilities had potable water for usage by the workers and cleaning of the premises, meaning that expectant and postnatal mothers were often found drawing water for the health facilities or returned home to draw water for nurses if they sought care without it. Alternatively, the midwives would have to leave the mothers in the healthcare setting in search of water for cleaning. Thus, "*some expectant mothers get discouraged from giving birth there." [IDIs, other nurses, DoN, male, DBID]*.

Inadequate lighting

Ghana government's rural electrification initiatives were understood to have covered a significant part of the countryside. Despite this, not all old and recently constructed health facilities were securely connected to the national grid. For instance, Duang CHPS was inaugurated around 2015 but continues to experience intermittent power outages from faulty wiring system. A similar limitation was found at Charikpong health centre (one of the premier health facilities in the district), and Nanvilli health centre depended on patients to provide fuel to power the facility generator; without fuel, either the delivery would have to be transferred elsewhere or be carried out in the presence of often inappropriate family members:

> *We do not have a source of water and light. When I am conducting delivery, I use a lamp or generator. However, the generator must be fuelled by the relative of the expectant mother. Due to the cost, they are not able to afford. I use torchlight when there is a tear. I had a labour case where the mother sustains some lacerations which I have to suture. Sometimes, I involve the relatives because I cannot hold the torchlight while suturing, and patients' rights are violated, because that may not be the right person to see her nakedness [IDIs, midwife, NHC].*

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Medical equipment and logistics availability and functionality

Nadowli hospital

The hospital has inadequate equipment despite the significant threshold population it serves. The entire hospital operated on one used anaesthetic machine, a dysfunctional haematology analyser at the laboratory and an incomplete resuscitation table, all of which affects service delivery. Despite the occurrence of stillbirths and neonatal deaths, there was no neonatal intensive care unit in the hospital. Other challenges included:

> *Frequent power fluctuations are causing significant breakdowns in the equipment, i.e. blood bank refrigerators, autoclaves, air conditioners and theatre lamps. It further affects service delivery in the maternity section [IDIs, other nurses].*

Only a poorly supplied resuscitation table for preterm delivery care is available:

> *Resuscitation table requires many items so that in case a baby is born and is asphyxiated; we can conduct it with ease. The table we have now is not well-equipped. We are only managing to save lives [IDIs, other nurses].*

All the Health Centres (HCs) had midwives and conducted childbirths. While the CHPS compounds without midwives were not allowed to conduct childbirths or deal with other emergency obstetric situations, a basic bed and set of delivery equipment were provided for all compounds. Only two HCs had a manual vacuum aspiration kit. There was other basic (and essential) equipment available for checking vital signs at the health centres: blood pressure (BP) apparatus, thermometer, weighing scale, including foetus cope and foetal Doppler, but not all were in usable condition. Some CHPS compounds did not have necessary logistics such as vaccine fridge:

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> *"There is electricity here now, but we do not have a vaccine fridge. When we even conduct a childbirth, we have to ride to Kojokpere health centre for poliomyelitis vaccine for the newborn and return the remaining for storage. When expectant mothers are around the 20th week of gestation, we administer tetanus toxoid injection (TTI), but the vaccine cannot be stored here" [IDIs, In-Charge, male, JKCHPS]*.

Similarly, the CHPS compounds often did not have mandatory equipment to manage emergency deliveries or resuscitate asphyxiated newborns, such as Ambu bags, meaning that at times *"we see that the woman will be struggling and we cannot do anything to help"* (IDIs, In–charge NCHPS).

Effects of logistics shortages on infection control procedures

Some health facilities did not have necessary daily non-drug consumables for administering care. While Rapid Diagnostics Test (RDT) kits (for malaria) were readily supplied to some facilities, infection control items such as facilities for handwashing and hand gloves were often not provided for some facilities:

> *We have had consignments on the RDT which had no gloves included. Therefore, we do use bare hands to conduct the tests. The improvised hand gloves you saw me wear, were old gloves I found because we do not have hand gloves in the entire facility and the current RDT kits were not supplied with gloves [IDIs, In-charge, male, JKCHPS]*.

Another identified how shortage of gloves was "*the reason I improvised with hazardous materials (rubber bag) to conduct HIV/AIDS and Syphilis tests" (IDIs, In-charge, male, JKCHPS]*.

The National Malaria Control Programme (NMCP) scaled-up access and universal coverage to provide long-lasting insecticide bed nets (LLINs) to all expectant mothers and children

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who are under five years of age, however, some pregnant women in these districts were denied access to these services. Some health facilities were not included in the regular consignments of supplies.

> *When I came here, there were no mosquito nets in the facility. We do not also have sulphadoxine-pyrimethamine (SP); it is a prophylaxis for malaria prevention in pregnancy. Since I came to the installation, there has not been any SP for the pregnant women [IDIs, midwife, NHC].*

Essential medicines at the sub-district level

While "*the WHO protocol recommends antibiotics for pregnant women who give birth newly"* [IDIs, other nurses], the National Health Insurance Drug lists for CHPS compounds prohibits prescription of antibiotics to newly delivered mothers, although it is mandatory for mothers who give birth. This is because the *"CHPS compound is a small facility. When we prescribe it, NHIS refuse to pay. Therefore, we sell it to them [the patient] which they always complain they do not have money to pay for medicines" [IDIs, other nurses].*

Some health facilities did not have other essential medicinal products for conducting childbirth.

> *I came in December 2015, and there was no oxytocin, no Vitamin K_1 for the newly born babies. As at now, still, there is no vitamin K_1 in the facility [IDIs, midwife, NHC].*

As a result of other changes in health policy there were other limitations placed health centre midwives prescribing certain essential medicines to manage labours.

> *At the health centre, we cannot use the Zeamatin (if the woman is having preterm, we cannot give, we have to refer to Nadowli Hospital) [IDIs, Midwife, CHC].*

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Transport services

The majority of the health facilities did not provide transport (for example, motor bikes) for midwives to visit communities, thereby restricting their ability to engage in health education, to follow up on women not attending ANC, and to carry out routine immunisations:

> *We have so many maternal and newborn programmes that require motorbikes, but we do not have enough motorbikes for all the facilities. Aside from the bikes, some of the communities are hard-to-reach [IDIs, DoN, other nurses, female].*

Management of referrals of emergency obstetric and newborn complications

The referral hospital reported receiving emergency obstetric cases from the health centres and CHPS compounds. Expectant mothers referred during labour were 54 (5.22% of births) in 2012, 36 out of (10% of births) in 2013, 24 (7.09% of births) in 2014 and 17 (7.13% of births) in 2015.

Typical referral management procedure at the sub-district health care level

The model below typifies the referral pattern which pertains in the communities, with a focus on worst case scenario (Figure 2).

Figure 2: Pictorial view of a typical referral management in study area

All four health centres received labouring mothers and obstetric referrals from the CHPS compounds and across all communities in their catchment area, with the number of referrals significantly influenced by their geographical location. Nearly all maternity cases brought to the health centres originated from the remotest communities.

Availability of transport during referrals

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Transport provided by health care service to nearest referral facility

There were two groups of ambulance services operating in both districts to improve health service delivery; the hospital ambulance service and the National Ambulance Service (NAS) station. Each of them had one vehicle serving the two districts and other districts which were within its catchment area. The NAS station was situated at Nadowli but served any other district that gave them a call for emergency case(s) within the UWR. Meaning, the hospital vehicle and the NAS vehicle were both stationed at Nadowli leaving the far hinterland without ready access to vehicular transport during emergencies. There was one dysfunctional ambulance vehicle for all referrals to and from the Nadowli hospital. Daffiama health centre was the only health facility in Daffiama/Bussie/Issa district with double cabin pickup for emergency referrals of all patients and day-to-day operations of the facility. There were no available means of transport in any of the sub-districts except Daffiama health centre, with their car serving as an official vehicle as well as transferring emergency obstetric and newborn complications. However, the location of Daffiama health centre is within 20 minutes' drive of Nadowli hospital, closest than all other communities in the district.

Public and private transport

Lack of ambulances means that the majority of clients are reliant on public means of transport. This implies the client and family will usually have to wait until certain hours in the day to access transport:

> *If we are to send someone to a referral facility and it is around 10 am, the client cannot get means because all the vehicles go to Wa [region's capital]. Unless in the evening that they return to the community [IDIs, In-Charge, CHO, Duang].*

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The search for affordable transport, whether it be by tricyle, motor bike or pick up car, can often result in a delay in accessing the next level of care.

> *During referrals, we wait for several hours before they can get modes of transport to the next level of healthcare. We do not also have laboratory services in the entire district so for us to conduct the routine laboratory investigations, we refer expectant mothers to Nadowli or Wa which becomes a challenge for many pregnant women. Even for pregnant women to get money to arrange for means of transport to the next level of care is always a problem [IDIs, midwife, WCHPS].*

As a general rule, it was the responsibility of the expectant mother (or their family) to arrange for means of transport during emergency referrals, because of a shortage of emergency vehicles. The cost often limited the ability of the expectant mother to receive care.

Managing information and communication during emergency obstetric referral

The telecommunication sector presents a significant challenge in managing referrals in some communities. Vodafone and MTN Ghana telecommunication service providers had network coverage in the communities, although some communities had challenges accessing networks. During the field data collection exercise, the first author found that Charikpong, Nanvilli/Siruu, Jimpensi/Kenkelley and Duang communities had intermittent telecom networks. Therefore, mobile phone users had the option to either climb up a tree in a strategic area or hover around various signal hotspots (identified by the community) to make a phone call. The facility heads agreed with this observation, noting that:

> *Our mobile phones network is a serious challenge…Therefore, when we have an emergency case, how to link with the national ambulance or the ambulance at Nadowli hospital is always a problem [IDIs, In-charge, WCHPS].*

DISCUSSION

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By utilizing the structure of the BPCR monitoring and evaluation framework for health facilities, the results of this study provide an insight into the preparedness of health care facilities to provide efficient obstetric and newborn to the communities.

As far as we know, this study is one of the first to assess health facility preparedness for birth complication readiness in the Nadowli-Kaleo and Daffiama-Bussie-Issa districts of Ghana. The barriers to improved maternal health service utilisation and the potential to address these complexities are well documented in the literature. Extrinsic and intrinsic inequities in access including transport arrangements and management of referrals are also identified to support existing findings in related districts of the Upper West Region (UWR).[12] While this study did not focus primarily on assessing the bottlenecks on and the capacities of health facilities to provide maternal and newborn health services in the study area, the findings presented provides significant signals and insights into situational issues impacting on maternal and neonatal health care delivery and utilization.

Despite a skill upgrade programme by the GHS for sub-district level staff (since 2004),[17 30] inadequate numbers of skilled health staff (i.e. licensed midwives and medical doctors) continue to, which provide many challenges for the few staff available, including role stress and undignifying behaviour patterns towards mothers, which support previous observations.[22] At the hospital, one midwife may be on duty to manage all admissions, including new admissions and emergency referrals for the entire maternity unit. There were no remuneration packages to motivate the few skilled staff, aside from the average monthly wage. The impact of shortages is compounded when referrals are made between district hospitals because of lack of staff at the referring hospital or to other facilities with insufficient staff. These findings are consistent with other studies in ten referral district hospitals in Ghana,[18] India, Tanzania and Ethiopia[31] and other developing countries.[15 32 33] Shortage of, and limited access to, licensed staff lends support to the view of some writers that, utilising appropriately trained

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TBAs, CHNs and ENs in the mainstream childbirth care in Ghana could reduce some of the current frustrations associated with managing obstetric complications and referral processes,[13] although this is not without its challenges. It was found that poor treatment of pregnant women discouraged skilled maternal health service utilisation with its attendant implications on the health outcomes in the rural communities.[23] While many of these behaviours could be attributed to the role stress identified in this study, it nevertheless defies professional codes of conduct and the priorities of the country and stakeholders in general.[23]

The Ministry of Health is a policy oriented-body while Ghana Health Service implements the initiatives. Based on the Ministry's Programme of Work (POW, 2014-2017), there were initiatives by Ghana Health Service (GHS) to increase the country's performance on MNH indicators in particular, through ANC defaulter-tracing, home-visiting, free ANC services for all mothers with active National Health Insurance Scheme (NHIS) subscription, focussing on preventive care through the sub-district structures.[12 22] Despite this, many factors limit the quality of care provided at the facilities, such as disrespect, irregular service availability at sub-district facilities, midwife absenteeism, and lack of necessary medical equipment and essential medicines.

While efficient lighting systems, water facilities and essential medicines motivates the utilisation of skilled health services, conversely, reduced laboratory services and inadequate space and equipment in childbirth rooms in all health care settings provided limited confidence to women accessing ANC and contemplating birthing in the health facility. Similar findings were reported elsewhere in the Upper West Region of Ghana and Kenya.[12 13 34] The challenges motivated born-before-arrival syndrome in the Upper West Region.[13] An evaluation in Ghana, Malawi and Kenya also found informal cost and cultural appropriateness of ANC services as key motivators to patronising skilled maternity care.[35] In most locations, health care facilities were rudimentary, and while the hospital had better

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equipment and amenities (compared to the health centres and CHPS compounds), irregular power supply had similar negative impacts on service delivery.[5] The health facilities with intermittent electricity supply were unable to conduct deliveries at night. Most sub-district health facilities (CHPS compounds) had inadequate access to vaccine fridge and the power grid to store vaccines, and having to travel for long distances for necessary vaccines such as tetanus toxoid injection (TTI) vaccines and other anti-malaria prophylaxis diminished efficacy and efficiency of the healthcare delivery system[36]. Conversely, some facilities had no readily available medicines such as oxytocin to induce labours. Other referrals were prompted by NHIS drug policy which prevents the staff at CHPS compounds from prescribing necessary antibiotics to newly delivered women, suggesting that revision of the NHIS user-fee exemption policy on maternal and neonatal health care would be appropriate.[12] These findings are congruent with other studies in India and a systematic review on this subject.[15 37] An earlier evaluation in district hospitals in Ghana revealed that they were the highest referral point for many obstetric complications. Meanwhile, many of them did not have the requisite logistics and staff to manage normal childbirth labour and complications.[18]

The project for improvement of maternal and child health in the Upper West Region by JICA provided elaborate education for district and sub-district healthcare staff on managing emergency referrals[38]. A fundamental requirement was to have the midwife accompany the client to the receiving facility. However, considering the staffing inadequacies and the lack of transport services linking the communities coupled with the behavioural norms on early utilisation of health facility care, the approach may further intensify the current shortages of midwives and result in poor health care outcomes due to the distances and lack of complication readiness interventions identified in another component of the study.[5 26] Despite the geographical isolation of communities to referral centres, and between health facilities,

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much like those experienced in other isolated locations, such as Uttar Pradesh, India.[32] A key difference may be the fact that the main referral hospital (at Nadowli) serving both districts had no ambulance facility to conduct the timely transfer of obstetric emergencies and preterm babies to appropriate health facilities such as Jirapa Hospital or Wa Hospital which were the nearest.

Although by convention, all health facilities in Ghana operate twenty-four hours for all days, there was the tendency to deny clients seeking emergency care at certain times, thereby defying the core mandate of the sub-district health structures of providing preventive and basic curative care including obstetric first aid.[13 22 29] The common limitations connecting with referral hospitals (mostly Nadowli or Wa) and means of transport create dissonance between the already aggrieved expectant mother in pain and the possibly stressed Nurse who provides care to a large number of population on the one hand, and the healthcare targets/indicators on the other.

Non-availability and affordability of transport and telecommunication systems during obstetric emergencies were a contemporary issue between Nadowli or Wa hospital (the closest to study communities) and sub-district health facilities. Demand for skilled care was on the increase, but the absence of ambulance/vehicular linkage and coverage could delay or cancel obstetric referrals despite regular demand for transfers from lower level facilities. The challenges identified in this study correspond to those already identified elsewhere in rural Ghana, suggesting the need to streamline referral management systems which are critical to reducing avoidable mortalities and inequities in access. [5 12 22] Buor and colleagues[39 40] their studies in Ghana and sub-Saharan Africa and another study in the Upper West region demonstrated that distances to health facilities contributed to reduced utilisation and outcomes of obstetric referrals,[41] thereby providing pregnant women to fewer alternatives during complications and childbirth labour.[13] This study may have underestimated the impact

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of these barriers compared with previous evaluations on this subject, but the negative effects of home or born-before-arrival syndrome at the health facility is consistent with other research.[13 37]

Implications for future research, policy and maternal health service delivery

While reports show that Ghanaians have increased utilisation of skilled maternal health care than previously, it also implies that, policy initiatives at improving upon current systemic bottlenecks would provide a way forward towards achieving global goals for the country. This is particularly important because the majority of the chronic health cases leading to life-threatening disabilities and mortalities are found in the hard-reach communities of the country [30]. An evaluation in Ghana also noted that, although the national health insurance fee-exemption policy have increased service uptake, inequities and geographical disparities in access continue to exist between the rural poor and nonpoor, thereby causing low use among the poor due to the informal costs on services and medicines. [30]

The many barriers in this study are interdependent and addressing them will require holistic approach including community awareness and proactivity during obstetric complications to help the health providers tackle the issues appropriately and on time. While these shortages in the health facilities may not be addressed in the short-medium term due to cost implications, preventative measures could be facilitated at the community level to influence behaviour and cultural change (as identified in other components of the study)[26] to help improve maternal and neonatal health outcomes.

While motivational packages (housing, additional allowances, and career opportunities) for Physicians and Midwives may have some potential in encouraging them to accept postings to rural areas, the lack of equipment and essential medicines for continued knowledge and skill

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development could serve as a limitation. Global technological advancement and professional networking through the social media, telecommunication and the general internet services via reliable internet networks engenders increased ambitions to advance in skill through education and career. However, the gap in these services to the district level was extensive, suggesting that improving the mobile telecommunication network and general internet services at the district level could also motivate acceptability of postings to these locations.

CONCLUSION

The health facilities at both grassroots and referral hospital levels in the districts were not adequately prepared to provide quality maternal and neonatal health care, contributing, at least in part, to the preference of many mothers for choosing not to take up ANC and favouring a home birth. These factors may also contribute to the difficulties experienced in implementing Ghana's health service first referral policy guidelines launched in 2014 [29].

The findings suggest that the health services require adequate funding to achieve existing institutionalised guidelines and the broader national objective on maternal and newborn care. Improving MNH services provided at the healthcare facilities, including increasing the availability of doctors, midwives, anaesthetists, labour beds, resuscitation equipment, essential medicines, ambulance van and improving access to basic amenities such as electricity and water facilities, along with efforts to address other barriers on BPCR identified elsewhere, will assist rural Ghana to achieve the critical Sustainable Development Goal (SDG) three (targets one and two) by 2030. The study recommends in-depth evaluations of operational procedures of the NHIS, and further research exploring ethical issues faced by nurses as well as the management of staff postings.

Strengths and limitations of this study

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This study has several strengths amidst limitations. It contributes to the scant literature on supply-side factors impacting MNH care in the Upper West Region of Ghana. The majority of obstetric complications and problems affecting the indicators are predominant in the rural communities. Therefore, a brief assessment of what pertains in the health centres and CHPS zones could trigger policy initiatives and district level oversight responsibilities. Data were obtained from healthcare professionals through a purposive sampling approach. Critics question the credibility of data through such sampling procedure, but this study was the first of its kind in these districts, and considering the findings, supported by general facility observation and cues during the interview, it is reasonable to say relevant data was generated through the approach to support the research objective. The sample was relatively small compared to the established norm, however, as a mixed method study, data from the other participant groups were used to support and cross-validate those of the healthcare settings; these results are reported elsewhere [5].

Figure 1. Study communities and health facilities

Figure 2: Pictorial view of a typical referral management in study area

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Figure 1. Study communities and health facilities

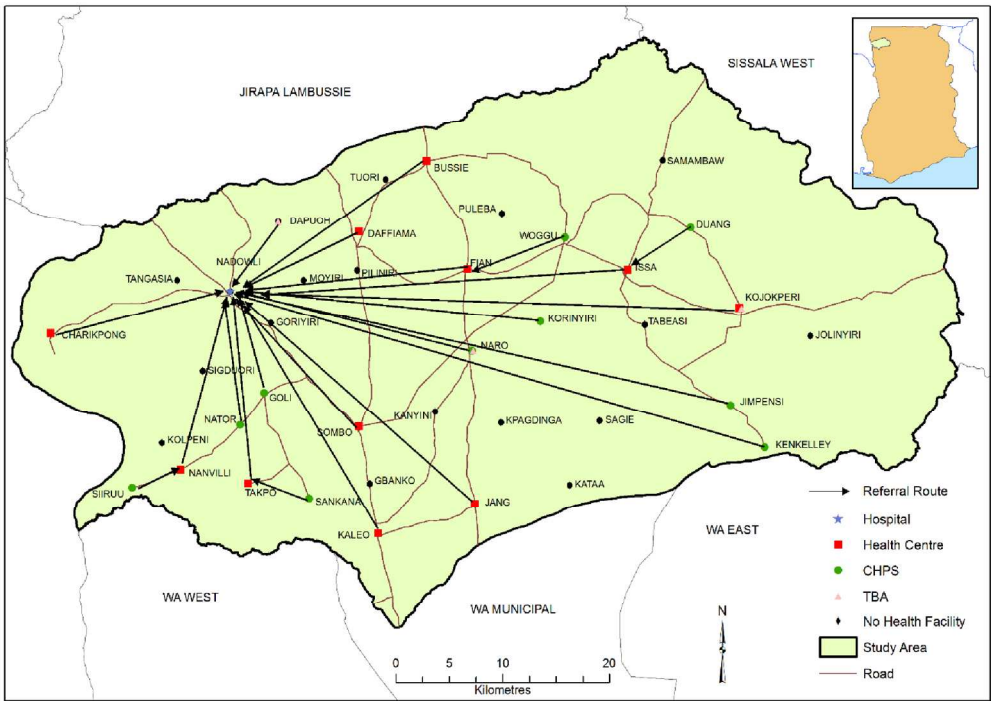

Figure 1. Study communities and health facilities

158x121mm (300 x 300 DPI)

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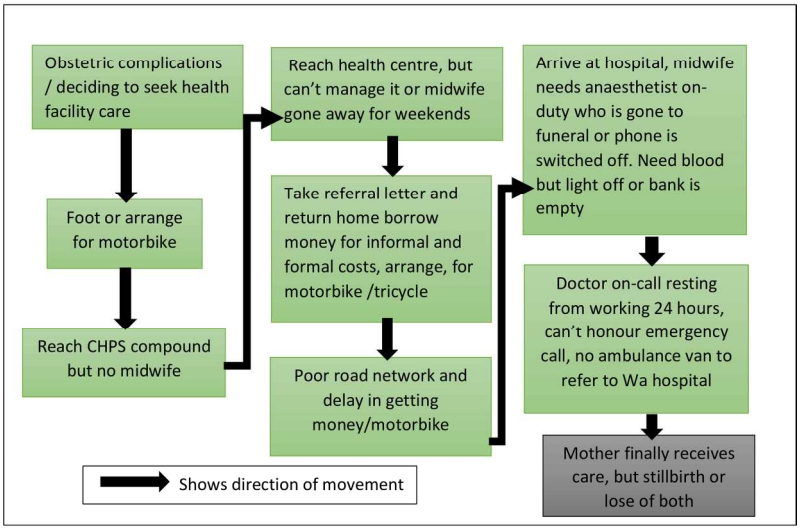
Figure 2: Pictorial view of referral management in study area



1

Figure 2: Pictorial view of a typical referral management in study area

146x222mm (300 x 300 DPI)

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Checklist of SQUIRE Guidelines followed in preparing the manuscript

S/N	Item	Page number
1	Title: the manuscript concerns an initiative to improve healthcare	**1**
2	Abstract	**2**
3	Introduction: Explains the aim of the study which emerge from existing unsatisfactory and unacceptable maternal and newborn service delivery in the study area.	**4**
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Perceived barriers to maternal and newborn health services delivery: a qualitative study of health workers and community members in low and middle-income settings

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Perceived barriers to maternal and newborn health services delivery: a qualitative study of health workers and community members in low and middle-income settings

Joshua Sumankuuro[1, 2] *, Judith Crockett[2], Shaoyu Wang[2]

[1]Youth Alive Ghana, P.O Box TL 1708, Tamale, Ghana.

[2]School of Community Health, Faculty of Science, Charles Sturt University, Orange, New South Wales, Australia.

*Corresponding author: Joshua Sumankuuro; ijoshua200@gmail.com

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Abstract

Objectives: Considering the explanations for poor maternal and newborn health outcomes, many investigations focused on decision-making patterns and actions of expectant mothers and families as opposed to exploring the "supply side" (health service provider) barriers. Thus, we examined the health system factors impacting access to, and quality maternal and newborn healthcare delivery in rural settings.

Design: A semi-structured qualitative study using face-to-face in-depth interviews with health professionals and focus group sessions with community members in eight project sites in two districts of Upper West Region, Ghana. Participants were purposively selected generate relevant data that will help address the study objective. The survey was guided by the WHO standard procedures and Ghana's Health Ministry operational work plan for maternal and newborn care.

Setting: Nadowli-Kaleo and Daffiama-Bussie-Issa districts in Upper West Region, Ghana.

Participants: Two hundred and fifty-three participants were engaged in the study through convenient and purposive sampling: healthcare professionals (Pharmacist, Medical doctor, two district directors of health services, Midwives, Community health and Enrolled Nurses) (n=13), and community members comprising opinion leaders, youth leaders and adult non-pregnant women (n = 240 in 24 units of focus groups).

Results: Results show significant barriers affecting the quality and appropriateness of maternal and neonatal health services in the rural communities and the Nadowli district hospital. The obstacles were inadequate medical equipment and essential medicines, infrastructural challenges, shortage of skilled staff and high informal costs on essential medicines and general limited capacities to provide care.

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Conclusion: Implementation of BPCR strategy is in its infancy at the health facility level in the study areas. Increasing resources at the health provider level are essential to achieving international targets on maternal and neonatal health outcomes and bridging inequities in access to essential maternal and newborn health care.

Keywords: Health facilities; Birthing centres; maternal care patterns; newborn care; Health attitude; Ghana

Strengths and limitations of the study

- The study provides the first comprehensive assessment of maternal and neonatal health delivery from the perspectives of community residents and healthcare providers in the two districts.
- The findings focus exclusively on participants' views from sub-district health facilities, the district hospital, health service management and community members.
- The study aims to identify factors affecting maternal and newborn health outcomes and thus, health facilities capacities to provide quality health services, was a component of the multisite study into community perspectives on BPCR interventions in the rural communities, which may not incorporate all the issues rigorously as a stand-alone evaluation of the health system.
- The results represent the views of health facility managerial and another frontline healthcare professionals which may not reflect the views of all staff in the two districts.
- Much of this component of the study is qualitative which has both strengths and limitations regarding processing and interpretation; thus, it lacks statistical rigour.

INTRODUCTION

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There are increasingly renewed commitments towards achieving the Sustainable Development Goals in advanced countries, however, in low and middle-income economies, inadequate services delivery initiatives persist.[1] Globally, about 15% of obstetric complications occurred during pregnancy, labour and childbirth and the early postnatal period,[2 3] and approximately 800 girls and women died as a result of pregnancy, and childbirth-related complications in 2015.[4 5] An estimated 99% of all maternal deaths occur in developing countries and more than half occur in sub-Saharan Africa (SSA).[1] Although advanced countries recorded an estimated 11 to 14 deaths per 100,000 in 2015, 511 to 652 deaths per 100,000 were recorded in SSA within the same period. Consequently, Ghana's maternal mortality rate (MMR) was estimated between 358 and 319 per 100,000 in 2015.[5 6]

WHO noted that 75% of these deaths occur due to avoidable causes including severe bleeding, sepsis, pre-eclampsia, unsafe abortion and complications in childbirth.[1] Another 65% of women die in Ghana due to similar causes[1]. The UNFPA found that maternal deaths in Ghana could further be reduced by 90% if expectant mothers are given ready access to emergency healthcare.[7]

In 2015 the Sustainable Development Goals or Global goals negotiated new targets of reducing maternal deaths ratio to less than 70 per 100,000 live births as well as ending preventable deaths of newborns by 2030.[1 5] There are two maternal healthcare strategies proposed in the renewed commitments to stakeholders, with the high potential for preventing avoidable obstetric deaths: skilled attendance at birth and emergency obstetric health care.[8 9] These measures are promoted through effective antenatal education and efficient management of referrals, coupled with adequate skilled healthcare professional attendance to both normal childbirths and those with obstetric complications.[10 11] In many countries, these interventions form part of the birth preparedness and complication readiness (BPCR) strategy; a component of the antenatal care (ANC) program.[4 12 13]

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Although factors such as social, economic and cultural issues impact on using ANC and implementing BPCR [14-16], there are also "supply side" (healthcare provider factors) barriers to improving maternal health outcomes. These include commodities/logistics (drugs and non-drugs consumables, medical equipment), skilled human resources, appropriate technology and the capacity to handle maternity cases.[17] Availability of accessible emergency obstetric services (such as parenteral oxytocics, antibiotics and anticonvulsants; assisted deliveries, manual extraction of the placenta, blood transfusions, and so on) are mandatory on the continuum of quality maternity healthcare.[3 18] That said, preference for facility-based childbirth can be high when there is the appropriate quality of care with the necessary medical facilities such as equipment for surgery and blood transfusion services.[19 20]

For childbirth to be called skilled birth, the attendant must receive training from an accredited health institution and be licensed to practice.[20 21] The inadequacy of trained healthcare workers, including midwives, was identified as a significant barrier to improved MNH outcomes. Although public and private sector efforts have recently increased skilled birth attendants (SBAs) on the global front, the opposite exists in some sub-Saharan African countries. There, the nurse/midwife to population ratio was estimated by the World Bank (for the periods of 2008-2014) as 0.9 per 1,000 for Ghana,[22] and less than one to over 95,000 people in the study area since 2010, [23] compared to the global standard of 4.45 per 1,000 people.[24]

Ghana began an innovative decentralised health programme in 2004 aimed at addressing problems related to utilisation of skilled birth attendants by upgrading the skills of Community Health Nurses (CHNs) to Community Health Officers (CHOs) with basic midwifery skills. The essence was to equip CHNs with the core competencies in managing labours and deliveries during emergencies.[25 26] The policy coincided with a ban on the utilisation of traditional birth attendants (TBAs) and further challenged by an ongoing

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shortage of physicians. For example, in 2012, Upper West Region (UWR) had eleven times fewer doctors compared to Greater Accra (nation's capital) and Ashanti region; well over 50% of all doctors live in Greater Accra with 20% in Ashanti Region. The remaining 30% resided in the other eight health/geographic regions.[23]

Despite the implementation of the decentralised initiative, access to health facilities for delivery is still comparatively low, with approximately 44% of women in UWR giving birth in a healthcare facility.[5 25] The rate is the second lowest in Ghana, compared to about 83% in the Greater Accra Region, and 68% in the country.[23] Many women in the rural communities continue to prefer care from traditional birth attendants (TBAs).[5] In many cases, women chose other alternatives due to demand-side barriers such as decisions on choice of facility, financial and physical access to services, which frustrate utilisation of appropriate healthcare.[5]

There are also many supply-side barriers despite local community potentials in rural communities such as those of the Upper West Region (UWR) of Ghana, including direct bottlenecks of the health service delivery system impacting on potential service users such as physical infrastructure, drugs, equipment, finances, human resources[9 17] and appropriate transfer arrangements.[14] The UWR has 174 health facilities with five district hospitals out of the ten districts and one municipality. Further, the region has the smallest number of kilometres of tarred roads compared to the other nine regions of Ghana, with only Nadowli and Jirapa townships having a direct link to the regional hospital via tarred road.[23] Before the study, an ex-post evaluation on the Country Programme Five (CP5) for Ghana by the United Nations Population Fund (UNFPA) found thirty-six (90%) poor performing districts out of forty districts in five regions (eight districts in each) regarding MNH indicators.[27]Three (about 8%) of these underperforming districts were in UWR (Nadowli, Sissala East and Wa West). CP5 (2006-2010) focused on three areas: a) reproductive health, population and

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development; b) gender equity and women empowerment and c) reproductive health and HIV/AIDS [27] As a result of the limitations, UNFPA implemented the Country Programme Six (2012-2016) in those locations, which included the two study districts; Nadowli/Kaleo and Daffiama/Bussie/Issa. Although the package included key logistics and equipment as well as skill upgrade of staff, there has not been any known investigation into the current state of maternal healthcare delivery services.[19 25 28] Therefore, this study answered the question: "what are the perceived barriers to maternal and and newborn service delivery in Nadowli-Kaleo and Daffiama-Bussie-Issa Districts of Ghana". Key indicators covered were: staff capacities, basic equipments, service space/beds capacities, water and lighting facilities, medicines and other essential supplies for service delivery as well as staff relations with mothers.

METHODS

Study setting

The study was semi-structured qualitative using face-to-interviews to explore into barriers to skilled service delivery and utilisation in eight purposively selected study sites in the Upper West Region of Ghana; four in Nadowli/Kaleo and four in Daffiama/Bussie/Issa. The study area had two-tier health system; the district level (the hospital) and 29 sub-district level health facilities (13 health Centre and 16 CHPS compounds are the lowest order in the Ghana Health Service structure) [29 30] (Figure 1). The CHPS compounds provide preventive services and obstetric first aid including immunisations, vaccinations, health promotion and health education activities, whilst the health centres provide both preventive and curative services to the communities. Six of these communities did not have access roads to the nearest hospital (Nadowli Hospital).

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The population of Nadowli/Kaleo district was 61,561 (46.7% males and 53.3% females), constituting 8.8 percent of the region's population.[30] Daffiama/Bussie/Issa Districts also had a population of 32,827 (48.7% males and 51.3% females) representing 4.7% of the people of UWR.[29]

Figure 1. Study communities and health facilities

Conceptual framework

The monitoring and evaluation framework for accessing health facility practices in relation to BPCR,[31] WHO standards of care and Ghana's Ministry of Health operational work plan were adapted to guide the conduct the instrumentation and reporting of the findings. These policy documents prioritise timely access to relevant and quality care in compliance with infection control procedures and strict adherence to the appropriate protocols and professional standards (Table 1). These guidelines aim to improve maternal and newborn quality of care in facilities.[23 32 33]

Table 1. Indicators for monitoring health facility practice of BPCR

Factors on BPCR of health facilities	**Definition**
Skilled human resource base of health facilities	Availability of midwives, anaesthetists and specialist's doctors
Health facility infrastructure	Ready lighting system in facilities, spacious labour rooms
Logistics and equipment availability	Health facilities are equipped with the needed logistics and equipment for providing quality and timely MNH care

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Referral management	Transport or ambulance availability for efficient and effective transfer of emergency obstetric cases

Source: Adapted from existing literature and the BPCR toolkit by JHPIEGO[31]

Study design

Health services delivery and related factors influencing BPCR are complex[19 20 23 25], which necessitates the need to explore them from the perspectives of community members and service providers a qualitative approach was considered to be most appropriate, using focus groups discussions (FGDs) and in-depth interviews (IDIs). The district health management provided time series data to a structured survey question on their resource capacities and logistics and referral management prospects and challenges.

Participant selection

Following appropriate ethical approvals, (Charles Sturt Human Research Ethics Committee 2016/013 and H16178; Regional Health Directorate of Upper West Region) participants were selected in the following ways. Written informed consent was obtained from each participant.

Focus group participants

A combination of key informant and purposive sampling procedures were adopted to identify and select a convenient sample of; opinion leaders (n=80), youth leaders aged 18-35 (n=80) and nonpregnant women (who had childbirth experiences) (n=80) to provide data in 24 different group discussions, three in each community. The community representative, who is a nonpartisan but statutorily elected official representing each community at the District level, assisted in identifying potential participants for the FGDs. The sample sizes were pre-

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determined to facilitate data saturation and potential transferability of the findings to other contexts and settings (see the link for the detailed questionnaire and interview guide for all participant groups https://doi.org/10.1371/journal.pone.0185537.s001).

Healthcare staff

Skilled healthcare staff were included in the study to provide their opinions on health services delivery and the outcomes. Upon receiving written support from the Health Directorates, the staff in charge of each of the healthcare facilities in the study area were asked to participate in the study. Three "other nurses" that were providing health services but not in managerial positions were purposively selected to submit further insights into expectant mother-ANC provider relationships and uptake of medical advice.

A summary of all participants can be found in Table 2.

Table 2: Study participants, data types and sex disaggregation

Participants	Age range (years)	Number	Data type	Sex disaggregation	No. of Communities
Opinion leaders	18-59	80	Qualitative	22 females, 58 males	8
Non-pregnant women	18-59	80	Qualitative	All females	8
Youth	18-35	80	Qualitative	40 females; 40 males	8
Healthcare staff	25-59	13	Qualitative	11 females 2 males	10 (8 communities and two district health administrations)

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Research instruments

An interview schedule containing structured and unstructured questions were used by health professionals and encompassed staffing and logistical capacities to provide quality maternal health services, healthcare financing issues and preparedness for birth and complications.

A similar semi-structured discussion guide was used for the FGDs with the community members, which enabled in-depth investigation into community perspectives on BPCR interventions, the causes of maternal and neonatal morbidities and mortalities, sociocultural beliefs and practices impacting the use of maternal and newborn health services, and barriers to healthcare uptake. The semi-structured interview guides were not pretested and were conducted in 'Dagaare' (the local language).

Data collection

The FGDs were completed first before the IDIs with the healthcare providers. This arrangement gave the chance to cross-examine relevant issues emerging from the discussions. Some of the key emergent issues identified included the sale of ANC routine drugs and other essential medicines to clients with active health insurance subscriptions and the challenges associated with the insurance scheme as well as patronage the services of traditional birth attendants.

Convenient venues were arranged within the communities for the FGDs. All discussions and surveys were in the local language (*Dagaare*), as illiteracy was high.[29 30] However, the IDIs were conducted in English at scheduled locations in the health facilities. JS received training from Charles Sturt University Research Office on survey designs, data collection and analysis, supervised by JC and SW. However, two experienced researchers (JS and FT)

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collected both quantitative and qualitative data. All quantitative surveys, IDIs and FGDs, were completed as planned, thereby resulting in a higher than anticipated response rate. Data were collected within two periods: February to June 2016 and January to May 2017.

Data processing

All interviews and group sessions were tape-recorded with the informed consent of the participants. To achieve accuracy and dependability of the data, all audio recordings, except those of the health professionals were first transcribed (hand-written) in "Dagaare" and then translated into English by JS. JS is a native and writes and speaks the local dialect. However, the interviews with healthcare staff were transcribed in English. Two separate individuals from the Ghana Institute of Languages were engaged to verify the recordings with the transcripts. WHO's four-stage process for translation and adaptation of instruments guided the transcription process.[34]

Data analysis

Analysis of the qualitative data began in the field. After each interview, notes were made containing: a) emerging opinions from the participants and how they could be noted and applied to other interviews,[5] b) what went well or not-so-well; c) what should be done differently in future interviews and d) physical observations of health facilities, surface nature of roads, interactions among participants and nurses. This interim analysis enabled the researcher to add follow up questions to the interview schedule to clarify issues as they emerged.

Nvivo (version 7.5) was used to analyse the qualitative data. Analytical text categories and themes related to "logistics, equipment, staffing, essential medicines" emerged from the computerised coding using the Nvivo, which were complementary themes to *a priori* topics

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and sub-themes identified in the quantitative analysis and existing literature and experience.

Theme	Sub-themes (factors)

The different factors affecting service delivery and skilled healthcare utilisation emerged as significant themes from the data (interview/FGDs transcripts, right notes, field observations/reflections). They were thoroughly read and re-read to identify and index topics and categories. Participant opinions were subsequently chosen to support the themes. Finally, both the predetermined and emerged themes were pooled together to address the research question.

Patient and Public Involvement

The findings of the study would contribute to policy and service delivery interventions in Ghana and similar geographical locations. It is the more reason that the views of the intended beneficiaries (women) were obtained for the study. District level briefings would be organised to disseminate the findings to health workers and opinions leaders (as some may not have access to published findings) to help re-pattern service delivery activities.

RESULTS

Four congruent themes under the conceptual framework gives the order of the results. The issues identified are categorised into 1) human resources, 2) facility infrastructure, 3) health logistics and equipment and 4) referral management (Table 3).

Table 3: Major theme and sub-themes (factors)

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Human resource capacities in health facilities	**Nadowli district hospital** • Staff shortages on service delivery **Staffing and the effects on sub-district health facilities** • Skilled attendance at birth • Nurses – expectant mother relationships • Management of basic and emergency obstetric cases
Health facility infrastructure	• Service space in maternity units • Water supply • Lighting system
Medical equipment and logistics availability and functionality	**Nadowli District Hospital** • Logistics shortages on infection control procedures **Sub-district health facilities** • Essential medicines at the sub-district level • Transport services
Management of referrals of emergency obstetric and newborn complications	• Typical referral management procedure at the sub-district healthcare level Transport services during referrals • National ambulance services • Public and private transport services • Managing information and communication during emergency obstetric referral

1. Human resource capacities in health facilities

Nadowli district hospital

At the time of the survey (2016), there were three resident medical doctors (1 female and two males) in the hospital (Table 3). Ten midwives provided care at the maternity ward to clients, conducting labours and deliveries including general gynaecological cases on admission. Non-midwives (Community health and Enrolled nurses) did not attend to childbirths or provide any other support in managing labour at the maternity unit (because of the definition of skilled attendance) regardless of the number of midwives that may be on-duty. Two

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anaesthetics nurses go on-duty in turns throughout the weekdays for eight hours daily (Table 4). The number of professional staffing has been unstable over the years (2013-2016) with the number of Midwives and Medical Doctors decreasing than increasing (Table 4).

Table 4: Available staff at Nadowli district hospital (from 2013-2016)

Year/ Core staff	**2013** **Number (%)**	**2014** **Number (%)**	**2015** **Number (%)**	**2016** **Number (%)**
Doctors (General practitioners)	1 (1.72)	2 (2.25)	3 (2.54)	3 (2.86)
Physician Assistants	1 (1.72)	2 (2.25)	2 (1.69)	3 (2.86)
Midwives	4 (6.91)	8 (8.98)	13 (11.02)	10 (9.52)
Registered General Nurses	20 (34.48)	30 (33.71)	39 (33.05)	39 (37.14) [3, 7.7% on study leave]
Enrolled nurses	31 (53.45)	46 (51.69)	59 (50.00) [11, 18.6% on study leave]	48 (45.71)
Anaesthetists	1 (1.72) [on duty for 8 hours daily]	1 (1.12) [on duty for 8 hours daily]	2 (1.70) [1 on duty at a time for 8 hours	2 (1.90) [1 on duty at a time for 8 hours

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			daily]	daily)
Total (%)	**58 (100.00)**	**89 (100.00)**	**118 (100.00)**	**105 (100.00)**

Source: Field survey, May 2017.

Staff shortages on service delivery

The professional staff shortages at Nadowli district hospital were found to be contributing to staff role stress and unnecessary referrals of pregnancy and newborn cases to other hospitals (mostly to Wa regional or Jirapa district hospitals).

"It is only two anaesthetists that are in the hospital. Sometimes, one will be on leave leaving only one. We could call the anaesthetist, and it [the phone] is switched off. Other times, he will tell us he is very far away. The doctors too are sometimes few, maybe the doctor is gone on official duty and very far away from the hospital or maybe throughout the day and night; the doctor might have worked so hard that if he tries to attend to the next case, the outcome may be severe. Therefore, it is referred out of the facility" [IDIs, other nurses].

Midwife shortages prolong the time mothers spend accessing ANC services.

"Due to a shortage of midwives, pregnant women can spend the full day seeking care [at the hospital], which discourages the very distant communities from seeking care" [IDIs, other nurses].

Staffing and the effects on sub-district health facilities

Data from the eight sub-district health facilities indicated shortages of skilled healthcare staff was a persistent challenge to healthcare management. Among the surveyed health facilities, 62.5% (5) (3 health centres and 2 CHPS compounds) had resident midwives while Nanvilli health centre, Duang (DCHPS) and Jimpensi CHPS compounds (JCHPS) had no midwife.

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Jang Health centre (JHC) had two midwives (but one at post). The midwife was assigned to each health facility to provide all MNH services to clients - ANC, labour, childbirth care, other general ailments from the populace, in addition to performing administrative roles as facility head.

Almost all health facilities had Community Health Nurses (CHNs) (13 in total) and Enrolled nurses (ENs) (6 in total). There was also one Registered General Nurse, one Physician Assistant, two field technicians and one mental health professional located in the region.

Skilled attendance at birth

WHO's definition of "skilled attendance" at birth denotes employing the services of a midwife or doctor, which is a significant challenge in rural Ghana. The staffing challenges motivate the health service management at the district level to endorse Community Health Nurse and Enrolled Nurse supervised delivery as skilled birth, even if they had no midwifery training.

"How about the CHNs we put at the CHPS compound and ask them, when a woman is delivering, they should catch (receive)? Therefore, I [DoN] think any delivery that is supervised by a trained health worker should be considered skilled delivery. So, the CHNs are forced to always refer to facilities with midwives, and considering the distances, we record poor outcomes or home births. Will they go?" [IDIs, other nurses, DoN, male, DBID].

The number of midwives in the Daffiama/Bussie/Issa district was deemed inadequate to serve the numbers of pregnant women:

"The district has five health centres and twelve CHPS compounds. However, we currently have seven (7) midwives at the post which is inadequate to provide maternal healthcare to many pregnancy issues we face each day. Even the district capital, Issa needs more than one midwife; but we are forced to make do with just one" [IDIs, other nurses, DoN, male, DBID].

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The midwives themselves agree with the above assessment:

"I am the only midwife and always stressed up. Whenever I have two or three labour cases at the same time, it is stressful working all the time. Also, if I am conducting ANC and a labour case is brought in, I suspend the ANC and attend to that one. Sometimes, expectant mothers default ANC when it happens that way, and it becomes difficult tracing them because I am alone" [IDIs, In-charge, midwife, WCHPS].

The skills shortage affects the quality of prenatal and postnatal services delivery:

"We do not have enough skilled staff. Therefore, the expectations of clients are sometimes not met. As I said earlier, one midwife is unable to explain certain issues clearly for pregnant women to understand because she has limited time to carry out all [the] education and detail[ed] explanations" [IDIs, Other nurses].

Nurses – expectant mother relationships

Negative attitudes of some nurses towards pregnant women can act as a deterrent to expectant mothers:

"Expectant mothers receive cheeky words from the nurses, so some do not receive maternal healthcare at the clinic because they have received enough of the insults. They are afraid to divulge the truth for fear of receiving worse treatments in subsequent attendance" [FGDs, non-pregnant women, Naro/Korinyiri].

Discussants in another community suffered similar treatments:

"I have not been to other clinics, but the nurses in our clinic do not give us attention at all whenever we seek care at night or evening. They might not even utter a word, before going back into their residences. When the client or family insist, they write a referral letter. Given the odd hour, how are we going to manage the case to Wa or Nadowli hospital?" [FGDs, non-pregnant women, Jang].

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Although health centres and CHPS compounds are expected to provide a twenty-four-hour service to communities, some clients were denied care.

"Some nurses would even tell us they do not run shifts and so will not work after 2 pm" [FGDs, non-pregnant women, Jang].

Management of basic and emergency obstetric cases

Among the eight sub-district health facilities (health centres and CHPS compounds), 7 (85.5%) regularly only received primary obstetric cases, and 1(12.5%) received both basic and comprehensive emergency obstetric cases. However, half of the health facilities managed one comprehensive emergency obstetric case each in three years (2013-2015) preceding the study; two health centres confirmed they had managed five or more obstetric complications in the same time frame. Three-quarters of the sub-district healthcare settings did not have the necessary skilled staff to manage obstetric cases.

2. Health facility infrastructure

Service space in maternity units

Nadowli district hospital was the only public hospital serving the two districts and was the highest referral facility. It had 76 beds, including 12 beds for the maternity ward and two delivery beds in the labour section.

"For the labour ward, we have only three beds, out of which only two are used. We use the third bed as a last resort, although it is not meant for childbirth. It is for examination. In critical situations, we are forced to conduct delivery in the manual vacuum aspiration (MVA) room" [IDIs, Other Nurses].

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Water supply

None of the sub-district health facilities had potable water for usage by the workers and cleaning of the premises, meaning that expectant and postnatal mothers were often found drawing water for the health facilities or returned home to draw water for nurses if they sought care without it. Alternatively, the midwives would have to leave the mothers in the healthcare setting in search of water for cleaning. Thus, "*some expectant mothers get discouraged from giving birth there."* [IDIs, other nurses, DoN, male, DBID].

Lighting system

Ghana government's rural electrification initiatives were understood to have covered a significant part of the countryside. Despite this, not all old and recently constructed health facilities were connected to the national grid. For instance, Duang CHPS was inaugurated around 2015 but continues to experience intermittent power outages from faulty wiring system. A similar limitation was found at Charikpong health centre (one of the premier health facilities in the district), and Nanvilli health centre depended on patients to provide fuel to power the facility's generator; without fuel, either the delivery would have to be transferred elsewhere or be carried out in the presence of often inappropriate family members:

"We do not have a source of water and light. When I am conducting delivery, I use a lamp or generator. However, the generator must be fuelled by the relative of the expectant mother. Due to the cost, they are not able to afford. I use torchlight when there is a tear. I had a labour case where the mother sustains some lacerations which I have to suture. Sometimes, I involve the relatives because I cannot hold the torchlight while suturing, and patients' rights are violated, because that may not be the right person to see her nakedness" [IDIs, midwife, NHC].

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3. Medical equipment and logistics availability and functionality

Nadowli District Hospital

The hospital has inadequate equipment despite the significant threshold population it serves. The entire hospital operated on one anaesthetic machine, a dysfunctional haematology analyser at the laboratory and an incomplete resuscitation table, all of which affects service delivery. Despite the occurrence of stillbirths and neonatal deaths, there was no neonatal intensive care unit in the hospital. Other challenges included:

"Frequent power fluctuations are causing significant breakdowns in the equipment, i.e. blood bank refrigerators, autoclaves, air conditioners and theatre lamps. It further affects service delivery in the maternity section" [IDIs, other nurses].

Only a poorly supplied resuscitation table for preterm delivery care is available:

"Resuscitation table requires many items so that in case a baby is born and is asphyxiated; we can conduct it with ease. The table we have now is not well-equipped. We are only managing to save lives" [IDIs, other nurses].

Sub-district health facilities

All the Health Centres (HCs) had midwives and conducted childbirths. While the CHPS compounds without midwives were not allowed to conduct childbirths or deal with other emergency obstetric situations, a bed and set of delivery equipment were provided for all compounds. Only two HCs had a manual vacuum aspiration kit. There was other necessary (and essential) equipment available for checking vital signs at the health centres: blood pressure (BP) apparatus, thermometer, weighing scale, including foetus cope and foetal Doppler, but not all were in usable condition. Some CHPS compounds did not have necessary logistics such as vaccine fridge:

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"There is electricity here now, but we do not have a vaccine fridge. When we even conduct childbirth, we have to ride to Kojokpere health centre for poliomyelitis vaccine for the newborn and return the remaining for storage. When expectant mothers are around the 20th week of gestation, we administer tetanus toxoid injection (TTI), but the vaccine cannot be stored here" [IDIs, In-Charge, male, JKCHPS].

Similarly, the CHPS compounds often did not have the mandatory equipment to manage emergency deliveries or resuscitate asphyxiated newborns, such as Ambu bags, meaning that at times *"we see that the woman will be struggling and we cannot do anything to help"* (IDIs, In–charge NCHPS).

Logistics shortages on infection control procedures

Some health facilities did not have necessary daily non-drug consumables for administering care. While Rapid Diagnostics Test (RDT) kits (for malaria) were readily supplied to some facilities, infection control items such as facilities for handwashing and hand gloves were often not provided for some facilities:

"We have had consignments on the RDT which had no gloves included. Therefore, we do use bare hands to conduct the tests. The improvised hand gloves you [interviewer] saw me wear, were old gloves I found because we do not have hand gloves in the entire facility and the current RDT kits were not supplied with gloves" [IDIs, In-charge, male, JKCHPS].

Another identified how a shortage of gloves was "*the reason I improvised with hazardous materials (rubber bag) to conduct HIV/AIDS and Syphilis tests"* [IDIs, In-charge, male, JKCHPS].

The National Malaria Control Programme (NMCP) scaled-up access and universal coverage to provide long-lasting insecticide bed nets (LLINs) to all expectant mothers and children who are under five years of age, however, some pregnant women in these districts were

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denied access to these services. Some health facilities were not included in the regular consignments of supplies.

"When I came here, there were no mosquito nets in the facility. We do not also have sulphadoxine-pyrimethamine (SP); it is prophylaxis for malaria prevention in pregnancy. Since I came to the installation, there has not been any SP for the pregnant women" [IDIs, midwife, NHC].

Essential medicines at the sub-district level

While "*the WHO protocol recommends antibiotics for pregnant women who give birth newly"* [IDIs, other nurses], the National Health Insurance Drug lists for CHPS compounds prohibit prescription of antibiotics to newly delivered mothers, although it is mandatory for mothers who give birth. This is because the *CHPS "compound is a small facility. When we prescribe it, NHIS refuse to pay. Therefore, we sell it to them [the patient] which they always complain they do not have money to pay for medicines"* [IDIs, other nurses].

Some health facilities did not have other essential medicinal products for conducting childbirth.

"I came in December 2015, and there was no oxytocin, no Vitamin K_1 for the newly born babies. As at now, still, there is no vitamin K_1 in the facility" [IDIs, midwife, NHC].

As a result of other changes in health policy, there were other limitations placed health centre midwives prescribing certain essential medicines to manage labours.

"At the health centre, we cannot use the Zeamatin (if the woman is having preterm, we cannot give, we have to refer to Nadowli Hospital)" [IDIs, Midwife, CHC].

Transport services

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The majority of the health facilities did not provide transport (for example, motorbikes) for midwives to visit communities, thereby restricting their ability to engage in health education, to follow up on women not attending ANC, and to carry out routine immunisations:

"We have so many maternal and newborn programmes that require motorbikes, but we do not have enough motorbikes for all the facilities. Aside from the bikes, some of the communities are hard-to-reach" [IDIs, DoN, other nurses, female].

4. Management of referrals of emergency obstetric and newborn complications

The referral hospital reported receiving emergency obstetric cases from the health centres and CHPS compounds. Expectant mothers referred during labour were 54 (5.22% of births) in 2012, 36 out of (10% of births) in 2013, 24 (7.09% of births) in 2014 and 17 (7.13% of births) in 2015.

Typical referral management procedure at the sub-district healthcare level

The model below typifies the referral pattern which pertains to the communities, with a focus on worst case scenario (Figure 2).

Figure 2: Pictorial view of typical referral management in the study area

All four health centres received labouring mothers and obstetric referrals from the CHPS compounds and across all communities in their catchment area, with the number of referrals significantly influenced by their geographical location. Nearly all maternity cases brought to the health centres originated from the remotest communities.

Transport services during referrals

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National ambulance service

There were two groups of ambulance services operating in both districts to improve health service delivery; the hospital ambulance service and the National Ambulance Service (NAS) station. Each of them had one vehicle serving the two districts and other districts which were within its catchment area. The NAS station was situated at Nadowli but served any other district that gave them a call for emergency case(s) within the UWR. Meaning, the hospital vehicle and the NAS vehicle were both stationed at Nadowli leaving the far hinterland without ready access to vehicular transport during emergencies. There was one dysfunctional ambulance vehicle for all referrals to and from the Nadowli hospital. Daffiama health centre was the only health facility in Daffiama/Bussie/Issa district with double cabin pickup for emergency referrals of all patients and day-to-day operations of the facility. There were no available means of transport in any of the sub-districts except Daffiama health centre, with their car serving as an official vehicle as well as transferring emergency obstetric and newborn complications. However, the location of Daffiama health centre is within twenty minutes' drive of Nadowli hospital, closest than all other communities in the district.

Public and private transport services

Lack of ambulances means that the majority of clients are reliant on public means of transport. This implies the client and family will usually have to wait until certain hours in the day to access transport:

"If we are to send someone to a referral facility and it is around 10 am, the client cannot get means because all the vehicles go to Wa [region's capital]. Unless in the evening that they return to the community" [IDIs, CHO, DCHPS].

The search for affordable transport, whether it be by tricycle, motorbike or pick-up car, can often result in a delay in accessing the next level of care.

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"During referrals, we wait for several hours before they can get modes of transport to the next level of healthcare. We do not also have laboratory services in the entire district so for us to conduct the routine laboratory investigations, we refer expectant mothers to Nadowli or Wa which becomes a challenge for many pregnant women. Even for pregnant women to get money to arrange for means of transport to the next level of care is always a problem" [IDIs, midwife, WCHPS].

As a general rule, it was the responsibility of the expectant mother (or their family) to arrange for means of transport during emergency referrals, because of a shortage of emergency vehicles. The cost often limited the ability of the expectant mother to receive care.

Managing information and communication during emergency obstetric referral

The telecommunication sector presents a significant challenge in managing referrals in some communities. Vodafone and MTN Ghana telecommunication service providers had network coverage in the communities, although some communities had challenges accessing networks. During the field data collection exercise, the first author found that Charikpong, Nanvilli/Siruu, Jimpensi/Kenkelley and Duang communities had intermittent telecom networks. Therefore, mobile phone users had the option to either climb up a tree in a strategic area or hover around various signal hotspots (identified by the community) to make a phone call. The facility heads agreed with this observation, noting that:

"Our mobile phones network is a serious challenge…Therefore, when we have an emergency case, how to link with the national ambulance or the ambulance at Nadowli hospital is always a problem" [IDIs, midwife, WCHPS].

DISCUSSION

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By utilising the structure of the BPCR monitoring and evaluation framework for health facilities, the results of this study provide an insight into the preparedness of healthcare facilities to provide efficient obstetric and newborn to the communities.

As far as we know, this study is one of the first to assess health facility preparedness for birth complication readiness in the Nadowli-Kaleo and Daffiama-Bussie-Issa districts of Ghana. The barriers to improved maternal health service utilisation and the potential to address these complexities are well documented in the literature. Extrinsic and intrinsic inequities in access including transport arrangements and management of referrals are also identified to support existing findings in related districts of the Upper West Region (UWR).[14]

Skills upgrading programme by the GHS for sub-district level staff (since 2004),[19 35] sort to increase skilled staffing capacities of the facilities, however, there were inadequate skilled health staff (i.e. licensed midwives and medical doctors) , which provide many challenges for the few staff available, including role stress and undignifying behaviour patterns towards mothers, which support previous observations.[23] At the hospital, one midwife may be on duty to manage all admissions, including new admissions and emergency referrals for the entire maternity unit. There were no remuneration packages to motivate the few skilled staff, aside from the average monthly salary. The impact of shortages is compounded when referrals are made between district hospitals because of lack of staff at the referring hospital or to other facilities with insufficient staff. Similar gaps exist in the Upper East Northern Regions. [23] These findings are consistent with other studies in ten referral district hospitals in Ghana,[20] India, Tanzania and Ethiopia[36] and other developing countries.[17 37 38] Shortage of, and limited access to licensed staff lends support to the view of some writers that, utilising appropriately trained TBAs, CHNs and ENs in the mainstream childbirth care in Ghana could reduce some of the current frustrations associated with managing obstetric complications and referral processes,[25] although this is not without its challenges. It was found that poor treatment of

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pregnant women discouraged skilled maternal health service utilisation with its attendant implications on the health outcomes in the rural communities.[28] Although many of these behaviours could be attributed to the role stress identified in this study, it nevertheless defies professional codes of conduct and the priorities of the country and stakeholders in general.[28]

The Ministry of Health is a policy oriented-body while Ghana Health Service implements the initiatives. Based on the Ministry's Programme of Work (POW, 2014-2017), there were initiatives by Ghana Health Service (GHS) to increase the country's performance on MNH indicators in particular, through ANC defaulter-tracing, home-visiting, free ANC services for all mothers with active National Health Insurance Scheme (NHIS) subscription, focussing on preventive care through the sub-district structures.[14 23]

Despite these, many factors limit the quality of care provided at the facilities, such as general under-investments in the health system concerning health workforce, medical equipment, medicines, coupled with other multi-sectoral constraints such as poor road infrastructure, electricity and water. Systemic issues including disrespect, irregular service availability at sub-district facilities and, midwife absenteeism had a significant impact on service delivery.

Efficient lighting systems, water facilities and essential medicines reportedly motivate and increase skilled health services uptake. However, reduced laboratory services and inadequate space and equipment in childbirth rooms in all healthcare settings provided limited confidence to women accessing ANC and contemplating birthing in the health facility. Similar findings were reported elsewhere in the Upper West Region of Ghana and Kenya.[14 25 39] The challenges motivated born-before-arrival syndrome in the Upper West Region.[25] An evaluation in Ghana, Malawi and Kenya also found informal cost and cultural appropriateness of ANC services as key motivators to patronising skilled maternity care.[40] In most locations, healthcare facilities were rudimentary, and while the hospital had better

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equipment and amenities (compared to the health centres and CHPS compounds), irregular power supply had similar negative impacts on service delivery.[5] The health facilities with intermittent electricity supply were unable to conduct deliveries at night. Most sub-district health facilities (CHPS compounds) had inadequate access to vaccine fridge and the power grid to store vaccines, and having to travel for long distances for necessary vaccines such as tetanus toxoid injection (TTI) vaccines and other anti-malaria prophylaxis diminished efficacy and efficiency of the healthcare delivery system[41]. Conversely, some facilities had no readily available medicines such as oxytocin to induce labours. Other referrals were prompted by NHIS drug policy which prevents the staff at CHPS compounds from prescribing necessary antibiotics to newly delivered women, suggesting that revision of the NHIS user-fee exemption policy on maternal and neonatal healthcare would be appropriate.[14] These findings are congruent with other studies in India and a systematic review on this subject.[17 42] An earlier evaluation in district hospitals in Ghana revealed that they were the highest referral point for many obstetric complications. Meanwhile, many of them did not have the necessary logistics and staff to manage normal childbirth labour and complications.[20]

The project for improvement of maternal and child health in the Upper West Region by JICA provided elaborate education for district and sub-district healthcare staff on managing emergency referrals[43]. A fundamental requirement was to have the midwife accompany the client to the receiving facility. Nevertheless, considering the staffing inadequacies and the lack of transport services linking the communities coupled with the behavioural norms on early decisions to seek care, [5 16] the approach may further intensify the current shortages of midwives and result in adverse outcomes due to the distances and lack of readiness for complication, identified in another component of the study.[5 44] Despite the geographical isolation of communities to referral centres, and between health facilities, much like those

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experienced in other isolated locations, such as Uttar Pradesh, India.[37] A key difference may be the fact that the main referral hospital (at Nadowli) serving both districts had no ambulance facility to conduct timely transfer of obstetric emergencies and preterm babies to appropriate health facilities such as Jirapa Hospital or Wa Hospital which were the nearest.

Although by convention, all health facilities in Ghana operate twenty-four hours for all days, there was the tendency to deny clients seeking emergency care at certain times, thereby defying the core mandate of the sub-district health structures of providing preventive and basic curative care including obstetric first aid.[23 25 33] The common limitations connecting with referral hospitals (mostly Nadowli or Wa) and means of transport create dissonance between the already aggrieved expectant mother in pain and the possibly stressed Nurse who provides care to a large number of population on the one hand, and the healthcare targets/indicators on the other.

Non-availability and affordability of transport and telecommunication systems during obstetric emergencies were a contemporary issue between Nadowli or Wa hospital (the closest to study communities) and sub-district health facilities. The findings demonstrate that demand for skilled care was on the increase, but the absence of ambulance/vehicular linkage and coverage could delay or cancel obstetric referrals despite regular demand for transfers from lower level facilities. The challenges identified in this study correspond to those already identified elsewhere in rural Ghana, suggesting the need to streamline referral management systems which are critical to reducing avoidable mortalities and inequities in access. [5 14 23] Studies by Buor and colleagues[45 46] in Ghana and sub-Saharan Africa and another study in the Upper West region demonstrated that distances to health facilities contributed to reduced utilisation and outcomes of obstetric referrals,[47] thereby providing pregnant women to fewer alternatives during complications and childbirth labour.[25] This study may have underestimated the impact of these barriers compared with previous evaluations on this

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subject, but the adverse effects of home or born-before-arrival syndrome at the health facility are consistent with other research.[25 42]

Implications for future research, policy and maternal health service delivery

Reports show that Ghanaians have increased utilisation of skilled maternal healthcare[23 27], it also implies that policy initiatives at improving upon current systemic bottlenecks would provide a way forward towards achieving global goals for the country. This is particularly important because the majority of the chronic health cases leading to life-threatening disabilities and mortalities are found in the hard-to-reach communities of the country [35]. For example, an evaluation in Ghana also noted that, although the national health insurance fee-exemption policy has increased service uptake, inequities and geographical disparities in access continue to exist between the rural poor and nonpoor, thereby causing low use among the poor due to the informal costs on services and medicines.[35]

The many barriers in this study are interdependent and addressing them will require holistic approach including community awareness and proactivity in managing obstetric complications to help the health providers tackle the issues appropriately and on time. Whereas these shortages in the health facilities may not be addressed in the short to medium term due to cost implications, preventative measures could be facilitated at the community level to influence behaviour and cultural change (as identified in other components of the study)[5 16 44] to help improve maternal and neonatal health outcomes.

Instituting motivational packages (housing, additional allowances, and career opportunities) for Physicians and Midwives may have some potential to encourage staff to accept postings to rural areas, but the lack of equipment and essential medicines for

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continued knowledge and skill development could serve as a limitation. Global technological advancement and professional networking through the social media, telecommunication and the general internet services via reliable internet networks engender increased ambitions to advance in skill through education and career. However, the gap in these services to the district level was extensive, suggesting that improving the mobile telecommunication network and general internet services at the district level could also motivate acceptability of postings to these locations. That aside, facilitating emergency referrals from the sub-district health facilities to the health centres and the hospital could also improve with improved and reliable telecommunication networks.

CONCLUSION

The health facilities at both grassroots and referral hospital levels in the districts were not adequately prepared to provide quality maternal and neonatal healthcare, contributing, at least in part, to the preference of many mothers for choosing not to take up ANC and favouring a home birth. These factors present a discrepancy between policy and implementation. Some policies and health reforms identified in the study including task-shifting, the twenty-four-hour policy, drug prescriptions, staff relocation and the legal restrictions on antibiotic prescriptions under NHIS reimbursement mechanisms had a profound impact on health system performance and adequate and quality MNH care as well as affecting referral management.

Improving MNH services provided at the healthcare facilities by increasing the availability of doctors, midwives, anaesthetists, labour beds, resuscitation equipment, essential medicines, ambulance services and improving access to basic amenities such as electricity and water facilities, will assist rural Ghana to achieve the critical Sustainable Development Goal (SDG) three (targets one and two) by 2030. The study recommends revisions to the prescription

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components of the NHIS, investigate codes of conducts of nurses and increased investment in logistics as well as the management of staff postings.

Strengths and limitations of this study

This study has several strengths. It contributes to the scant literature on the barriers to service delivery and access to, which impacts on MNH care in the Upper West Region of Ghana. The majority of obstetric complications with profound impacts on MNH indicators are predominant in the rural communities. Therefore, a brief assessment of what pertains to the health centres and CHPS zones could trigger policy initiatives and district level oversight responsibilities.

Despite the strengths, the study has limitations. Purposive sampling approach was used to obtain data from the participants. Critics question the credibility of data through such sampling procedure,[48] but this study was the first of its kind in these districts and considering the findings, supported by general facility observation and cues during the interview, it is reasonable to say relevant data was generated through the approach to support the research objective. The sample was relatively small compared to the established norm, however, as a mixed method study, data from the other participant groups were used to support and cross-validate those of the healthcare settings; these results are reported elsewhere [5].

Figure 1. Study communities and health facilities

Figure 2: Pictorial view of a typical referral management in the study area

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Figure 1. Study communities and health facilities

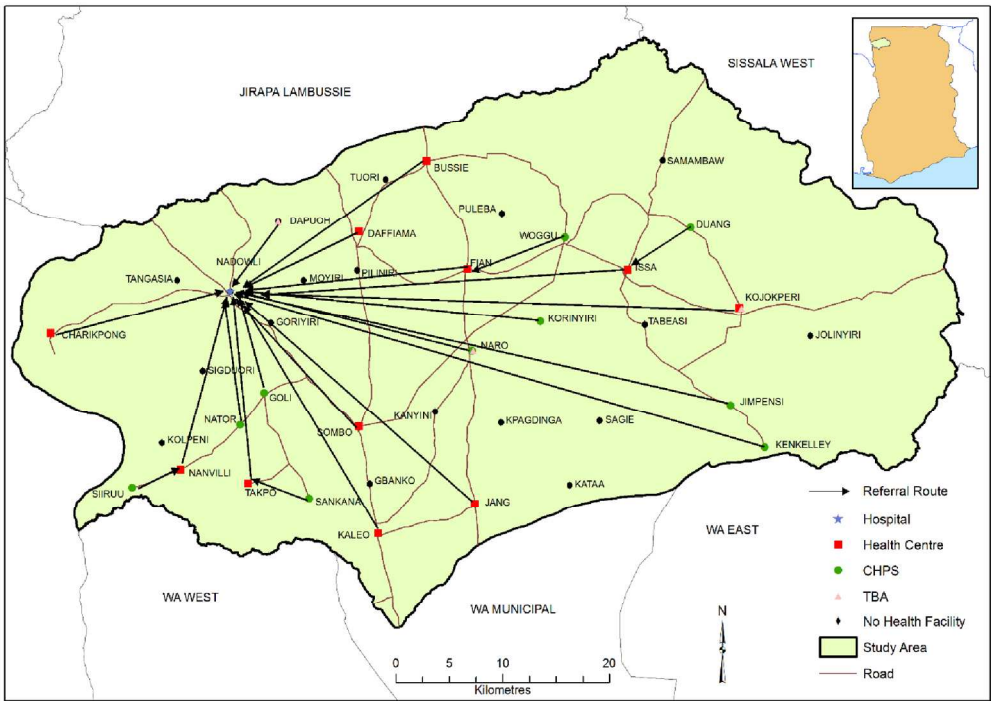

Figure 1. Study communities and health facilities

158x121mm (300 x 300 DPI)

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Figure 2: Pictorial view of referral management in study area

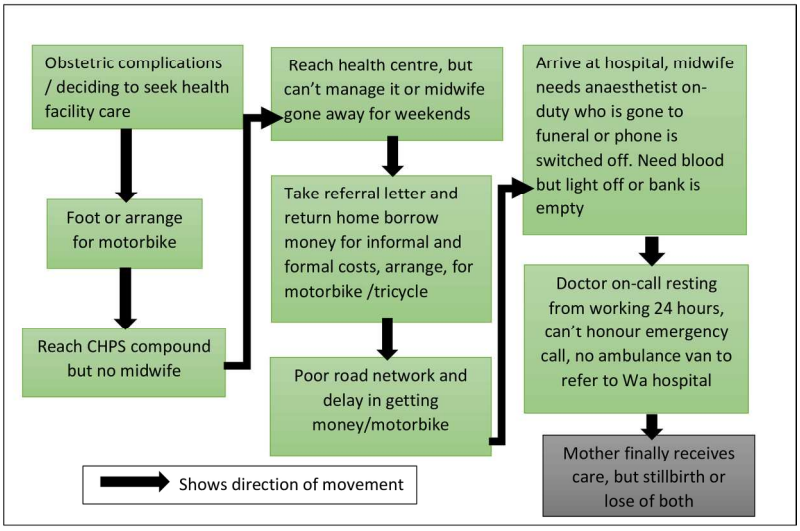

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Figure 2: Pictorial view of a typical referral management in study area

146x222mm (300 x 300 DPI)

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Checklist of SQUIRE Guidelines followed in preparing the manuscript

S/N	Item	Page number
1	Title: the manuscript concerns an initiative to improve healthcare	**1**
2	Abstract	**2**
3	Introduction: Explains the aim of the study which emerge from existing unsatisfactory and unacceptable maternal and newborn service delivery in the study area.	**4**
4	Methods	**6**
5	Setting, participants and participant selection, data collection, processing and analysis.	**7**
6	Results: presents the findings of study	**13**
7	Discussion comprising the main findings and interpretation in relation to previous knowledge on the subject.	**27**
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Perceived barriers to maternal and newborn health services delivery: a qualitative study of health workers and community members in low and middle-income settings

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Perceived barriers to maternal and newborn health services delivery: a qualitative study of health workers and community members in low and middle-income settings

Joshua Sumankuuro[1, 2] *, Judith Crockett[2], Shaoyu Wang[2]

[1]Youth Alive Ghana, P.O Box TL 1708, Tamale, Ghana.

[2]School of Community Health, Faculty of Science, Charles Sturt University, Orange, New South Wales, Australia.

*Corresponding author: Joshua Sumankuuro; ijoshua200@gmail.com

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Abstract

Objectives: In considering explanations for poor maternal and newborn health outcomes, many investigations have focused on the decision-making patterns and actions of expectant mothers and families, as opposed to exploring the "supply side" (health service provider) barriers. Thus, we examined the health system factors impacting on access to, and delivery of quality maternal and newborn healthcare in rural settings.

Design: A semi-structured qualitative study using face-to-face in-depth interviews with health professionals, and focus group sessions with community members, in eight project sites in two districts of Upper West Region, Ghana was employed. Participants were purposively selected to generate relevant data to help address the study objective. The survey was guided by WHO standard procedures and Ghana Health Ministry's operational work plan for maternal and newborn care.

Setting: Nadowli-Kaleo and Daffiama-Bussie-Issa districts in Upper West Region, Ghana.

Participants: Two hundred and fifty-three participants were engaged in the study through convenient and purposive sampling: healthcare professionals (pharmacist, medical doctor, two district directors of health services, midwives, community health and enrolled nurses) (n = 13), and community members comprising opinion leaders, youth leaders and adult non-pregnant women (n = 240 in 24 units of focus groups).

Results: Results show significant barriers affecting the quality and appropriateness of maternal and neonatal health services in the rural communities and the Nadowli District Hospital. The obstacles were inadequate medical equipment and essential medicines, infrastructural challenges, shortage of skilled staff, high informal costs of essential medicines and general limited capacities to provide care.

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Conclusion: Implementation of the birth preparedness and complication readiness (BPCR) strategy is in its infancy at the health facility level in the study areas. Increasing the resources at the health provider level is essential to achieving international targets for maternal and neonatal health outcomes, and for bridging inequities in access to essential maternal and newborn health care.

Keywords: Health facilities; birthing centres; maternal care patterns; newborn care; health attitudes; Ghana

Strengths and limitations of the study

- The study provides the first comprehensive assessment of maternal and neonatal health delivery from the perspectives of community residents and healthcare providers in the two districts.
- The findings focus exclusively on views of participants' from sub-district health facilities, the district hospital, health service management and the community.
- The study aims to identify factors affecting maternal and newborn health outcomes, and thus the capacities of health facilities to provide quality health services was a component of the multisite study into community perspectives on BPCR interventions in the rural communities. This may not have rigorously incorporated all the issues required for a stand-alone evaluation of the health system.
- The results represent the views of health facility managerial and another frontline healthcare professionals, which may not reflect the views of all staff in the two districts.
- Much of this component of the study is qualitative, which has both strengths and limitations regarding processing and interpretation; hence it lacks statistical rigour.

INTRODUCTION

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Increasingly there are renewed commitments towards achieving the Sustainable Development Goals in advanced countries, however, in low and middle-income economies, inadequate services delivery initiatives persist.[1] Globally, about 85% of obstetric complications occurred during pregnancy, labour and childbirth and the early postnatal period in 2015.[2 3 4] Approximately 800 girls and women died as a result of pregnancy and childbirth-related complications in 2015 in sub-Saharan Africa.[4 5] An estimated 99% of all maternal deaths occur in developing countries and more than half occur in sub-Saharan Africa (SSA).[1] Although advanced countries recorded an estimated 11 to 14 deaths per 100,000 in 2015, 511 to 652 deaths per 100,000 were recorded in SSA within the same period. Ghana's maternal mortality rate (MMR) was estimated to be between 358 and 319 per 100,000 in 2015.[5 6]

WHO noted that 75% of maternal deaths occur due to avoidable causes including severe bleeding, sepsis, pre-eclampsia, unsafe abortion and complications in childbirth.[1] Sixty-five percent of women die in Ghana due to similar causes[1]. The United Nations Population Fund (UNFPA) found that maternal deaths in Ghana could be reduced by 90% if expectant mothers were given ready access to emergency healthcare.[7]

In 2015 the Sustainable Development Goals negotiated new targets of reducing the maternal deaths ratio to less than 70 per 100,000 live births, as well as ending preventable deaths of newborns by 2030.[1 5] There are two maternal healthcare strategies proposed in the renewed commitments to stakeholders, with a high potential for preventing avoidable obstetric deaths: skilled attendance at birth and emergency obstetric health care.[8 9] These measures are promoted through effective antenatal education and efficient management of referrals, coupled with adequate skilled healthcare professional attendance to both normal childbirths and those with obstetric complications.[10 11] In many countries, these interventions form part of the birth preparedness and complication readiness (BPCR) strategy, a component of the antenatal care (ANC) program.[4 12 13]

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Although factors such as social, economic and cultural issues impact on the use of ANC and implementation of BPCR [14-16], there are also "supply side" (healthcare provider factors) barriers to improving maternal health outcomes. These include commodities/logistics (drugs and non-drug consumables, medical equipment), skilled human resources, appropriate technology and the capacity to handle maternity cases.[17] Availability of accessible emergency obstetric services (such as parenteral oxytocics, antibiotics and anticonvulsants, assisted deliveries, manual extraction of the placenta, blood transfusions, and so on) are mandatory for the continuum of quality maternity healthcare.[3 18] Preference for facility-based childbirth can be high when there is the appropriate quality of care, with the necessary medical facilities, such as equipment for surgery and blood transfusion services.[19 20]

For childbirth to be called skilled birth, the attendant must receive training from an accredited health institution and be licensed to practice.[20 21] The inadequacy of trained healthcare workers, including midwives, was identified as a significant barrier to improved maternal and neonatal health (MNH) outcomes. Although public and private sector efforts have recently increased the numbers of skilled birth attendants (SBAs) on the global front, the opposite exists in some sub-Saharan African countries. There, the nurse/midwife to population ratio was estimated by the World Bank (for the periods of 2008-2014) as 0.9 per 1,000 for Ghana,[22] and less than one to over 95,000 people in the study area since 2010, [23] compared to the global standard of 4.45 per 1,000 people.[24]

Ghana began an innovative decentralised health programme in 2004 aimed at addressing problems related to utilisation of skilled birth attendants, by upgrading the skills of Community Health Nurses (CHNs) to Community Health Officers (CHOs) with basic midwifery skills. The essence of this initiative was to equip CHNs with the core competencies for managing labours and deliveries during emergencies.[25 26] The policy coincided with a ban on the utilisation of traditional birth attendants (TBAs), and was further

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challenged by an ongoing shortage of physicians. For example, in 2012, the Upper West Region (UWR) had eleven times fewer doctors compared to the Greater Accra (Ghana's capital) and Ashanti regions; well over 50% of all doctors lived in Greater Accra with 20% in the Ashanti Region. The remaining 30% resided in the other eight health/geographic regions.[23]

Despite the implementation of the decentralised initiative, access to health facilities for delivery is still comparatively low, with approximately 44% of women in UWR giving birth in a healthcare facility.[5 25] The rate is the second lowest in Ghana, and compares to 83% in the Greater Accra Region, and 68% in the country overall.[23] Many women in the rural communities continue to prefer care from traditional birth attendants (TBAs).[5] In many cases, women choose other alternatives due to demand-side barriers, such as lack of autonomy in decision-making and financial and physical barriers to services, which discourages the utilisation of appropriate healthcare.[5]

There are also many supply-side barriers, despite local community potentials in rural communities such as those of the Upper West Region (UWR) of Ghana. These include direct bottlenecks in the health service delivery system impacting on potential service users, such as physical infrastructure, drugs, equipment, finances, human resources[9 17] and appropriate transfer arrangements.[14] The UWR has 174 health facilities with five district hospitals in the ten districts and one municipality. However the region has the smallest number of kilometres of tarred roads compared to the other nine regions of Ghana, with only Nadowli and Jirapa townships having a direct link to the regional hospital via tarred road.[23] Before the study, an ex-post evaluation of Country Programme Five (CP5) for Ghana by the United Nations Population Fund (UNFPA) found thirty-six (90%) poor performing districts out of forty districts in five regions (eight districts in each) with regard to MNH indicators.[27] Three (about 8.3%) of these underperforming districts were in UWR (Nadowli, Sissala East and Wa West).

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CP5 (2006-2010) focused on three areas: a) reproductive health, population and development; b) gender equity and women's empowerment and c) reproductive health and HIV/AIDS [27] As a result of these limitations, UNFPA implemented Country Programme Six (2012-2016) in those locations, which included the two study districts: Nadowli/Kaleo and Daffiama/Bussie/Issa. Although the package included key logistics and equipment, as well as skills upgrade of staff, there has not been any known investigation into the current state of maternal healthcare delivery services in these regions.[19 25 28] Therefore, this study answered the question: "what are the perceived barriers to maternal and and newborn service delivery in Nadowli-Kaleo and Daffiama-Bussie-Issa Districts of Ghana". Key indicators covered were: staff capacities, basic equipment, service space/bed capacities, water and lighting facilities, medicines and other essential supplies for service delivery, as well as staff/maternal relations.

METHODS

Study setting

The study was a semi-structured qualitative design using face-to-interviews to explore barriers to skilled service delivery and utilisation in eight purposively selected study sites in the Upper West Region of Ghana; four in Nadowli/Kaleo and four in Daffiama/Bussie/Issa. The study area had a two-tier health system; the district level (the hospital) and 29 sub-district level health facilities (13 health centres, and 16 Community-Based Health Planning and Services (CHPS) compounds which are the lowest order in the Ghana Health Service structure) [29 30] (Figure 1). The CHPS compounds provide preventive services and obstetric first aid including immunisations, vaccinations, health promotion and health education activities, whilst the health centres provide both preventive and curative services to the

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communities. Six of these communities did not have access roads to the nearest hospital (Nadowli Hospital).

The population of Nadowli/Kaleo district was 61,561 (46.7% males and 53.3% females), constituting 8.8 percent of the region's population.[30] Daffiama/Bussie/Issa Districts had a population of 32,827 (48.7% males and 51.3% females) representing 4.7% of the people of UWR.[29]

Figure 1. Study communities and health facilities

Conceptual framework

Health facility outputs are measured by the number of interventions for normal and emergency healthcare provision[31 32 33]. In order to achieve skilled maternal and newborn attendance, a prerequisite to reducing avoidable infections and other morbidities and mortalities, the Ghana Health Service, in accordance with WHO policies, instituted measures to improve access to skilled and quality care in the country. The quality of MNH service delivery is assessed using benchmarks; human resources, logistics, referral policy/processes, and service delivery space/physical infrastrure[24,31,32]. The monitoring and evaluation frameworks for accessing health facility practices in relation to BPCR by JHPIEGO[31] was adapted to guide the design, interpretation and reporting of the findings. The policy document prioritise timely access to relevant and quality care, in compliance with referral procedures, management of emergency obstetric complications, infection control procedures and strict adherence to the appropriate protocols and professional standards (Table 1), to improve maternal and newborn care quality in facilities.[23 32 33]

Table 1. Indicators for monitoring health facility practice of BPCR

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Factors affecting BPCR of health facilities	Definition
Skilled human resource base of health facilities	Availability of midwives, anaesthetists and specialist doctors
Health facility infrastructure	Ready lighting system in facilities, spacious labour rooms
Logistics and equipment availability	Health facilities equipped with logistics and equipment necessary for providing quality and timely MNH care
Referral management	Transport or ambulance availability for efficient and effective transfer of emergency obstetric cases

Source: Adapted from existing literature and the BPCR toolkit by JHPIEGO[31]

Study design

Health services delivery and related factors influencing BPCR are complex[19 20 23 25], which necessitates the need to explore them from the perspectives of both community members and service providers. A qualitative approach was considered to be most appropriate, using focus group discussions (FGDs) and in-depth interviews (IDIs). The district health management provided time series data using a structured survey of their resource capacities and logistics, and referral management prospects and challenges.

Participant selection

Written informed consent was obtained from each participant. Following appropriate ethical approvals from Charles Sturt Human Research Ethics Committee (protocol numbers:

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2016/013 and H16178 and Regional Health Directorate of Upper West Region, participants were selected in the following ways:

Focus group participants

A combination of key informant and purposive sampling procedures was adopted to identify and select a convenient sample of opinion leaders (n = 80), youth leaders aged 18-35 (n = 80) and nonpregnant women (who had childbirth experiences) (n = 80) to provide data in 24 different group discussions, three in each community. The community representative, who is a nonpartisan but statutorily elected official representing each community at the District level, assisted in identifying potential participants for the FGDs. The sample sizes were pre-determined to facilitate data saturation and potential transferability of the findings to other contexts and settings (see the link for the detailed questionnaire and interview guide for all participant groups https://doi.org/10.1371/journal.pone.0185537.s001).

Healthcare staff

Skilled healthcare staff were included in the study to provide their opinions on health services delivery and outcomes. Upon receiving written support from the Health Directorates, the staff in charge of each of the healthcare facilities in the study area were asked to participate in the study. Three "other nurses" who were providing health services but not in managerial positions were purposively selected to submit further insights into expectant mother-ANC provider relationships and uptake of medical advice.

A summary of all participants can be found in Table 2.

Table 2: Study participants, data types and sex disaggregation

Participants	Age range (years)	Number	Data type	Sex disaggregation	No. of Communities

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Opinion leaders	18-59	80	Qualitative	22 females, 58 males	8
Non-pregnant women	18-59	80	Qualitative	All females	8
Youth	18-35	80	Qualitative	40 females; 40 males	8
Healthcare staff	25-59	13	Qualitative	11 females 2 males	10 (8 communities and two district health administrations)

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Research instruments

An interview schedule containing structured and unstructured questions was applied to health professionals, and surveyed staffing and logistical capacities to provide quality maternal health services, healthcare financing issues and preparedness for birth and complications.

A similar semi-structured discussion guide was used for the FGDs with the community members, which enabled in-depth investigation into community perspectives of BPCR interventions, the causes of maternal and neonatal morbidities and mortalities, sociocultural beliefs and practices impacting the use of maternal and newborn health services, and barriers to healthcare uptake. The semi-structured interview guides were not pretested and were conducted in 'Dagaare' (the local language).

Data collection

The FGDs were completed first, before the IDIs with the healthcare providers. This arrangement provided the opportunity to cross-examine relevant issues emerging from the discussions. Some of the key emergent issues identified included the sale of ANC routine drugs and other essential medicines to clients with active health insurance subscriptions, and the challenges associated with the insurance scheme, as well as patronage of the services of traditional birth attendants.

Convenient venues were arranged within the communities for the FGDs. All discussions and surveys were in the local language (*Dagaare*), as illiteracy was high.[29 30] The IDIs were conducted in English at scheduled locations in the health facilities. JS received training from the Charles Sturt University Research Office on survey design, data collection and analysis, supervised by JC and SW. Two experienced researchers (JS and FT) collected the data. All

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surveys, IDIs and FGDs, were completed as planned, thereby resulting in a higher than anticipated response rate. Data were collected within two periods: February to June 2016 and January to May 2017.

Data processing

All interviews and group sessions were tape-recorded with the informed consent of the participants. To achieve accuracy and dependability of the data, all audio recordings, except those of the health professionals, were first transcribed (hand-written) in "Dagaare" and then translated into English by JS. JS is a native of the region and writes and speaks the local dialect. The interviews with healthcare staff were transcribed in English. Two separate individuals from the Ghana Institute of Languages were engaged to verify the recordings with the transcripts. WHO's four-stage process for translation and adaptation of instruments guided the transcription process.[34]

Data analysis

Analysis of the qualitative data began in the field. After each interview, notes were made containing: a) emerging opinions from the participants and how they could be noted and applied to other interviews,[5] b) what went well or not so well; c) what should be done differently in future interviews and d) physical observations of health facilities, surface nature of roads, interactions among participants and nurses. This interim analysis enabled the researcher to add follow up questions to the interview schedule to clarify issues as they emerged.

NVivo (version 7.5) was used to analyse the qualitative data. Analytical text categories and themes related to "logistics, equipment, staffing, essential medicines" emerged from the computerised coding using the NVivo, which were complementary themes to *a priori* topics

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and sub-themes identified in the quantitative analysis and existing literature and experience.

Theme	Sub-themes (factors)

The different factors affecting service delivery and skilled healthcare utilisation emerged as significant themes from the data (interview/FGD transcripts, right notes, field observations/reflections). These were thoroughly read and re-read to identify and index topics and categories. Participant opinions were subsequently chosen to support the themes. Finally, both the predetermined and emerged themes were pooled together to address the research question.

Patient and public involvement

The study design emerged from the implementation of the UNFPA CP6. Thus, the participants and the public were not directly involved in the conceptualisation and design of the study. Nevertheless, the findings of the study would contribute to policy and service delivery interventions in Ghana and similar geographical locations, which is the reason that the views of the intended beneficiaries were obtained for the study.

RESULTS

Four congruent themes under the conceptual framework determine the order of the results. The issues identified are categorised as 1) human resources, 2) facility infrastructure, 3) health logistics and equipment and 4) referral management (Table 3).

Table 3: Major theme and sub-themes (factors)

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Human resource capacities in health facilities	**Nadowli District Hospital** • Staff shortages on service delivery **Staffing and the effects on sub-district health facilities** • Skilled attendance at birth • Nurses – expectant mother relationships • Management of basic and emergency obstetric cases
Health facility infrastructure	• Service space in maternity units • Water supply • Lighting system
Medical equipment and logistics availability and functionality	**Nadowli District Hospital** • Logistics shortages on infection control procedures **Sub-district health facilities** • Essential medicines at the sub-district level • Transport services
Management of referrals of emergency obstetric and newborn complications	• Typical referral management procedure at the sub-district healthcare level Transport services during referrals • National ambulance services • Public and private transport services • Managing information and communication during emergency obstetric referral

1. Human resource capacities in health facilities

Nadowli District Hospital

At the time of the survey (2016), there were three resident medical doctors (one female and two males) in the hospital (Table 3). Ten midwives provided care in the maternity ward, conducting labours and deliveries as well as admissions and general gynaecological care. Non-midwives (community health and enrolled nurses) did not attend to childbirths or provide any other support in managing labour at the maternity unit (because of the definition of skilled attendance) regardless of the number of midwives on duty. Two anaesthetics nurses

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were on duty in turns on weekdays for eight hours daily (Table 4). The number of professional staff has been unstable over the years (2013-2016) with the number of midwives decreasing (Table 4).

Table 4: Available staff at Nadowli District Hospital (from 2013-2016)

Year/ Core staff	**2013** **Number (%)**	**2014** **Number (%)**	**2015** **Number (%)**	**2016** **Number (%)**
Doctors (General practitioners)	1 (1.72)	2 (2.25)	3 (2.54)	3 (2.86)
Physician Assistants	1 (1.72)	2 (2.25)	2 (1.69)	3 (2.86)
Midwives	4 (6.91)	8 (8.98)	13 (11.02)	10 (9.52)
Registered General Nurses	20 (34.48)	30 (33.71)	39 (33.05)	39 (37.14) [3, 7.7% on study leave]
Enrolled nurses	31 (53.45)	46 (51.69)	59 (50.00) [11, 18.6% on study leave]	48 (45.71)
Anaesthetists	1 (1.72) [on duty for 8 hours daily]	1 (1.12) [on duty for 8 hours daily]	2 (1.70) [1 on duty at a time for 8 hours	2 (1.90) [1 on duty at a time for 8 hours

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			daily]	daily)
Total (%)	**58 (100.00)**	**89 (100.00)**	**118 (100.00)**	**105 (100.00)**

Source: Field survey, May 2017.

The effect of staff shortages on service delivery

The professional staff shortages at Nadowli District Hospital were found to be contributing to staff role stress and unnecessary referrals of pregnancy and newborn cases to other hospitals (mostly to Wa regional or Jirapa district hospitals).

"It is only two anaesthetists that are in the hospital. Sometimes, one will be on leave leaving only one. We could call the anaesthetist, and it [the phone] is switched off. Other times, he will tell us he is very far away. The doctors too are sometimes few, maybe the doctor is gone on official duty and very far away from the hospital or maybe throughout the day and night; the doctor might have worked so hard that if he tries to attend to the next case, the outcome may be severe. Therefore, it is referred out of the facility" [IDIs, other nurses].

Midwife shortages prolonged the time mothers spent accessing ANC services.

"Due to a shortage of midwives, pregnant women can spend the full day seeking care [at the hospital], which discourages the very distant communities from seeking care" [IDIs, other nurses].

Staffing and the effects on sub-district health facilities

Data from the eight sub-district health facilities indicated shortages of skilled healthcare staff were a persistent challenge to healthcare management. Among the surveyed health facilities, 62.5% (5) (3 health centres and 2 CHPS compounds) had resident midwives while Nanvilli health centre, Duang (DCHPS) and Jimpensi CHPS compounds (JCHPS) had no midwife.

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Jang Health centre (JHC) had two midwives (but only one at post). The midwife was assigned to each health facility to provide all MNH services to clients (ANC, labour, childbirth care), and to deal with other general ailments of the populace, in addition to performing administrative roles as facility head.

Almost all health facilities had community health nurses (CHNs) (13 in total) and enrolled nurses (ENs) (6 in total). There was also one registered general nurse, one physician assistant, two field technicians and one mental health professional located in the region.

Skilled attendance at birth

WHO's definition of "skilled attendance" at birth denotes employing the services of a midwife or doctor, which is a significant challenge in rural Ghana. The staffing challenges motivate the health service management at the district level to endorse community health nurse and enrolled nurse supervised delivery as skilled birth, even if they have had no midwifery training.

"How about the CHNs we put at the CHPS compound and ask them, when a woman is delivering, they should catch (receive)? Therefore, I [DoN] think any delivery that is supervised by a trained health worker should be considered skilled delivery. So, the CHNs are forced to always refer to facilities with midwives, and considering the distances, we record poor outcomes or home births. Will they go?" [IDIs, other nurses, DoN 1].

The number of midwives in the Daffiama/Bussie/Issa district was deemed inadequate to serve the numbers of pregnant women:

"The district has five health centres and twelve CHPS compounds. However, we currently have seven (7) midwives at the post which is inadequate to provide maternal healthcare to many pregnancy issues we face each day. Even the district capital, Issa needs more than one midwife; but we are forced to make do with just one" [IDIs, other nurses, DoN 1].

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The midwives themselves agreed with the above assessment:

"I am the only midwife and always stressed up. Whenever I have two or three labour cases at the same time, it is stressful working all the time. Also, if I am conducting ANC and a labour case is brought in, I suspend the ANC and attend to that one. Sometimes, expectant mothers default ANC when it happens that way, and it becomes difficult tracing them because I am alone" [IDIs, midwife 3, CHPS].

The skills shortage affected the quality of prenatal and postnatal service delivery:

"We do not have enough skilled staff. Therefore, the expectations of clients are sometimes not met. As I said earlier, one midwife is unable to explain certain issues clearly for pregnant women to understand because she has limited time to carry out all [the] education and detail[ed] explanations" [IDIs, other nurses].

Nurses – expectant mother relationships

Negative attitudes of some nurses towards pregnant women can act as a deterrent to expectant mothers:

"Expectant mothers receive cheeky words from the nurses, so some do not receive maternal healthcare at the clinic because they have received enough of the insults. They are afraid to divulge the truth for fear of receiving worse treatments in subsequent attendance" [FGDs, non-pregnant women, Naro/Korinyiri].

Discussants in another community suffered similar treatments:

"I have not been to other clinics, but the nurses in our clinic do not give us attention at all whenever we seek care at night or evening. They might not even utter a word, before going back into their residences. When the client or family insist, they write a referral letter. Given the odd hour, how are we going to manage the case to Wa or Nadowli hospital?" [FGDs, non-pregnant women, Jang].

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Although health centres and CHPS compounds are expected to provide a twenty-four hour service to communities, some clients were denied care.

"Some nurses would even tell us they do not run shifts and so will not work after 2 pm" [FGDs, non-pregnant women, Jang].

Management of basic and emergency obstetric cases

Among the eight sub-district health facilities (health centres and CHPS compounds), 7 (85.5%) regularly only received primary obstetric cases, and 1(12.5%) received both basic and comprehensive emergency obstetric cases. However, half of the health facilities managed one comprehensive emergency obstetric case each in the three years (2013-2015) preceding the study and two health centres confirmed they had managed five or more obstetric complications in the same time frame. Three-quarters of the sub-district healthcare settings did not have the necessary skilled staff to manage obstetric cases.

2. Health facility infrastructure

Service space in maternity units

Nadowli District Hospital was the only public hospital serving the two districts and was the highest referral facility. It had 76 beds, including 12 beds for the maternity ward and two delivery beds in the labour section.

"For the labour ward, we have only three beds, out of which only two are used. We use the third bed as a last resort, although it is not meant for childbirth. It is for examination. In critical situations, we are forced to conduct delivery in the manual vacuum aspiration (MVA) room" [IDIs, other nurses].

Water supply

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None of the sub-district health facilities had potable water for usage by the workers and cleaning of the premises, meaning that expectant and postnatal mothers were often found drawing water for the health facilities, or were forced to return home to draw water for nurses if they sought care without it. Alternatively, the midwives would have to leave the mothers in the healthcare setting in search of water for cleaning. Thus, "*some expectant mothers get discouraged from giving birth there."* [IDIs, other nurses, DoN 1].

Lighting system

Ghana government's rural electrification initiatives were understood to have covered a significant part of the countryside. Despite this, not all old or even recently constructed health facilities were connected to the national grid. For instance, Duang CHPS was inaugurated around 2015 but continues to experience intermittent power outages from a faulty wiring system. A similar limitation was found at Charikpong health centre (one of the premier health facilities in the district), and Nanvilli health centre depended on patients to provide fuel to power the facility's generator; without fuel, either the delivery would have to be transferred elsewhere or be carried out in the presence of often inappropriate family members:

"We do not have a source of water and light. When I am conducting delivery, I use a lamp or generator. However, the generator must be fuelled by the relative of the expectant mother. Due to the cost, they are not able to afford. I use torchlight when there is a tear. I had a labour case where the mother sustains some lacerations which I have to suture. Sometimes, I involve the relatives because I cannot hold the torchlight while suturing, and patients' rights are violated, because that may not be the right person to see her nakedness" [IDIs, midwife, HC].

3. Medical equipment and logistics availability and functionality

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Nadowli District Hospital

The hospital had inadequate equipment despite the significant threshold population it serves. The entire hospital operated on one anaesthetic machine, a dysfunctional haematology analyser at the laboratory and an incomplete resuscitation table, all of which had the potential to affect service delivery. Despite the occurrence of stillbirths and neonatal deaths, there was no neonatal intensive care unit in the hospital. Other challenges included:

"Frequent power fluctuations are causing significant breakdowns in the equipment, i.e. blood bank refrigerators, autoclaves, air conditioners and theatre lamps. It further affects service delivery in the maternity section" [IDIs, other nurses].

Only a poorly supplied resuscitation table for preterm delivery care was available:

"Resuscitation table requires many items so that in case a baby is born and is asphyxiated; we can conduct it with ease. The table we have now is not well-equipped. We are only managing to save lives" [IDIs, other nurses].

Sub-district health facilities

All the health centres (HCs) had midwives and conducted childbirths. While the CHPS compounds without midwives were not allowed to conduct childbirths or deal with other emergency obstetric situations, a bed and set of delivery equipment were provided for all compounds. Only two HCs had a manual vacuum aspiration kit. There were other necessary (and essential) equipment available for checking vital signs at the health centres - blood pressure (BP) apparatus, thermometer, weighing scale - including foetoscope and foetal Doppler, but not all were in usable condition. Some CHPS compounds did not have necessary logistics such as a vaccine fridge:

"There is electricity here now, but we do not have a vaccine fridge. When we even conduct childbirth, we have to ride to Kojokpere health centre for poliomyelitis vaccine for the newborn and return the remaining for storage. When expectant mothers are around the 20th

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week of gestation, we administer tetanus toxoid injection (TTI), but the vaccine cannot be stored here" [IDIs, CHPS].

Similarly, the CHPS compounds often did not have the mandatory equipment to manage emergency deliveries or resuscitate asphyxiated newborns, such as Ambu bags, meaning that at times *"we see that the woman will be struggling and we cannot do anything to help"* (IDIs, In–charge, CHPS).

The effect of logistics shortages on infection control procedures

Some health facilities did not have the necessary daily non-drug consumables for administering care. While Rapid Diagnostic Test (RDT) kits (for malaria) were readily supplied to some facilities, infection control items such as facilities for handwashing and hand gloves were often not provided for some facilities:

"We have had consignments on the RDT which had no gloves included. Therefore, we do use bare hands to conduct the tests. The improvised hand gloves you [interviewer] saw me wear, were old gloves I found because we do not have hand gloves in the entire facility and the current RDT kits were not supplied with gloves" [IDIs, In-charge, male, CHPS].

Another participant identified how a shortage of gloves was "*the reason I improvised with hazardous materials (rubber bag) to conduct HIV/AIDS and Syphilis tests"* [IDIs, In-charge, male, CHPS].

The National Malaria Control Programme (NMCP) scaled up access and universal coverage to provide long-lasting insecticide bed nets (LLINs) to all expectant mothers and children who under five years of age, however some pregnant women in these districts were denied access to these services. Some health facilities were not included in the regular consignments of supplies.

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"When I came here, there were no mosquito nets in the facility. We do not also have sulphadoxine-pyrimethamine (SP); it is prophylaxis for malaria prevention in pregnancy. Since I came to the installation, there has not been any SP for the pregnant women" [IDIs, midwife 4, HC].

Essential medicines at the sub-district level

While "*the WHO protocol recommends antibiotics for pregnant women who give birth newly"* [IDIs, other nurses], the National Health Insurance Drug lists for CHPS compounds prohibit prescription of antibiotics to newly delivered mothers, despite it being mandatory. This is because the *CHPS "compound is a small facility. When we prescribe it, NHIS refuse to pay. Therefore, we sell it to them [the patient] which they always complain they do not have money to pay for medicines"* [IDIs, other nurses].

Some health facilities did not have other essential medicinal products for conducting childbirth.

"I came in December 2015, and there was no oxytocin, no Vitamin K_1 for the newly born babies. As at now, still, there is no vitamin K_1 in the facility" [IDIs, midwife 3, HC].

As a result of other changes in health policy, there were other limitations placed on health centre midwives prescribing certain essential medicines to manage labours.

"At the health centre, we cannot use the Zeamatin (if the woman is having preterm, we cannot give, we have to refer to Nadowli Hospital)" [IDIs, midwife 1, HC].

Transport services

The majority of the health facilities did not provide transport (for example, motorbikes) for midwives to visit communities, thereby restricting their ability to engage in health education, to follow up on women not attending ANC, and to carry out routine immunisations:

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"We have so many maternal and newborn programmes that require motorbikes, but we do not have enough motorbikes for all the facilities. Aside from the bikes, some of the communities are hard-to-reach" [IDIs, DoN 2].

4. Management of referrals of emergency obstetric and newborn complications

The referral hospital reported receiving emergency obstetric cases from the health centres and CHPS compounds. Expectant mothers referred during labour were 54 (5.22% of births) in 2012, 36 (10% of births) in 2013, 24 (7.09% of births) in 2014 and 17 (7.13% of births) in 2015.

Typical referral management procedure at the sub-district healthcare level

The model below typifies the referral pattern which pertains to the communities, with a focus on worst case scenario (Figure 2).

Figure 2: Pictorial view of typical referral management in the study area

All four health centres received labouring mothers and obstetric referrals from the CHPS compounds and across all communities in their catchment area, with the number of referrals significantly influenced by their geographical location. Nearly all maternity cases brought to the health centres originated from the remotest communities.

Transport services during referrals

National ambulance service

There were two groups of ambulance services operating in both districts to improve health service delivery; the hospital ambulance service and the National Ambulance Service (NAS).

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Each of them had one vehicle serving the two districts and other districts within its catchment area. The NAS station was situated at Nadowli but served any other district that called them for emergencies within the UWR. Thus the hospital vehicle and the NAS vehicle were both stationed at Nadowli leaving the far hinterland without ready access to vehicular transport during emergencies. There was one dysfunctional ambulance vehicle for all referrals to and from the Nadowli hospital. Daffiama health centre was the only health facility in Daffiama/Bussie/Issa district with double cabin pickup for emergency referrals of all patients as well as day-to-day operations of the facility. There were no available means of transport in any of the sub-districts except Daffiama health centre, *with their car serving as an official vehicle as well as transferring emergency obstetric and newborn complications*. However, the location of Daffiama health centre is within twenty minutes' drive of Nadowli hospital, closer than all other communities in the district, which leaves the remainder of the district without any emergency vehicles.

Public and private transport services

Lack of ambulances means that the majority of clients are reliant on public means of transport. This implies the client and family will usually have to wait until certain hours in the day to access transport:

"If we are to send someone to a referral facility and it is around 10 am, the client cannot get means because all the vehicles go to Wa [region's capital]. Unless in the evening that they return to the community" [IDIs, CHO, CHPS].

The search for affordable transport, whether it be by tricycle, motorbike or pick-up car, can often result in a delay in accessing the next level of care.

"During referrals, we wait for several hours before they can get modes of transport to the next level of healthcare. We do not also have laboratory services in the entire district so for us to conduct the routine laboratory investigations, we refer expectant mothers to Nadowli or

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Wa which becomes a challenge for many pregnant women. Even for pregnant women to get money to arrange for means of transport to the next level of care is always a problem" [IDIs, midwife, CHPS].

As a general rule, it was the responsibility of the expectant mother (or her family) to arrange for means of transport during emergency referrals, because of a shortage of emergency vehicles. The cost often limited the ability of the expectant mother to receive care.

Managing information and communication during emergency obstetric referral

The telecommunication sector presents a significant challenge to managing referrals in some communities. Vodafone and MTN Ghana telecommunication service providers had network coverage in the communities, although some communities had challenges accessing networks. During the field data collection exercise, the first author found that Charikpong, Nanvilli/Siruu, Jimpensi/Kenkelley and Duang communities had intermittent telecom networks. Therefore, mobile phone users had the option to either climb up a tree in a strategic area or hover around various signal hotspots (identified by the community) to make a phone call. The facility heads agreed with this observation, noting that:

"Our mobile phones network is a serious challenge…Therefore, when we have an emergency case, how to link with the national ambulance or the ambulance at Nadowli hospital is always a problem" [IDIs, midwife 2, CHPS].

DISCUSSION

By utilising the structure of the BPCR monitoring and evaluation framework for health facilities, the results of this study provide an insight into the preparedness of healthcare facilities to provide efficient obstetric and newborn care to the communities.

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As far as we know, this study is one of the first to assess health facility preparedness for birth complication readiness in the Nadowli-Kaleo and Daffiama-Bussie-Issa districts of Ghana. The barriers to improved maternal health service utilisation and the potential to address these complexities are well documented in the literature. Extrinsic and intrinsic inequities in access, including transport arrangements and management of referrals, are also identified to support existing findings in related districts of the Upper West Region (UWR).[14]

The skills upgrading programme introduced by the Ghana Health Service for sub-district level staff (since 2004)[19 35] sought to increase skilled staffing capacities of the facilities. However there were inadequate numbers of skilled healthcare staff (i.e. licensed midwives and medical doctors) in the study areas, which provided many challenges for the few staff available, including role stress and undignifying behaviour patterns towards mothers. This supports previous observations.[23] At the hospital, one midwife may be on duty to manage all new admissions and emergency referrals for the entire maternity unit. There were no remuneration packages to motivate the few skilled staff, aside from the average monthly salary. The impact of shortages was compounded when referrals were made between district hospitals because of lack of staff at both facilities. Similar gaps exist in the Upper East Northern Regions. [23] These findings are consistent with other studies in ten referral district hospitals in Ghana,[20] India, Tanzania and Ethiopia[36] and other developing countries.[17 37 38] Shortage of, and limited access to licensed staff lends support to the view of some writers that utilising appropriately trained TBAs, CHNs and ENs in mainstream childbirth care in Ghana could reduce some of the current frustrations associated with managing obstetric complications and referral processes,[25] although this is not without its challenges. It was found that poor treatment of pregnant women discouraged skilled maternal health service utilisation with its attendant implications on health outcomes in the rural communities.[28] Although many of these behaviours could be attributed to the role stress identified in this

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study, they nevertheless defy professional codes of conduct and the priorities of the country and stakeholders in general.[28]

The Ministry of Health is a policy oriented body while Ghana Health Service implements its initiatives. Based on the Ministry's Programme of Work (POW, 2014-2017), there were initiatives by Ghana Health Service to increase the country's performance on MNH indicators in particular, through ANC defaulter tracing, home-visiting, and free ANC services for all mothers with active National Health Insurance Scheme (NHIS) subscriptions, focussing on preventive care through the sub-district structures.[14 23]

Despite these initiatives, many factors limited the quality of care provided at the facilities, such as general under-investment in the health system regarding health workforce, medical equipment and medicines, coupled with other multi-sectoral constraints such as poor road infrastructure, electricity and water. Systemic issues including disrespect, irregular service availability at sub-district facilities and midwife absenteeism had a significant impact on service delivery.

Efficient lighting systems, water facilities and essential medicines reportedly motivate and increase skilled health services uptake. However, reduced laboratory services and inadequate space and equipment in childbirth rooms in all healthcare settings provided limited confidence to women accessing ANC and contemplating birthing in the health facility. Similar findings were reported elsewhere in the Upper West Region of Ghana and Kenya.[14 25 39] The challenges influenced born-before-arrival syndrome in the Upper West Region.[25] An evaluation in Ghana, Malawi and Kenya also found informal cost and cultural appropriateness of ANC services as key motivators to patronising skilled maternity care.[40] In most locations in this study, healthcare facilities were rudimentary, and while the hospital had better equipment and amenities (compared to the health centres and CHPS compounds),

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irregular power supply had similar negative impacts on service delivery.[5] The health facilities with intermittent electricity supply were unable to conduct deliveries at night. Most sub-district health facilities (CHPS compounds) had inadequate access to vaccine fridges and the power grid to store vaccines, and having to travel for long distances for necessary vaccines such as tetanus toxoid injection (TTI) and anti-malaria prophylaxis diminished efficacy and efficiency of the healthcare delivery system[41]. Some facilities had no readily available medicines such as oxytocin to induce labours. Other referrals were prompted by NHIS drug policy which prevents the staff at CHPS compounds from prescribing necessary antibiotics to newly delivered women, suggesting that revision of the NHIS user-fee exemption policy on maternal and neonatal healthcare would be appropriate.[14] These findings are congruent with other studies in India and a systematic review on this subject.[17 42] An earlier evaluation in district hospitals in Ghana revealed that they were the highest referral point for many obstetric complications. Meanwhile, many of them did not have the necessary logistics and staff to manage normal childbirth labour and complications.[20]

The project for improvement of maternal and child health in the Upper West Region by the Japan International Cooperation Agency (JICA) provided elaborate education for district and sub-district healthcare staff on managing emergency referrals[43]. A fundamental requirement was to have the midwife accompany the client to the receiving facility. However, considering the staffing inadequacies and the lack of transport services linking the communities, coupled with the behavioural norms on early decisions to seek care, [5 16] this approach may further intensify the current shortages of midwives and result in adverse outcomes, due to the distances and the lack of readiness for complications identified in another component of the study.[5 44] The geographical isolation of communities from referral centres, and between health facilities, is much like those experienced in other isolated locations, such as Uttar Pradesh, India.[37] A key difference from the Indian situation may be the fact that the main

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referral hospital (at Nadowli) serving both districts had no ambulance facility to conduct timely transfer of obstetric emergencies and preterm babies to appropriate health facilities such as Jirapa Hospital or Wa Hospital which were the nearest regional hospitals.

Although by convention all health facilities in Ghana operate twenty-four hours a day, there was the tendency to deny clients emergency care at certain times, thereby defying the core mandate of the sub-district health structures of providing preventive and basic curative care including obstetric first aid.[23 25 33] The common limitations related to hospital referral (mostly Nadowli or Wa) and means of transport create dissonance between the already aggrieved expectant mother in pain and the possibly stressed nurse who provides care to a large population on the one hand, and the healthcare targets/indicators on the other.

Non-availability and affordability of transport and telecommunication systems during obstetric emergencies influenced referrals to Nadowli and Wa hospitals (the closest to study communities) from sub-district health facilities. The findings demonstrated that demand for skilled care was on the increase, but the absence of ambulance/vehicular linkage and coverage could delay or cancel obstetric referrals despite regular demand for transfers from lower level facilities. The challenges identified in this study corresponded to those already identified elsewhere in rural Ghana, suggesting the need to streamline referral management systems, which are critical to reducing avoidable mortalities and inequities in access. [5 14 23] Studies by Buor and colleagues[45 46] in Ghana and sub-Saharan Africa, and another study in the Upper West region, demonstrated that distances to health facilities contributed to reduced utilisation and outcomes of obstetric referrals,[47] thereby providing pregnant women with fewer alternatives during labour and in the event of complications and .[25] This study may have underestimated the impact of these barriers compared with previous evaluations on this subject, but the adverse effects of home or born-before-arrival syndrome at the health facility are consistent with other research.[25 42]

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Implications for future research, policy and maternal health service delivery

Reports show that Ghanaians have increased utilisation of skilled maternal healthcare[23 27], which implies that policy initiatives to address current systemic bottlenecks would provide a way forward towards achieving global goals for the country. This is particularly important because the majority of the chronic health cases leading to life-threatening disabilities and mortalities are found in the hard-to-reach communities of the country [35]. For example, an evaluation in Ghana noted that although the national health insurance fee-exemption policy has increased service uptake, inequities and geographical disparities in access continue to exist between the rural poor and nonpoor, thereby causing low use among the poor due to the informal costs of services and medicines.[35]

The many barriers in this study are interdependent and addressing them will require a holistic approach, including community awareness and proactivity in managing obstetric complications, to help health providers tackle the issues appropriately and on time. Whereas these shortages in the health facilities may not be addressed in the short to medium term due to cost implications, preventative measures could be facilitated at the community level to influence behaviour and cultural change (as identified in other components of the study)[5 16 44] to help improve maternal and neonatal health outcomes.

Instituting motivational packages (housing, additional allowances, and career opportunities) for physicians and midwives may have some potential to encourage staff to accept postings to rural areas, but the lack of equipment and essential medicines for service delivery, continued knowledge and skill development could serve as a limitation. Global technological advancement and professional networking through social media, telecommunication and general internet services via reliable internet networks engender increased ambitions to

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advance in skills through education and career. However, the gap in these services to the district level was extensive, suggesting that improving the mobile telecommunication network and general internet services at this level could also motivate acceptability of postings to these locations. That aside, facilitating emergency referrals from the sub-district health facilities to the health centres and the hospital could also improve with improved and reliable telecommunication networks.

Strengths and limitations of this study

This study has several strengths. It contributes to the scant literature on the barriers to service delivery and access to services which impact MNH care in the Upper West Region of Ghana. The majority of obstetric complications with profound impacts on MNH indicators occur in the rural communities. Therefore, a brief assessment of issues pertaining to the health centres and CHPS zones could trigger policy initiatives and district level oversight responsibilities.

Despite the strengths, the study has limitations. A purposive sampling approach was used to obtain data from the participants. Critics question the credibility of data from such sampling procedures,[48] but this study was the first of its kind in these districts and considering the findings, supported by general facility observation and cues during the interviews, it is reasonable to say relevant data were generated through the approach to support the research objective. The sample was relatively small compared to the established norm, however, as a mixed method study, data from the other participant groups were used to support and cross-validate those of the healthcare settings; these results are reported elsewhere [5].

Figure 1. Study communities and health facilities

Figure 2: Pictorial view of a typical referral management in the study area

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CONCLUSION

The health facilities at both grassroots and referral hospital levels in the districts were not adequately prepared to provide quality maternal and neonatal healthcare, contributing, at least in part, to the preference of many mothers to eschew ANC and favour a home birth. These factors present a discrepancy between policy and implementation. Some policies and health reforms identified in the study, including task-shifting, the twenty-four hour policy, drug prescriptions, staff relocation and the legal restrictions on antibiotic prescriptions under NHIS reimbursement mechanisms, had a profound impact on health system performance and adequate and quality MNH care, as well as affecting referral management.

Improving MNH services provided at healthcare facilities by increasing the availability of doctors, midwives, anaesthetists, labour beds, resuscitation equipment, essential medicines, ambulance services and improving access to basic amenities such as electricity and water facilities, will assist rural Ghana to achieve the critical Sustainable Development Goal (SDG) three (targets one and two) by 2030. The study recommends revisions to the prescription components of the NHIS, investigation of the code of conduct of nurses and increased investment in logistics, as well as the management of staff postings.

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Figure 1. Study communities and health facilities

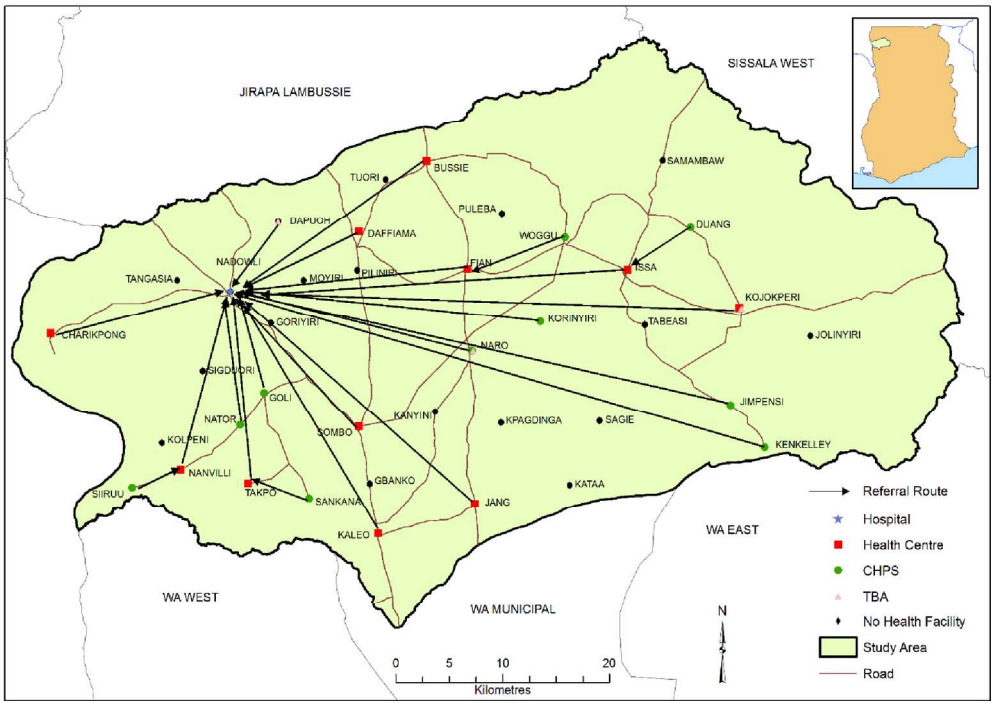

Figure 1. Study communities and health facilities

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Figure 2: Pictorial view of referral management in study area

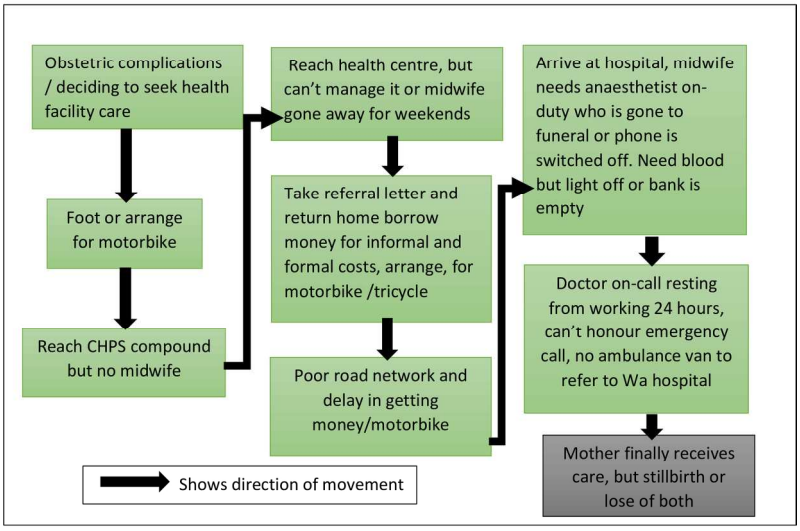

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Figure 2: Pictorial view of a typical referral management in study area

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	Page/line no(s).
Title and abstract	
Title - Concise description of the nature and topic of the study Identifying the study as qualitative or indicating the approach (e.g., ethnography, grounded theory) or data collection methods (e.g., interview, focus group) is recommended	Pages 1, line numbers 1&2
Abstract - Summary of key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results, and conclusions	Pages 2-3, line numbers 21 - 50
Introduction	
Problem formulation - Description and significance of the problem/phenomenon studied; review of relevant theory and empirical work; problem statement	Pages 4-7, line numbers 67-152
Purpose or research question - Purpose of the study and specific objectives or questions	Page 7, line numbers 137-150
Methods	
Qualitative approach and research paradigm - Qualitative approach (e.g., ethnography, grounded theory, case study, phenomenology, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g., postpositivist, constructivist/ interpretivist) is also recommended; rationale**	Pages 7- 14, line numbers 154 - 280
Researcher characteristics and reflexivity - Researchers' characteristics that may influence the research, including personal attributes, qualifications/experience, relationship with participants, assumptions, and/or presuppositions; potential or actual interaction between researchers' characteristics and the research questions, approach, methods, results, and/or transferability	Page 12, Line numbers 240-243
Context - Setting/site and salient contextual factors; rationale**	Pages 7&8, line numbers 155-170
Sampling strategy - How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g., sampling saturation); rationale**	Pages 9-11, line numbers 196-219
Ethical issues pertaining to human subjects - Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues	Pages 9-10, line numbers 197-200
Data collection methods - Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources/methods, and modification of procedures in response to evolving study findings; rationale**	Pages 12&13, line numbers 232-246

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Data collection instruments and technologies - Description of instruments (e.g., interview guides, questionnaires) and devices (e.g., audio recorders) used for data collection; if/how the instrument(s) changed over the course of the study	Page 12, line numbers 221-230
Units of study - Number and relevant characteristics of participants, documents, or events included in the study; level of participation (could be reported in results)	Page 10&11, line numbers 201-219
Data processing - Methods for processing data prior to and during analysis, including transcription, data entry, data management and security, verification of data integrity, data coding, and anonymization/de-identification of excerpts	Page 13, line numbers 27-255
Data analysis - Process by which inferences, themes, etc., were identified and developed, including the researchers involved in data analysis; usually references a specific paradigm or approach; rationale**	Pages 13&14, line numbers 257-274
Techniques to enhance trustworthiness - Techniques to enhance trustworthiness and credibility of data analysis (e.g., member checking, audit trail, triangulation); rationale**	Page 13, line numbers 248-255 & 262-272

Results/findings

Synthesis and interpretation - Main findings (e.g., interpretations, inferences, and themes); might include development of a theory or model, or integration with prior research or theory	Pages 14-27, line numbers 281 -549
Links to empirical data - Evidence (e.g., quotes, field notes, text excerpts, photographs) to substantiate analytic findings	Pages 14-27, line numbers 281-549

Discussion

Integration with prior work, implications, transferability, and contribution(s) to the field - Short summary of main findings; explanation of how findings and conclusions connect to, support, elaborate on, or challenge conclusions of earlier scholarship; discussion of scope of application/generalizability; identification of unique contribution(s) to scholarship in a discipline or field	Pages 27 –33 line numbers 551-682
Limitations - Trustworthiness and limitations of findings	Page 33, line numbers 685-689

Other

Conflicts of interest - Potential sources of influence or perceived influence on study conduct and conclusions; how these were managed	Page 35, line number 733
Funding - Sources of funding and other support; role of funders in data collection, interpretation, and reporting	Page 35, line numbers 730-732

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