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Knowledge, Barriers and Enablers of Clients Utilizing Basic Obstetric Ultrasound Services in PHC Facilities in Rivers State, Nigeria

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ABSTRACT

Background: Routine obstetric ultrasound scanning has been considered as one of the factors that has improved antenatal care and outcomes of pregnancy worldwide. This study aimed at assessing the obstetric problems experienced, knowledge of basic obstetric ultrasound services, enablers, and barriers affecting the utilization of these services among clients receiving care at PHC facilities in Rivers State.

Materials: This study utilized the descriptive hospital-based cross-sectional design and was conducted among 363 clients of PHC facilities in Rivers State, who were selected by convenience sampling. Data on knowledge of basic obstetric ultrasound services (BOUS), obstetric risks experienced, and possible enablers and barriers affecting access of the services was collected using self-administered questionnaires. Data analysis was done using the Microsoft Excel spreadsheet.

Results: In this study, 211 (58%) of the respondents had good knowledge of BOUS. Common obstetric risks experienced included teenage pregnancies 189 (52.1%), advanced maternal age pregnancies 188 (51.8%), pregnant mothers having existing health problems 164 (45.2%), among others. Enablers of service utilization included: ease of access to the facilities, health team adequacy, acceptance of the ultrasound scan services, provision of respectful treatment, among others. A barrier identified was: services were not readily available.

Conclusion: A large number of the respondents had good knowledge of BOUS. Various barriers that limited their effective utilization of these services were experienced. There is a need to boost the provision of the necessary infrastructural and manpower resources necessary for the provision of these services at the PHC level in Rivers State.

Keywords: Basic Obstetric Ultrasound Services, Knowledge, utilization, Enablers, Barriers, Primary Health Care, Rivers State



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INTRODUCTION

In modern medical practice, imaging has become an essential component of effective healthcare delivery¹. Several imaging modalities are in use in the medical field including ultrasonography, also known as ultrasound. Ultrasound scan (USS) is an imaging diagnostic procedure that primarily makes use of sound waves to scan a pregnant mother's abdominal and pelvic cavity, and produce a real-time image of the foetus^{2,3}. Obstetric ultrasound has a lot of benefits in monitoring, screening and diagnosis to ensure a mother's safe delivery and reducing the incidence of maternal and child mortalities^{4,5}. Routine obstetric ultrasound services have been considered as one of the factors that can strengthen antenatal assessment and management, but its effect on pregnancy outcomes depends on the availability of appropriate follow-up care and broader health system support⁴. The ultrasound scan is useful for estimating gestational age, detecting multiple pregnancies, placental location, foetal well-being, and foetal anomalies⁶. Additionally, it is essential for monitoring and managing high-risk pregnancies, lowering the risk of perinatal death and the need for obstetric interventions, and raising the possibility of ANC attendance and delivery at medical facilities^{5,6}. Other reported reasons for undergoing ultrasound include estimation of their expected date of delivery, for pregnancy confirmation, sex determination, assessment of baby development among others⁶.

Sub-Saharan Africa has been described as a major contributor of perinatal mortality globally, with estimated perinatal mortality of as much as 34.7 per 1000 births⁷. Despite the adoption of the Sustainable Development Goals, the maternal mortality ratio (MMR) was still reported in 2019 to be up to 512 deaths per 100,000 live births in Nigeria⁷. In a retrospective review of maternal mortality cases from 2012 to 2018 at the Rivers State University Teaching Hospital, an overall MMR of 644 deaths per 100,000 live births was reported with as high as 785 deaths per 100,000 live births recorded in 2018⁸. Problems of intrauterine growth retardation (IUGR) have been pinpointed as major contributors to perinatal mortality and morbidity, and the use of ultrasound may be useful in timely identification of expectant mothers who are at early risk⁷.

The revised World Health Organization's (WHO) guideline recommends a minimum of eight antenatal care (ANC) contacts during pregnancy, including one ultrasound examination/obstetric ultrasound before the

24th week of gestation⁹. The International Federation of Gynecology and Obstetrics (FIGO) also recommends that all pregnant women receive two ultrasound imaging screens during the first and second trimesters, which is recommended for assessment and early detection of unfavorable perinatal outcomes¹⁰. It is however essential to point out that women's knowledge of and attitude toward obstetric ultrasonography are crucial elements especially during pregnancy¹¹. Their knowledge of the obstetric ultrasonography scan and its benefits affect their decision to undergo a test, as pregnant women who are not aware of these benefits are less likely to have it performed¹¹. The ignorance of the appropriate time for ultrasound scanning among pregnant women may also contributes to delay in getting it done, which can hinder the early detection of fetal abnormalities, and could result in the occurrence of pregnancy- or childbirth-related problems¹¹. In addition to these, poor access to ultrasound services has been reported in low-resource settings as a result of a number of factors. These include human-resource-for-health constraints, equipment unavailability, lack of availability of the required technology for use and maintenance among others¹². Studies have identified varying levels of knowledge and use of obstetric ultrasound services among pregnant women. In the study conducted in Saudi Arabia, most women were identified to have good knowledge of these services as well as their importance¹³. About 51.4% of pregnant women in a study conducted in Ethiopia, were identified to have good knowledge of obstetric ultrasonography¹¹. In another study conducted in North-Western Nigeria, large proportions of women exhibited good knowledge of ultrasonography and its importance to the safety and well-being of pregnant mothers and the unborn child¹⁴. Mothers had done an ultrasound scan for their index pregnancy for reasons including estimation of their expected date of delivery, for pregnancy confirmation, sex determination, assessment of baby development among others. A study also revealed as high as 96.4% of women having good knowledge of ultrasound and its uses with a mean knowledge score of 86.3 ± 17 ¹⁴. In Rivers State, however, there seems to be a rather low number of published literature showing women's knowledge of ultrasound imaging services and its importance. Considering the high levels of maternal mortality reported in Rivers State¹⁵ and that having the knowledge of obstetric ultrasonography was crucial to the utilization of the services among pregnant women, it was important for

this study to be conducted. This study thus examined the knowledge of basic obstetric ultrasound services among women receiving care in primary healthcare (PHC) facilities, as well as the barriers and enablers affecting access to these services in these facilities in Rivers State, Nigeria.

MATERIALS AND METHODS

Study design

This study employed a facility-based cross-sectional design to assess the knowledge of PHC clients regarding Basic Obstetric Ultrasound Services (BOUS), the enablers and barriers affecting utilization of BOUS, and the obstetric problems ever experienced by the respondents.

Study setting: The study was conducted in selected Model PHC facilities and Comprehensive PHC facilities located in the 23 Local Government Areas (LGAs) of Rivers State, Nigeria.

Participants (study population): The study population comprised PHC clients presenting to access BOUS at the selected PHC facilities.

Eligibility criteria

Inclusion criteria: Women of childbearing age presenting to receive BOUS at the study facilities.

Additional respondents (proxy response): Where a woman was unable to respond or was in distress, but accompanied by her husband, the husband was permitted to respond on her behalf.

Exclusion criteria: Respondents (women or husbands acting as proxies) who did not meet the inclusion criteria at the time of data collection, or who declined participation.

Sample size determination: A sample size of 366 was calculated using Cochran's formula for cross-sectional studies, based on assumed prevalence/proportion $p = 96.4\%$ from a previous study¹⁴, significance level $\alpha = 0.02$, and adjustment for 10% non-response.

Sampling methodology: Participants were selected using convenience sampling of all willing respondents who were present at the health facilities during data collection.

Variables

- Knowledge of BOUS (measured using a 15-item knowledge questionnaire).
- Perceived enablers and barriers to BOUS utilization (measured using a 15-item Likert-scale questionnaire).

- Obstetric problems ever experienced (assessed using items requiring “Yes” or “No” responses).
- Sociodemographic characteristics (collected if included in the questionnaire; not explicitly stated in the provided text).

Measurement / Study instruments

1. Knowledge of BOUS questionnaire: 15 items with responses scored as:

- “Yes” = 1 point
- “I don’t know” = 0 point
- “No” = 0 point

2. Enablers and barriers questionnaire: 15 items with Likert responses:

- Strongly Agree, Agree, Undecided, Disagree, Strongly Disagree.

3. Obstetric problems checklist: presented items requiring respondents to indicate whether they had experienced each problem previously using “Yes” or “No”.

Content validity: Before deployment, the questionnaire was reviewed by an expert in obstetrics to ensure suitability and alignment with the study objectives.

Data collection procedure: After seeking informed consent and addressing other ethical considerations, the instrument was administered to eligible clients as they presented for clinical consultation at the PHC facilities. Data were collected using a self-administered adapted questionnaire, which was adapted from previous templates of other studies¹³⁻¹⁶.

Data management and analysis: Data were collected electronically using KoBoToolbox (Open-Source Mobile Data Collection platform) and stored securely on the KoBoToolbox server. Data were cleaned, collated, and analyzed using Microsoft Excel. Variables were summarized using frequencies and percentages and mean $\pm$ standard deviation (SD). Results were presented using tables and charts. Total knowledge score ranged from 0 to 15 (sum of all “Yes” responses). Knowledge levels were categorized as: Poor knowledge: scores $< 50\%$; Moderate knowledge: scores $50\%–75\%$; and Good knowledge: scores $> 75\%$. A 40% threshold was used to classify items: for positively directed statements, if $\geq 40\%$ selected Strongly Agree/Agree, for example, “the time required to reach the health centre is appropriate”, it was classified as enabler. If $\geq 40\%$ selected Strongly Disagree/Disagree, it was classified as barrier. For negatively directed statements, for example, “cost is a serious barrier to using BOUS”, If $\geq 40\%$ selected Strongly Agree/Agree, it was classified as barrier; if $\geq$

40% selected Strongly Disagree/Disagree → classified as enabler. A “No clear consensus”, if Undecided responses were higher than either relevant decision group, or if neither of the agreement/disagreement groups met the $\geq 40\%$ decision rule. Enablers and barriers were reported as frequencies and corresponding percentages.

Ethics approval: Ethical approval was obtained from the Health Research Ethics Committee of the Rivers State Hospital Management Board (Approval number: RSHMB/RSHREC/2024/013). Permission to conduct the evaluation was obtained from the Executive Secretary and Director of Planning, Research and Statistics, Rivers State Primary Health Care Management Board (RSPHCMB), Medical Officers of Health and facility heads of the PHC facilities.

Each respondent provided informed consent prior to participation. The data collection tools were anonymised to protect privacy and ensure confidentiality of respondents' responses.

RESULTS

Out of the 366 respondents sampled, 363 respondents filled the questionnaire completely, giving a 99.2% response rate.

Assessing the sociodemographic characteristics of the PHC clients, revealed that the majority of the respondents were female 313 (86.0%), were married 329 (91.0%), self-employed 198 (54.0%) and had received tertiary education 192 (52.9%). In addition, the largest proportion of the respondents were found to be aged between 30 and 39 years 162 (44.6%), and had a daily income range of between 500 and 1000 naira 126 (35.4%), These are shown in Table 1.

Table 1: Sociodemographic distribution of PHC clients in the study

Variable	Frequency (n=363)	Percentage (%)
Sex		
• Male	50	14.0
• Female	313	86.0
Age (years)		
• 10-19	11	3.0
• 20-29	91	25.1
• 30-39	162	44.6
• 40-49	78	21.5
• 50-59	21	5.8

Variable	Frequency (n=363)	Percentage (%)
Income (naira)		
• <500	76	20.9
• 501-1000	126	34.7
• 1001-2000	88	24.2
• 2001-3000	39	10.7
• >3000	34	9.5
Marital status		
• Single	23	6.3
• Married	329	90.6
• Cohabiting	6	1.7
• Divorced	2	0.6
• Widow(er)	3	0.8
Employment status		
• Unemployed	86	23.7
• Self-employed	198	54.5
• Employed	79	21.8
Educational level		
• Primary	13	3.6
• Secondary	151	41.6
• Tertiary	192	52.9
• Vocational	7	1.9

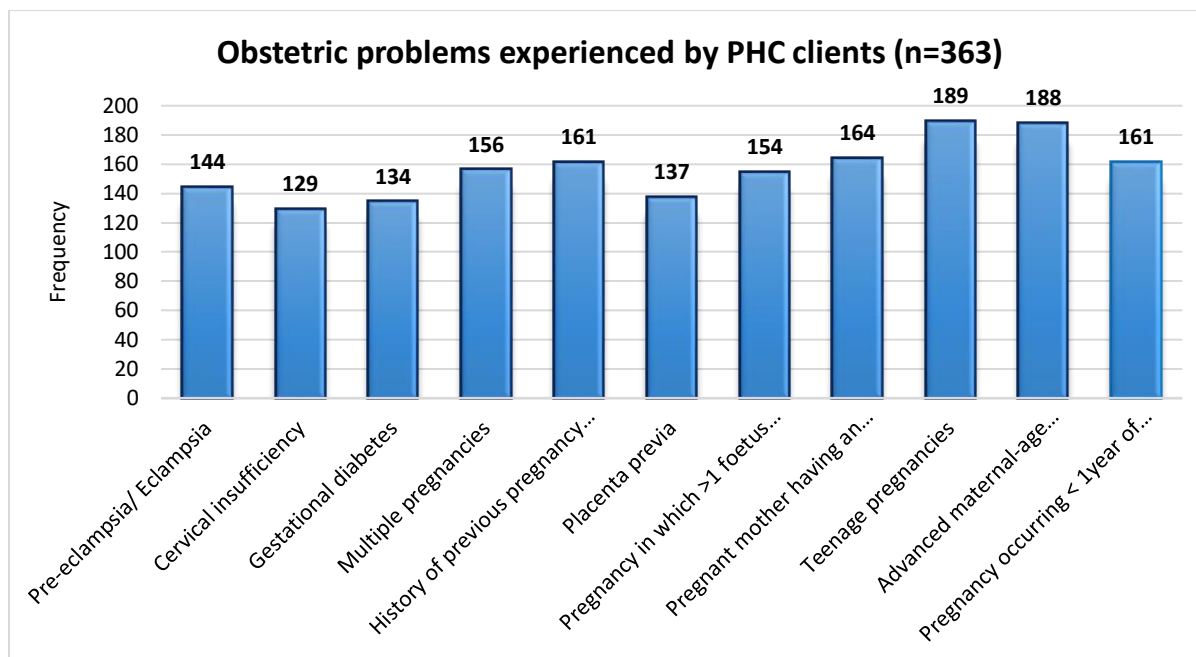


Figure 1: Self-reported obstetric complications, risk factors, and pregnancy-related conditions among PHC clients

Assessment of the obstetric problems ever experienced by the PHC clients at one time or the other is illustrated in Figure 1. Teenage pregnancies 189 (52.1%) and advanced maternal-age pregnancies 188 (51.8%) were found to be the highest proportions of pregnancy-related risks pointed out by the respondents.

Regarding the knowledge of BOIS among the PHC clients, it was identified that 58% of them had good knowledge of these services, 9% showed moderate knowledge of the BOIS, and up to 33% showed poor knowledge of these services. (See Figure 2).

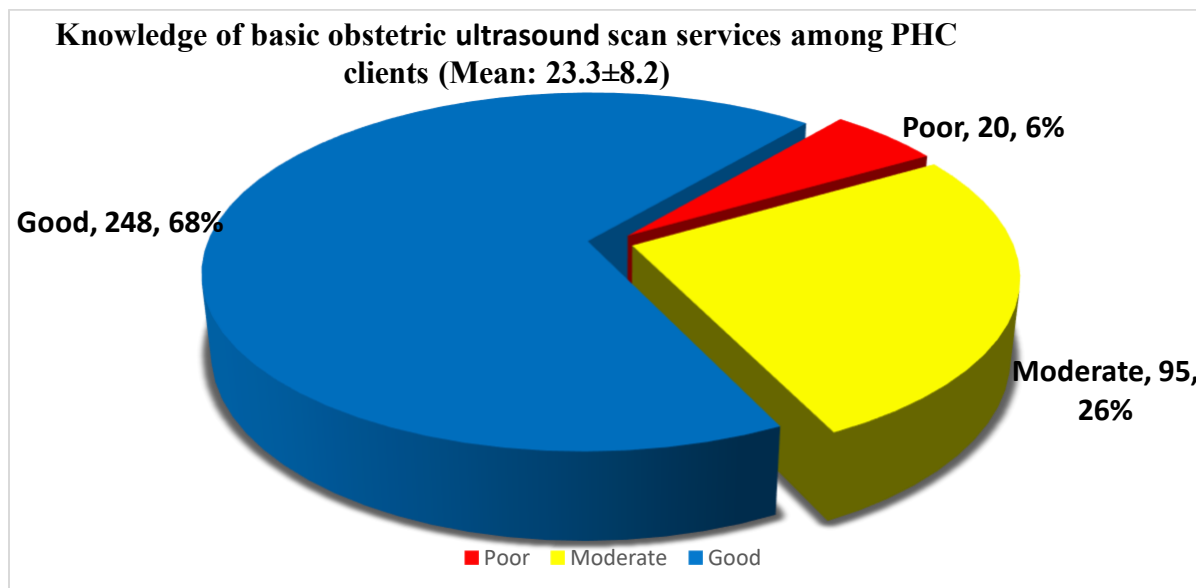


Figure 2: Knowledge of basic obstetric ultrasound scan services and its importance among PHC clients

Table 2: Barriers and Enablers of Utilization of Basic Obstetric Ultrasound Services

S/N	STATEMENTS ON UTILIZATION	SA f(%)	A f(%)	UN f(%)	D f(%)	Decision
1.	Obstetric imaging is readily provided at the health centre	36 (9.9)	59 (16.3)	94 (25.9)	174 (47.9)	Barrier
2.	The distance from the health centres to my house is too far	46 (12.7)	95 (26.2)	83 (22.9)	139 (38.3)	No clear consensus
3.	Getting to and from the health centre is easy for me	40 (11.0)	139 (38.3)	83 (22.9)	101 (27.8)	Enabler
4.	The facilities of the health centre meet the health needs of the clients for ultrasound scan	51 (14.0)	97 (26.7)	105 (28.9)	110 (30.3)	Enabler
5.	The health staff is adequate for the number of clients and their needs for ultrasound scan	47 (13.0)	104 (28.7)	104 (28.7)	108 (29.8)	Enabler
6.	The quality of ultrasound scan services provided in the health centre is not acceptable	22 (6.1)	61 (16.8)	141 (38.8)	139 (38.3)	No clear consensus
7.	I trust the statements of the ultrasound scan investigation team	41 (11.3)	98 (27.0)	132 (36.4)	92 (25.3)	No clear consensus
8.	I accept ultrasound scan services provided at the health centres	49 (13.5)	90 (24.8)	120 (33.1)	104 (28.7)	Enabler
9.	The treatment team at the health centre is respectful	95 (26.2)	129 (35.5)	98 (27.0)	41 (11.3)	Enabler
10.	Cost is a serious barrier to using ultrasound scan services	49 (13.5)	83 (22.9)	104 (28.7)	127 (35.0)	No clear consensus
11.	The expected time to receive the ultrasound scan services I need is too long	21 (5.8)	56 (15.4)	146 (40.2)	140 (38.6)	No clear consensus
12.	The working hours of the public health center are suitable for receiving ultrasound scan services from these centres	73 (20.1)	109 (30.0)	127 (35.0)	54 (14.9)	Enabler
13.	The physical space of the health center is suitable for receiving ultrasound scan services	82 (22.6)	129 (35.5)	108 (29.8)	44 (12.1)	Enabler
14.	The education that is given to me about the ultrasound scan investigation is given in an understandable manner	51 (14.0)	105 (28.9)	126 (34.7)	81 (22.3)	Enabler
15.	The information I need about ultrasound scanning is expressed in simple language	69 (19.0)	102 (28.1)	123 (33.9)	69 (19.0)	Enabler

Table 2 presents respondents' perceptions of barriers and enablers related to the utilization of basic obstetric imaging services. Based on the response pattern, some items were interpreted as possible enablers, while others were interpreted as potential barriers. Enablers of the utilization of the services included ease of access to the facilities, meeting their health needs for ultrasound scan, health team adequacy, as well as acceptance of the ultrasound scan services among the respondents. Others included the provision of respectful treatment, working hours of the facilities, the suitability of the physical space of the facilities, as well as the provision of necessary

obstetric imaging information in an understandable manner. A barrier that was however noted in this study, was that obstetric imaging was not readily provided at the health facilities. There was however no clear consensus/unclear perception on the proximity of their residence to the facilities, the quality of the obstetric imaging services, trust in the statements and services being provided by the ultrasound scan investigation team, cost of the services, as well as the waiting time before being attended to.

DISCUSSION

In this study, the knowledge of basic obstetric ultrasound service (BOUS) was assessed among respondents attending PHC facilities in Rivers State alongside the enabling and limiting factors affecting their utilization of these services. Regarding the knowledge of BOUS among them, it was identified that more than half of them had good knowledge of these services. This implies better awareness which may further mean fewer delays in seeking imaging when needed and this may also translate to greater potential for timely diagnosis and monitoring, and improved maternal outcomes. This is similar to reports made in other studies reporting good levels of knowledge of obstetric ultrasound services¹⁴. When clients are well-informed about obstetric ultrasound services, they tend to be more likely interested in utilizing them as well as utilizing antenatal care clinics where these services are provided¹⁶. This inadvertently results in the early detection and prompt management of any potential developmental problems (including fetal growth restrictions, congenital anomalies, and placental problems) that could affect the fetus, as well as ensure adequate monitoring of fetal development¹⁶.

In this study several obstetric complications and high-risk pregnancies were self-reported including placenta praevia, cervical insufficiency, multiple pregnancies, amongst others. BOUS can effectively to the early detection effective and prompt management of these cases. Timely obstetric ultrasound conduct may be a contributory factor in the reduction of cases of maternal and infant mortality rates as well as better equip clients to be involved in decision-making regarding pregnancies^{11,17}. This knowledge of BOUS may also promote healthier lifestyle choices and adherence to medical advice, which further contributes in the enhancement of pregnancy outcomes.

This study also identified enablers and barriers affecting the utilization of BOUS. Enablers included proximity of the PHC facility to their houses, provision of ultrasound scan services of acceptable quality, and the respectful disposition of the treatment team at the PHC facility. Others included the cost-effective nature of the services, prompt attention/ short waiting time before receiving the service as well as satisfaction with the physical space of the PHC facility for receiving obstetric ultrasound scan services¹⁸. These have been reported in other studies to be essential elements that also contribute to the utilization of obstetric ultrasound services. Having

these enabling factors in place are able to make it easier for pregnant mothers to easily access these services, which may in turn improve the quality of care received. When healthcare personnel also exhibit a respectful and empathic disposition to providing care without delay, it fosters trust and encourages clients to seek scheduled obstetric check-ups¹⁹.

In the present study, barriers to the utilization of these services were identified to include the unavailability of the services to meet the health needs of the clients for ultrasound scan, inadequacy of required manpower to provide the services and the lack of trust in the statements and services being provided by the ultrasound scan investigation team. These problems have also been reported in other studies where it was shown that these barriers are capable of adversely affecting the utilization of basic ultrasound imaging services¹⁷. In one of such studies, there was a gross shortage of nursing midwives to manage maternal and newborn health service provision to the populace, which resulted in high workload and failure to prioritize the provision of ultrasound scan services to those requiring them¹⁷. The implication of these findings are that even though PHC clients are knowledgeable enough about obstetric ultrasound services, but cannot easily access the services due to inadequacies in the required resources to provide them, they become prone to adopting other non-conventional measures to ensure the safety of their pregnancies²⁰. At certain times, these pregnant women have to travel long distances to access care which can be tedious as well as have to spend more to access obstetric ultrasound services¹². It is thus essential that these services be made as easily accessible, available and affordable to the populace as possible. In addition, the respondents reporting lack of trust in the service provided by the ultrasound scan team (in PHC facilities where they are present), could probably be as a result of perceived fears relating to the safety of the procedure on their pregnancies¹⁴.

Limitations

This study had some limitations. Firstly, being a cross-sectional study inhibits determining causal relationships and inferring temporality. Secondly, it is subject to bias because findings were based on self-reported data.

Implication of the Study

The study points to some gaps in the knowledge of, and barriers in BOUS among clients. Concerned governmental and non-governmental stakeholders should work concertedly to boost the provision of the

necessary infrastructural and manpower resources necessary for the provision of these services at the PHC level in Rivers State. Regular in-service training on the effective and empathic provision of these services to the populace, which can promote utilization of the services as well as enhance maternal health outcomes in Rivers State. Concerned stakeholders of health and public orientation in Rivers State and Nigeria at large should constantly reinforce health promotion and education initiatives focused on improving public health awareness of the benefits of utilizing obstetric ultrasound imaging services.

CONCLUSION

This study identified that some respondents had good knowledge of obstetric ultrasound imaging services among some respondents, and reported some perceived enabling factors that may support the use of these services. They were however faced with the barrier of obstetric imaging services being not readily provided at the health facilities which may have limited their effective utilization of the services.

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Declarations

Authors' contribution: P.I.D.A.: Writing—original draft, conceptualization, methodology, resources, formal analysis, investigation, visualization. S.B.D.: supervision, resources, review and editing, project administration. J.T.W.: supervision, resources, review and editing. A.C.O.: conceptualization, resources, project administration. All authors have reviewed and approved the final manuscript.

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