Assessment of Manpower, Equipment and Material Resources Adequacy for the Provision of Basic Obstetric Ultrasound Services in PHC Facilities in Rivers State, Nigeria

Siyeofori Belema Dede[1], Joy Tonye Wihioka[1], Pearl Iyaye Daibi Abereton[1,2*], Temple Nnodim Akagbue[1], Bariatoa Neyeko Demua[1], Adaeze Chidinma Oreh[3]

[1]Rivers State Primary Health Care Management Board, Port Harcourt 500001, Rivers State, Nigeria

[2]Environmental Health Department, School of Public Health, University of Port-Harcourt, Choba 500004, Rivers State, Nigeria

[3]Rivers State Ministry of Health, Port Harcourt 500001, Rivers State, Nigeria

***Corresponding Author**

DOI: https://doi.org/10.51244/IJRSI.2026.1315PH00044

Received: 10 March 2026; Accepted: 16 March 2026; Published: 31 March 2026

ABSTRACT

Background and aim: The World Health Organization (WHO) advocates for a world where every pregnant woman and newborn receives quality care throughout pregnancy, childbirth, and postnatal periods. This study was thus aimed at assessing the manpower, equipment and material resources adequacy for providing Basic Obstetric Imaging Services (BOIS) services, in primary healthcare facilities in Rivers State, Nigeria.

Materials and methods: This study utilized the descriptive, cross-sectional design and was conducted in 83 PHC facilities in Rivers State, Nigeria, where the heads of facility provided responses on the availability of manpower, equipment and material resources necessary for the provision of BOIS services. Data was collected using adapted manpower, equipment and materials checklists, after which evaluation was done using laid down PHC standards to identify the adequacy of the assessed resources. Data analysis was done using the Statistical Package for Social Sciences (SPSS) version 23 and was presented on tables and charts.

Results: Regarding the manpower, it was identified that the largest proportion of the facilities had one doctor 45 (47.4%), one nurse 27 (28.4%), one community health officer (CHO) 32 (33.7%), three community health extension workers (CHEW) 22 (23.2%), and one records officer 39 (41.1%) working in the facilities. About 38 (40.0%), 22 (23.2%), 28 (29.5%), 2 (2.1%), and 7 (7.4%) of the facilities did not have any doctor, nurse, CHO, CHEW, nor records officer respectively. Assessing the adequacy of the various cadres of workers using the national minimum standard requirements for manpower at PHC facilities, revealed inadequacies affecting all cadres, with nurses (76%) and doctors (40%) having the highest proportion of inadequacies. An assessment of the adequacy of the equipment and materials using a 50% cut-off for categorization of availability into “adequate” and “inadequate” showed that most facilities 72 (76.0%) experienced inadequacies as they did not have a number of these equipment and materials.

Conclusion and recommendation: The manpower, equipment and material resources necessary for BOIS provision in PHC facilities in Rivers State was found to be inadequate. It was recommended that PHC facilities in the State be strengthened with all resources for the effective provision of BOIS services to the populace.

Keywords: Obstetric Ultrasound, equipment, manpower, material resources, Rivers State

INTRODUCTION

Pregnancy is a critical period in a woman’s life, and it is important to ensure that she and her baby receive the best care available. Despite the adoption of the Sustainable Development Goals (SDGs) in 2015, the maternal

mortality ratio (MMR) in Nigeria was reported in 2019 to still be as high as 513 deaths per 100,000 live births.[1, 2] There are 10 countries that contribute highly to the burden of maternal deaths, of which Nigeria is inclusive [3, 4], however, evidence shows that majority of these deaths are preventable with implementation of high-quality, evidence-based interventions, amongst other measures.[5] One of such measures is the provision of antenatal care services. Antenatal care (ANC) has been shown to impact positively on the outcome of pregnancies, and also has contributed positively in the reduction of maternal and infant morbidities and deaths.[6] ANC, which is the gateway into the healthcare system for pregnant women and their families, requires the availability of a skilled birth attendant.[7] Eight ANC contacts, including at least one obstetric imaging is recommended before 24 weeks of gestation by the revised World Health Organization's (WHO) guideline.[8]

Routine obstetric imaging has been considered as one of the factors that has improved antenatal care and outcomes of pregnancy worldwide. The obstetric imaging is beneficial in estimating gestational age, detecting multiple pregnancies, placental position, foetal well-being, and anomalies.[9] It also plays a significant role in the management of high-risk pregnancies, reducing the risk of perinatal death, and increasing the likelihood of ANC attendance and delivery at health facilities.[10] The WHO envisions, and is working towards a world where pregnancy will no more be seen as a life threatening phenomenon, due to lack of patient-centred quality care, where every pregnant woman and newborn will receive quality care throughout the pregnancy phase, labour, delivery and post-partum phases.[9] An early identification, confirmation, and arrangement of referral services during ANC reduce morbidities and mortalities associated with high-risk pregnancies.[9, 11]

Obstetric imaging is an important screening and diagnostic examination during pregnancy, however access to ultrasound services is limited, especially in low-resource settings. This may be due to inadequate skilled personnel, equipment unavailability and maintenance issues, among others.[9, 12] There is still a huge access gap in this service provision despite a gradual increase in access and availability, especially in the developing countries, as majority of the pregnant women do not have access to an obstetric ultrasound examination. Radiologists and obstetricians are the primary care providers of the obstetric ultrasound services in these settings.[10] When there is lack of high-level health professionals, inadequately trained providers (60%), shortage of ultrasound equipment and supplies (45%), and lack of maintenance capability (47%), the availability of these ultrasound scan services are limited, especially at the Primary Health Care level of care.[12]

In filling up this major gap in the provision of BOIS, it has been reported that short courses on basic obstetric imaging for mid-level health professionals with no prior experience with ultrasound were effective, feasible, and efficient in improving maternal and fetal care.[13] There was about 99% concordance between the trainee and reviewer ultrasound diagnosis, and about 95% satisfactory images were obtained from the trainees. These further buttresses the importance of training PHCWs especially medical officers and midwives on basic obstetric imaging services, task shifting, and task sharing. This is to ensure that maternal and fetal morbidities and mortalities in poor resource settings and hard-to-reach areas are reduced to the barest minimum which is in line with the SDG 2030 goals.[14]

The availability of basic obstetric scans in primary health care settings is crucial for promoting maternal and foetal health by increasing routine access (financial and structural) in rural and hard-to-reach settings.[12, 14] There is a need, therefore, to integrate obstetric imaging services at this level of care. Studies have been conducted in Ethiopia as well as Bauchi and Kano States in Nigeria, on the state of obstetric imaging services at the PHC level and how this has improved maternal health outcomes.[10, 15, 16] There is however no comprehensive study done in Rivers State assessing basic obstetric imaging care services availability and adequacy. This study was thus aimed at assessing the manpower, equipment and material resources adequacy for providing basic obstetric imaging services, in primary healthcare facilities in Rivers State, Nigeria.

MATERIALS AND METHODS

This study utilized a descriptive, cross-sectional design to assess the adequacy of manpower, equipment and material resources for providing Basic Obstetric Imaging Services (BOIS), in primary healthcare facilities in Rivers State. It was conducted at 95 Model PHC facilities and Comprehensive PHC facilities located in the 23 Local Government Areas of Rivers State, Nigeria. Responses on the available resources for the provision of BOIS at the PHC facilities were provided by facility heads of the different PHC facilities.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI | Volume XIII Issue XV March 2026 | Special Issue on Public Health

The instrument for collection of data was an adapted checklist which was used to obtain the number of healthcare personnel providing services at the facilities. This data was then assessed and compared with the national minimum standard requirements for manpower at PHC facilities.[17] This was used to determine if the number of personnel was adequate or not. Equipment and materials required for the provision of BOIS were also assessed for availability using a 21-item checklist. After this was done, a 50% cut-off was then used to categorize the level of availability into "adequate" and "inadequate".

Ethics Approval was obtained for this study from the Health Research Ethics Committee of the Rivers State Hospital Management Board (Approval number: RSHMB/RSHREC/2024/013). Permission to carry out the evaluation was obtained from the Executive Secretary and Director Planning, Research and Statistics of the Rivers State Primary Health Care Management Board (RSPHCMB) as well as the Medical-Officers-of-Health of the selected PHC facilities. Informed consent was also obtained from each respondent before conducting the surveys. In addition, the data collection tools were anonymised to ensure protection of the privacy of respondents and confidentiality of their responses. Data was also collected electronically and safely stored in a secure server of the Kobo toolbox Open-Source Mobile Data Collection platform. Data was cleaned, collated and analyzed on a Microsoft Excel spreadsheet, was expressed as frequencies/percentages and mean ±S.D., and was presented on tables and charts.

RESULTS

Altogether, 95 PHC facilities were assessed for the adequacy of manpower, equipment and tools that were available for the providing basic obstetric imaging services. In these facilities, the facility heads provided responses regarding the assessment, and it was found that they were mostly females 64 (67.4%), aged between 40 and 49 years (mean age: 45.6±5.3 years) 61 (64.2%), and earned more than 3000 naira daily 52 (54.7%). In addition, most of the respondents were married 88 (92.6%) and had received tertiary education 94 (98.9%). These are shown in Table 1.

Table 1: Sociodemographic details of respondents

Variables	**Frequency (n=95)**	**Percentage (%)**
Sex		
Male	31	32.6
Female	64	67.4
Age category (years)		
20-29	1	1.1
30-39	11	11.6
40-49	61	64.2
50-59	21	22.1
60-69	1	1.1
Mean age: 45.6±5.3 years		
Income		
<500	5	5.3
500-1000	11	11.6
1001-2000	8	8.4
2001-3000	19	20.0
>3000	52	54.7

Marital status		
Single	5	5.2
Married	88	92.6
Widow	1	1.1
Divorced	1	1.1
Level of education received		
Secondary	1	1.1
Tertiary	94	98.9

Manpower available for the provision of basic obstetric ultrasound services

Regarding the manpower working at the health facilities, it was identified that the largest proportion of the facilities had one doctor 45 (47.4%), one nurse 27 (28.4%), one Community Health Officer (CHO) 32 (33.7%), three Community Health Extension Workers (CHEW) 22 (23.2%) and one records officer 39 (41.1%) working in the facilities. It was however worrisome to find out that 38 (40.0%), 22 (23.2%), 28 (29.5%), 2 (2.1%), and 7 (7.4%) of the facilities did not have any doctor, nurse, CHO, CHEW, nor records officer respectively. (Figure 1).

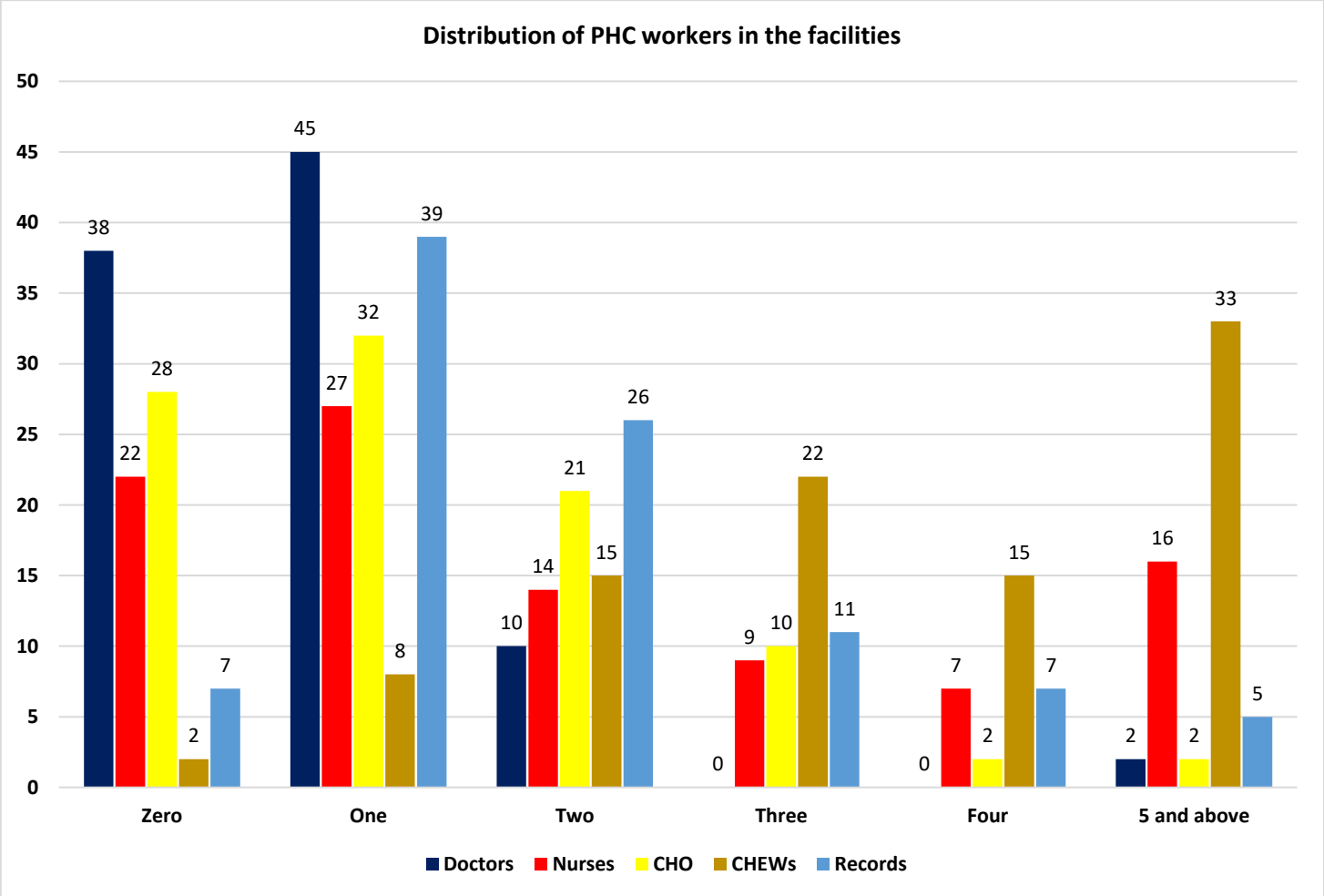

Figure 1: Distribution of the PHC workers in the various PHC facilities

Assessment of the adequacy of the various cadres of workers using the national minimum standard requirements for manpower at PHC facilities, revealed inadequacies affecting all cadres, with nurses (76%) and doctors (40%) having the highest proportions of inadequacies (Figure 2).

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI | Volume XIII Issue XV March 2026 | Special Issue on Public Health

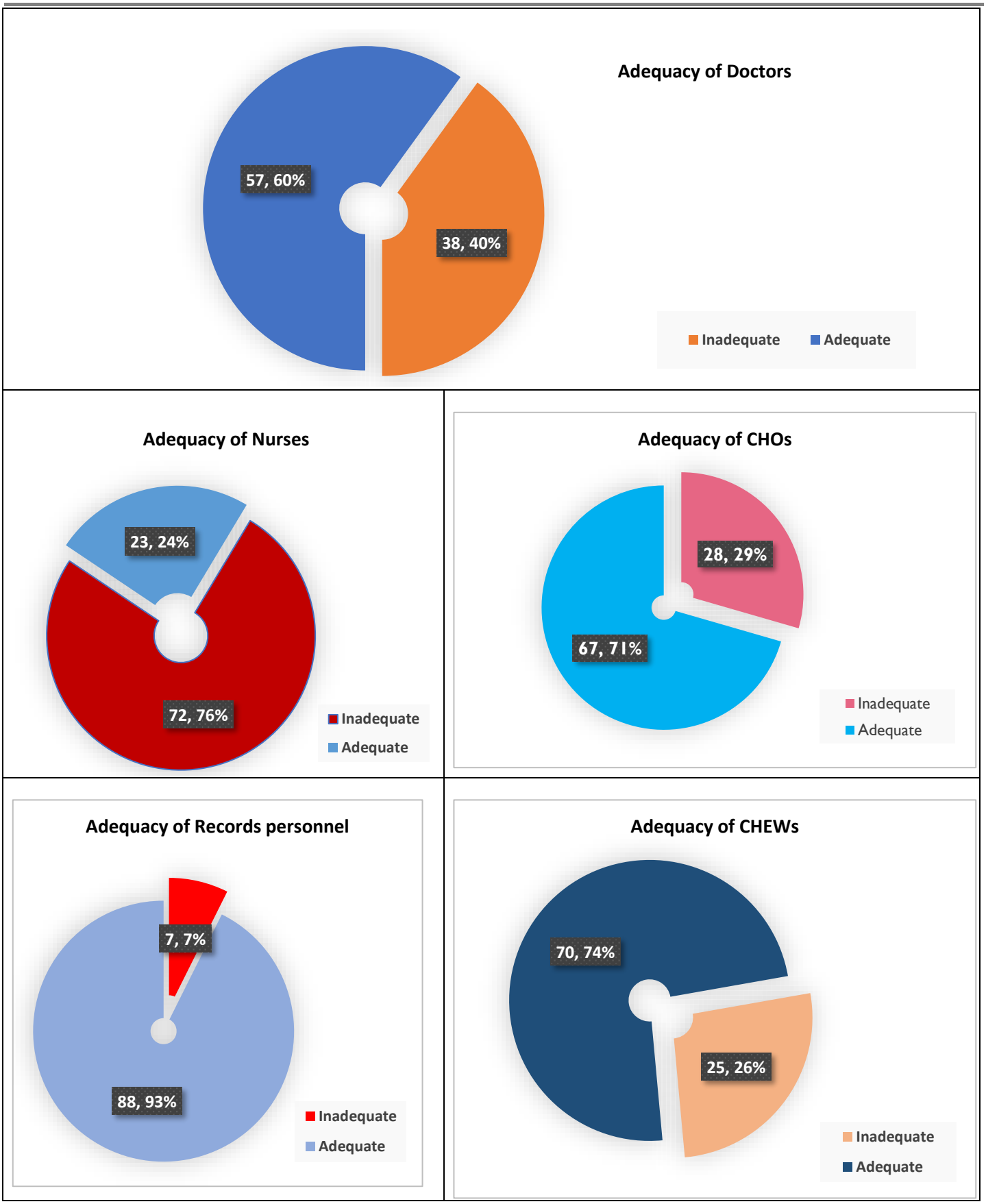

Figure 2: Adequacy of healthcare personnel to provide ultrasonography services

Equipment and material resources available for the provision of basic obstetric ultrasound services

Assessment of the 21-item necessary equipment and material resources available for the provision of basic obstetric ultrasound services revealed that only 33 (34.7%) of the 95 assessed facilities had an ultrasound

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI | Volume XIII Issue XV March 2026 | Special Issue on Public Health

scanning machine and as low as 10 (10.5%) of the facilities had the national guidelines on the use of obstetric ultrasonography as seen in Table 2. As seen in the table, no facility had all these items available.

Table 2: Equipment and Material resources for Obstetric Ultrasound

s/n	Which of the following do you have in this facility?	Number of facilities (n=95)	%
1.	Water dispensing unit	62	65.3
2.	Sanitizer	60	63.2
3.	Couch	59	62.1
4.	Bedsheets	50	52.6
5.	Covered stainless steel tray	44	46.3
6.	The ultrasound scanning monitor	38	40.0
7.	Record sheets	38	40.0
8.	The ultrasound scanning machine	33	34.7
9.	Sensitivity control devices for operating the scanning machine	23	24.2
10.	Ultrasound gel	21	22.1
11.	Scan Paper	20	21.1
12.	Serviette	20	21.1
13.	Data entry - mechanism (e.g. Registers/tablets/PCs)	19	20.0
14.	A curvilinear abdominal transducer	18	18.9
15.	Uninterrupted Power Supply (UPS)	17	17.9
16.	IEC materials (Flipcharts, Posters & Brochures for obstetric imaging	15	15.8
17.	Storage equipment for soft and/or hard copy scan results	14	14.7
18.	Printers for producing the hard copy USS results	12	12.6
19.	National guidelines on the use of obstetric ultrasonography	10	10.5
20.	A sector transducer	10	10.5
21.	Transvaginal transducers	7	7.4

An assessment of the adequacy of the above equipment and material resources required for the provision of basic ultrasonography at the PHC facilities using a 50% cut-off for categorization of availability into “adequate” and “inadequate” showed that most facilities 72 (76.0%) experienced inadequacies. Facilities within the Rivers West senatorial district had the highest levels of inadequacies 20 (87.0%) in comparison with the proportion of adequacies, while facilities within the Rivers East senatorial district had the highest levels of adequacy 14 (29.8%). (See Figures 3 and 4).

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI | Volume XIII Issue XV March 2026 | Special Issue on Public Health

Fig. 3.6: Adequacy of material resources for providing ultrasonography services across the 95 PHCs assessed

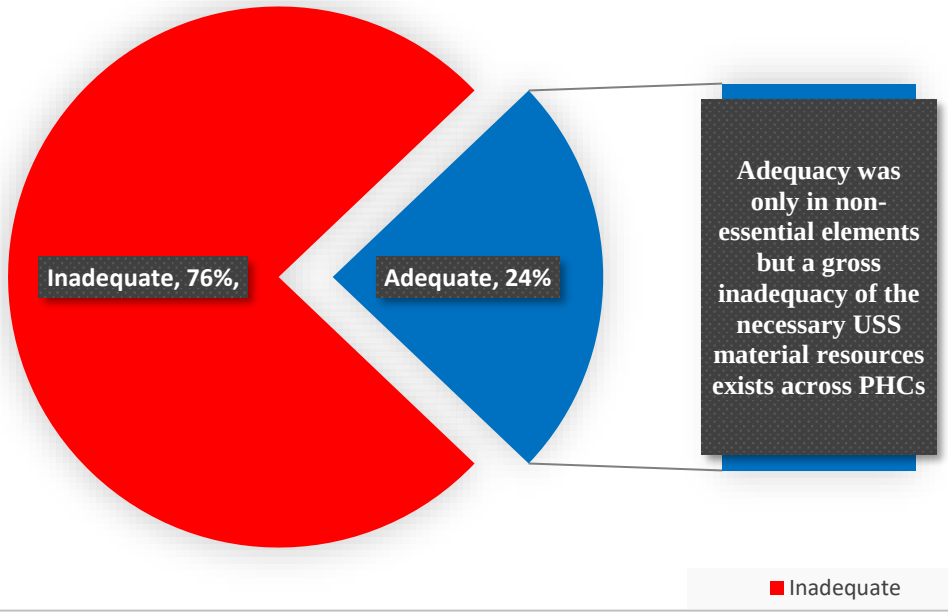

Figure 3: Chart showing the adequacy of tools to provide ultrasonography services

Fig 3.7: Adequacy of USS material resources according to Senatorial Districts

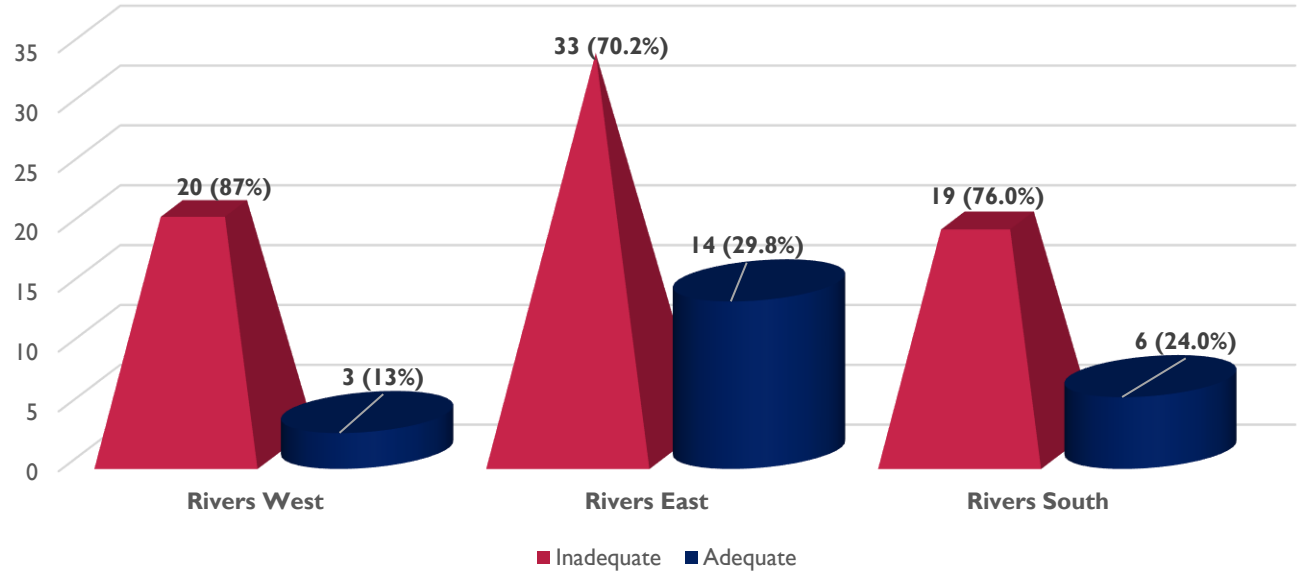

Figure 4: Level of adequacy of USS tools categorized by senatorial districts

Tables 3 and 4 respectively also show the least 20 and best 20 performing facilities with respect to adequacy of equipment and tools to provide basic obstetric imaging services.

Table 3: 20 least performing facilities (having highest levels of inadequacies of USS tools)

s/n	Performance (%)	Name of Facility	LGA of Facility
1	0.0	MPHC Ahoada	Ahoada East
2	0.0	Ulakwo MPHC	Etche

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI | Volume XIII Issue XV March 2026 | Special Issue on Public Health

3	0.0	MPHC Bonny	Bonny
4	0.0	MPHC Ihuaje	Ahoada East
5	0.0	Egwi MPHC	Etche
6	0.0	MPHC Akinima	Ahoada West
7	0.0	Ntoanoriyekirim West	Asari-Toru
8	0.0	Ikuru MPHCC	Andoni
9	0.0	PHC Mbiama	Ahoada West
10	0.0	MPHC Ihugbogo	Ahoada East
11	0.0	MPHC Ubimini	Emohua
12	0.0	MPHC Obrikom	Ogba–Egbema–Ndoni
13	0.0	MPHC Mgbuoshimini	Obio-Akpor
14	0.0	Akwa MPHC	Etche
15	0.0	Sama MPHC	Asari-Toru
16	4.8	Bori MPHC	Khana
17	4.8	MPHC Ula-Upata	Ahoada East
18	9.5	MPHC Woji	Obio-Akpor
19	9.5	MPHC Korokoro	Tai
20	9.5	MPHC Omoku	Ogba–Egbema–Ndoni

Table 4: 20 best performing facilities (having highest levels of adequacy of USS tools

s/n	**Performance score (%)**	**Name of Facility**	**LGA of Facility**
1	52.4	MPHC Elelenwo	Obio-Akpor
2	52.4	MPHC Ozuoba	Obio-Akpor
3	54.8	MPHC Beeri	Khana
4	57.1	MPHC Rumueme	Obio-Akpor
5	66.7	Unyeada MPHCC	Andoni
6	66.7	MPHC Eneka	Obio-Akpor
7	71.4	MPHC Agada I	Abua–Odual
8	73.8	Obioha MPHC	Omuma
9	73.8	CHC Degema	Degema
10	76.2	MPHC Bundu	Port Harcourt
11	76.2	MPHC Rumuokwurusi	Obio-Akpor
12	76.2	MPHC Mgbundukwu	Port Harcourt
13	76.2	MPHC Umuagbai	Oyigbo
14	83.3	MPHC Obakiri	Emohua
15	85.7	MPHC Apkajo	Eleme
16	90.5	MPHC Abuloma	Port Harcourt

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI | Volume XIII Issue XV March 2026 | Special Issue on Public Health

17	90.5	Finima PHC Bonny	Bonny
18	100.0	MPHC Churchill	Port Harcourt
19	100.0	MPHC Elekahia	Port Harcourt
20	100.0	MPHC Amadi Ama	Port Harcourt

DISCUSSION

This evaluation study on the adequacy of manpower, equipment and material resources required to provide BOIS in Rivers State identified the presence of inadequacies in these resources. Assessment of the adequacy of the various cadres of workers using the national minimum standard requirements for manpower at PHC facilities, revealed inadequacies affecting all assessed healthcare manpower cadres, with nurses being the most affected. The implication of this as was also identified in this study is that some primary healthcare facilities lacked the presence of these healthcare professionals, which would inadvertently affect the provision of BOIS within the facilities. This may be as a result of brain drain and inadequate employment of health personnel. The country is facing a lot of movement and relocation of skilled personnel in the health sector and other sectors due to many reasons ranging from insecurity, poor remuneration, brain drain, lack of continuous training, inadequate employment, amongst others. This finding corroborates findings from studies conducted by Ibrahim and colleagues. [18] Also, it was found that none of the healthcare facilities had all the necessary items prescribed by the national minimum standard requirements for manpower at PHC facilities for the provision of BOIS.[17] Occurrence of inadequacies in the infrastructural, manpower and material resources that enhance the provision of BOIS has also been reported in other studies.[9, 12] It is necessary to point out that in order to be able to effectively provide basic obstetric imaging services, all required infrastructural and material resources need to be available in the PHC facility.[12, 14] This thus buttresses the need for immediate action to equip PHC facilities in the State for effective delivery of BOIS considering the great deal of inadequacies identified in this study. This may be due to inadequate funding and poor resource allocation to meet the health needs in the various facilities. It may also be due to poor administration in the various PHC facilities leading to the mismanagement of the funds available, and issues in the supply chain. The finding from this study is also similar to findings from studies conducted by Okunlola and colleagues [19], and also Pholpark and colleagues.[20] The need to provide this essential healthcare infrastructure and manpower to render obstetric ultrasound services to pregnant women is not devoid of the prevailing maternal mortality rates reported in Nigeria and specifically in Rivers State. Despite the adoption of the SDGs in 2015, the MMR was still reported to be up to 512 deaths per 100,000 live births in Nigeria as at 2019.[1] Pregnant women in this part of the world still encounter problems accessing ultrasound examination as a result of the inadequacy or outright absence of necessary infrastructural and manpower resources to provide these services especially at the PHC level.[12] These problems alongside other facility- and patient-related factors have also been associated with the occurrence of high MMRs.[14, 21] These serve as important implications of the findings of inadequacies of resources for BOIS provision made in this study. In order to improve the MMR in Rivers State and Nigeria at large, more attention should be given to tackling the problem of maternal deaths at the primary health care level. This can be achieved by strengthening antenatal care interventions[6], improving manpower capabilities through regular training and retraining, provision of health education[19], making it possible for pregnant women to have an ultrasound scan done at the PHC especially before 24 weeks of the pregnancy[8], among other interventions.[22]

In this study, it was identified that more than half of the assessed PHC facilities had an inadequacy of nurses which could grossly affect the ability of the facility to provide the required healthcare services. It should be noted that well-trained midwives have been reported to be able to provide as much as 87% of all necessary sexual, reproductive, maternal and newborn healthcare services.[22] This may be due to poor distribution of health workforce to the various PHC facilities, and unavailability of skilled health personnel.[19] It is thus crucial that this manpower gap in nurses and other PHC professionals is immediately tackled to contribute in improving health outcomes in Rivers State. The implication of this finding is that problems of inadequate healthcare manpower can result in the experience of delayed diagnoses of obstetric problems and other pregnancy complications, which could result in the death of the mother and/or child and further worsen maternal and child mortality problems.[4, 8, 22] In situations where these mothers are major income providers in their respective

families, their death can severely affect family finances, education of dependents, access to paid healthcare among other problems. Their demise also creates a lacuna in the psychological and emotional health of family members especially their children[4] A solution to this problem of healthcare manpower inadequacies can be the adoption of task shifting and sharing which involves training PHCWs especially medical officers and midwives on basic obstetric imaging services.[14] Thus, once trained effectively and the PHC facilities are equipped with the necessary equipment for providing basic ultrasound imaging services, access to the service is improved which further contributes in reducing maternal and fetal morbidities and mortalities in poor resource settings and hard-to-reach areas in line with the SDG 2030 goals.[14] It is crucial to ensure an even distribution of these resources for BOIS provision to rural and hard-to-reach areas as well as encouraging the retention of these services in these areas for prompt diagnosis and treatment of maternal problems that could arise.[1, 22]

This study addresses a relevant topic about a critical gap in maternal healthcare with regards to manpower and available resources for obstetric imaging in primary health care facilities. It aligns well with WHO recommendations and maternal health guidelines. While this study has a strong public health impact as discussion links the findings to maternal mortality and need for improved care across PHC facilities, it was however, limited, because it was purely descriptive in nature. Reasons being that this study was an assessment of the baseline state of the PHC facilities. We therefore recommend future studies to incorporate the inferential component in the statistical analyses.

CONCLUSION

This study concludes that the manpower, equipment and material resources necessary for the provision of basic obstetric imaging services (BOIS) in PHC facilities in Rivers State was inadequate. It is recommended that:

- Agencies of government in Rivers State and all other concerned stakeholders of maternal healthcare should ensure the provision and even distribution of the necessary resources (infrastructure, manpower, materials) for the provision of basic obstetric imaging services to the Rivers State populace.

- In-service training of PHC workers on quality maternal healthcare service delivery should be carried out regularly to improve on the skills and competencies of the health workers to effectively provide basic obstetric imaging services.

- Considering the prevailing shortages in healthcare manpower to adequately provide BOIS, task-shifting and task-sharing initiatives can be adopted to develop the capacity of other cadres of primary healthcare workers in the use of the obstetric ultrasound to provide BOIS at the PHC level in Rivers State.

- Improvement on staff remuneration is also a key recommendation in solving the issues on manpower gap.

Author Contributions: S.B.D.: Writing—original draft, conceptualization, methodology, resources, formal analysis, investigation, visualization. J.T.W.: conceptualization, methodology, resources, formal analysis. P.I.D.A.: Writing—original draft, conceptualization, methodology, resources, formal analysis, investigation, visualization. T.N.A.: supervision, resources, review and editing, project administration. B.N.D.: supervision, resources, review and editing, project administration. A.C.O.: conceptualization, resources, project administration. All authors have read and agreed to the published version of the manuscript.

Funding: The fieldwork for this research received no specific grant from any funding agency in the public, commercial, private, or not-for-profit sectors.

Data Availability Statement: Not applicable.

Acknowledgments: The authors wish to thank Benson Ephraim-Emmanuel, Mabel Ekpo for their advice and technical assistance.

Conflicts of Interest: The authors declare no conflict of interest.

Abbreviations

BOIS	Basic Obstetric Imaging Services
CHO	Community Health Officer
CHW	Community Health Worker
PHC	Primary Health Care
PHCW	Primary Health Care Workers
MMR	Maternal Mortality Ratio
RSPHCMB	Rivers State Primary Health Care Management Board
RSHMB	Rivers State Hospital Management Board
RSHREC	Rivers State Health Research Ethics Committee
SDG	Sustainable Development Goals
SPSS	Statistical Package for Social Sciences
USS	Ultrasound scan

REFERENCES

1. Woko CN, Essi ID, Wegbom Ai. Estimating The Predictors Of Maternal Mortality In A Southern State Of Nigeria Using Logistic Regression Model. African J Math Stat Stud 2021; 4: 79–88.
2. Kruse C, Betancourt J, Ortiz S, et al. Barriers to the use of mobile health in improving health outcomes in developing countries: systematic review. J Med Internet Res 2019; 21: e13263.
3. Olamijulo J, Olorunfemi G, Osman H, et al. 44-Year Temporal Trends and Causes of Maternal Mortality at the Lagos University Teaching Hospital, LUTH, Lagos, Nigeria (1976-2019). J Clin Pract 2023; 26: 1273–82.
4. Chinwah V, Nyame-Asiamah F, Ekanem I. Risk factors affecting maternal health outcomes in Rivers State of Nigeria: Towards the PRISMA model. 2020.
5. Alexander DA, Northcross A, Karrison T, et al. Pregnancy outcomes and ethanol cook stove intervention: A randomized-controlled trial in Ibadan, Nigeria. Environ Int 2018; 111: 152–163.
6. Tunçalp Ö., Pena-Rosas JP, Lawrie T, et al. WHO recommendations on antenatal care for a positive pregnancy experience-going beyond survival. Bjog,. BJOG 2017; 124: 860–862.
7. Holmlund S, Ntaganira J, Edvardsson K, et al. Improved maternity care if midwives learn to perform ultrasound: a qualitative study of Rwandan midwives' experiences and views of obstetric imaging. Glob Health Action 2017; 10: 1350451.
8. World Health Organization W, United States Agency for International Development U. WHO Recommendations on Antenatal Care for a Positive Pregnancy Experience: Summary. Highlights and Key Messages from the World Health Organization ' s 2016 Global Recommendations for Routine Antenatal Care. Epub ahead of print 2018. DOI: 10.1186/1742-4755-10-19.5.
9. [de Masi S, Bucagu M, Tunçalp Ö, et al. Integrated person-centred health care for all women during pregnancy: Implementing World Health Organization recommendations on antenatal care for a positive pregnancy experience. Glob Heal Sci Pract 2017; 5: 197–201.
10. Roro MA, Aredo AD, Kebede T, et al. Enablers and barriers to introduction of obstetrics ultrasound service at primary care facilities in a resource-limited setting: a qualitative study in four regions of Ethiopia. BMC Pregnancy Childbirth 2022; 22: 1–9.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI | Volume XIII Issue XV March 2026 | Special Issue on Public Health

11. Ghi T, Eggebo T, Lees C, et al. ISUOG Practice Guidelines: intrapartum Ultrasound. Ultrasound Obs Gynecol 2018; 52: 128–139.
12. Shah S, Bellows BA, Adedipe AA, et al. Perceived barriers in the use of ultrasound in developing countries. Crit Ultrasound J 2015; 7: 1–5.
13. Nathan RO, Swanson JO, Swanson DL, et al. Evaluation of focused obstetric imaging examinations by health care personnel in the Democratic Republic of Congo, Guatemala, Kenya, Pakistan, and Zambia. Curr Probl Diagn Radiol 2017; 46: 210–215.
14. Mubuuke AG, Erem G, Nassanga R, et al. Point of care obstetric ultrasound training for midwives and nurses: implementation and experiences of trainees at a rural based hospital in Sub-saharan Africa: a qualitative study. BMC Res Notes 2023; 16: 287.
15. Luntsi G, Ugwu AC, Ohagwu CC, et al. Impact of ultrasound scanning on pregnant Women's compliance with attendance at antenatal care visits and supervised delivery at primary healthcare centres in northern Nigeria: Initial experiences. Radiography 2022; 28: 480–486.
16. Noguchi L, Bucagu M, Tunçalp Ö. Strengthening antenatal care services for all: implementing imaging ultrasound before 24 weeks of pregnancy. BMJ Glob Heal 2023; 8: e011170.
17. National Primary Health Care Development Agency. Minimum standards for Primary Health Care in Nigeria. 2021.
18. Ibrahim Ha. Inadequate Human Resources And Their Effect On The Service Delivery Of Adamawa State Primary Health Care Development Agency. Ayden International Journal of Law, Political Science, and Administration. 2024 Sep 20;12(3):1-0.
19. Okunlola KA, Oreofe I, Ohaeri B, Babarimisa O. Challenges facing primary health care services utilization and possible solutions. Euro Global Contemporary Studies Journal (EGCSJ). 2025;5(2):1-2.
20. Pholpark, A., Mon, H. M., Lim, L. T., Tsilaajav, T., de Oliveira Cruz, V., & Hanvoravongchai, P. (2025). Challenging inadequate and fragmented primary health care financing: findings from Bangladesh, Indonesia, Maldives, and Nepal. The Lancet Regional Health-Southeast Asia, 38.
21. Awoyesuku P., MacPepple D., Altraide BO. Magnitude , Trends and Causes of Maternal Mortality: A 7-year Review at a Tertiary Hospital in Rivers State, Nigeria. J Adv Med Med Res 2020; 32: 103–109.
22. [Tefera M, Mezmur H, Jemal M, et al. Health professionals ' perspectives on the role of obstetric ultrasonography in maternity care in rural eastern Ethiopia: a qualitative descriptive study. BMJ Open 2024; 14: e075263.