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Knowledge of the Use and Indications for Obstetric Ultrasound Scan among Women Attending A Main Referral Hospital, Sokoto, Nigeria

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Abstract **Background:** Routine obstetrics ultrasonography has become one of the most important advances in modern antenatal care. During pregnancy, health care practitioners usually request for routine ultrasound scanning or specifically when there are special indications. **Objective:** To assess the knowledge of the use and the various indications for obstetrics ultrasound scanning. **Setting:** women of child bearing age attending Antenatal clinic (ANC),Family planning and Child Health clinics of the Usmanu Danfodiyo University Teaching Hospital, Sokoto Nigeria **Participants:** proportional allocation was done to recruit 202 respondents from ANC, Family planning and Child Health clinics based on daily clinic attendance. A semi-structured questionnaire sought to obtain information on socio-demographic characteristics, knowledge and practice of ultrasound. **Results:** majority, (96.4%) of the respondents had good knowledge of ultrasound and its uses with a mean knowledge score of 86.3±17. Main reason for having a scan was to check the state of the fetus (38%); a total of 28.3% of the respondents had previously been given false information from the scan results mostly about the expected date of delivery (EDD). **Conclusion:** Although, majority of the respondents had good knowledge of ultrasound some of them still harbored fears about the safety of the procedure to the fetus and mother. There is the need for continuous education of the general public who are the end users of ultrasound scanning to allay their fears and misperceptions concerning the safety of the procedure. Training and retraining of sonologists also need to be intensified to reduce the incidence of false information to clients.

Keywords Knowledge, Practice, Indications, Obstetrics Ultrasonography

1. Introduction

Routine obstetric ultrasound has been considered one of the factors that improved antenatal care and outcome of pregnancy worldwide[1,2,3,4]. Although, the access to and utilization of this technology is not universal in developing countries, however, it has potential to reach all parts of the low income areas due to its user friendliness, high sensitivity and specificity, safety and is more relatively cheap to maintain than other forms of technology[5,6].

In Nigeria, the use of obstetric ultra-sonography is on the rise, however, there are mal-distribution within and between the different parts of the country with its impact less felt among the rural areas largely due to lack of basic infrastructure such as power and skilled health workers[7]. Moreover, the utilization of ultrasound may be hampered by literacy level of women especially in Sokoto state where adult female literacy rate stood at 30% and this might be contributory to the low (40%) ante-natal service utilization[7] which would have availed pregnant women an opportunity for ultrasound scan[8]. Furthermore, despite the documented merits of using obstetric ultrasound in developing countries[9,10,11,12], it is important to note that there were misconceptions from health care users and providers with potential for grave consequences[4,13]. The ultrasound experience among women varies from comforting the pregnant woman about the well-being of the fetus, to convincing them to adopt behaviors and practices that will ensure healthy growth and development of the fetus thereby facilitating early bonding[14,15]. The commonest expectation women have from routine scans such as fetal sex and the expected date of delivery ultrasound[16,17] seem to have over shadowed the medical and obstetric indications for scanning with many women citing fetal sex and the expected date of delivery as the main reason for obstetric ultrasound making them less prepared to cope with negative findings[14] or how to deal with a false negative scan[18]. Thus when

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pregnant women lack factual information on the strengths and limitations of obstetric ultrasound, they are likely to adopt attitudes and behaviors that could adversely affect their exploitation of this technology and such misperception may be passed to other potential users which may undermine the proactive use of this technology. In order to develop positive health messages regarding the use of obstetric ultrasound, there is need to first identify knowledge gaps among users in order to develop messages that will not only address observed gaps but to identify the most appropriate medium to reach the majority of potential users based on their identified common characteristics which this study aims to achieve. Hence the theoretical framework for this study was based on the theory of reason action (TRA) that presupposes humans are rational and that the behaviors being explored are under volitional control, thereby providing a construct that links individual beliefs, attitudes, intentions, and behavior[19]. The TRA model underscores the need to first understand audience behavioral, normative and control beliefs that influence their intention to adopt or act in a desired behavior which will then guide the development of health messages that will persuade them to change these beliefs. This study is aimed at assessing the knowledge of the use and the various indications for obstetrics ultrasound scanning amongst women attending the main referral tertiary hospital in Sokoto, Nigeria.

2. Methodology

This study was carried out among women of child bearing age attending Ante Natal (ANC), Family Planning and Child Health clinics of the Usmanu Danfodiyo University Teaching Hospital (UDUTH) Sokoto. It is a tertiary health institution with 850 bed capacity, serving as referral center to several hospitals within the North-Western region of Nigeria. It offers general and specialty services to patients at the General outpatient department (GOPD) and various specialty outpatient clinics in various departments. The hospital has a radiology department which offers ultrasound services to patients requiring it, but there is need to emphasize that the hospital serves both urban and rural communities and registration for any ailment (including antenatal care and delivery) is unrestricted. Patient are charged according to services rendered - user fee charges.

The study was a descriptive cross-sectional design carried out between February and March 2012. The study population comprised women of reproductive age attending Ante Natal (ANC), Family Planning and Child Health clinics of Usmanu Danfodiyo University Teaching Hospital (UDUTH) Sokoto. All women who had ever been pregnant were eligible to participate in the study (Inclusion criteria).

The desired sample size of 202 was calculated using the formula for populations greater than 10,0000 which is denoted as $n = z^2pq/d^2$[20], where n is the minimum desired sample size, Z as the standard normal deviate at alpha probability (1.8), P the prevalence (12%) from previous study[21], q as 1- p (1- 0.185=0.815) and d as the critical level (0.05). a total of 202 respondents were recruited into the study. Proportional allocation was done to recruit respondents from ANC, Family Planning and Child Health clinics based on daily clinic attendance. The individual respondents were selected from the list of attendees (sampling frame) using table of random numbers on each scanning day until the minimum desired sample size was attained. Participants were duly informed on the objectives of the study, that participation is voluntary and that they can opt out or refuse to answer any question during the course of interview, informed verbal consent was obtained from the participants before the commencement of the administration of the study instrument.

The instrument of data collection was a set of semi structured questionnaire, containing 3 sections which sought to obtain information on respondents' socio-demographic characteristics, knowledge and practice of ultrasound. The questionnaires were administered by three of the authors after obtaining informed consent from the respondents. A total of 195 questionnaires were found to be suitable for analysis giving a response rate of 96.5%.

The questionnaires were entered into SPSS version 18 statistical software and were subsequently analysed. Analysis of data started with description of data using mean and standard deviation for quantitative variables, counts and frequencies for qualitative variables. Questions on the use and indications for ultrasound scan were used to assess the respondents' knowledge, each correct response attracted one mark and zero was awarded for a wrong answer. A score of 50% and above was considered good knowledge while a score less than 50% as poor knowledge[22]. The assumption that the educational status of respondents has no influence on the knowledge of the use and indications for obstetric ultrasound scan among women attending a main referral hospital, Sokoto, Nigeria will be investigated using multivariate analysis with alpha level set at 0.05. Ethical approval for this study was obtained from the ethical committee of the Teaching hospital.

3. Results

The ages of the respondents ranges from 18 -40 years with a mean age of 27 ± 4.8years while the mean number of children per respondent was 3 ± 1.9 and the mean number of scans per respondent was 3 ± 2.6. One hundred and four (53.3%) of the respondents had tertiary level education while 11(5.6%) had only primary level education and most of them (35.9%) were house wives. Majority of the respondents (87.2%) had less than 5 children and 41.0% ever had 5 or more scans

The mean knowledge score was 86.3 ± 17.0 Majority, (96.4%) had good knowledge score for use and indications for USS in pregnancy. Among the responses given 31.3% felt too many USS are harmful to the baby while 13.8% also felt it could lead to cancer.

Table 1. Socio-demographic data

Variable	Frequency (%)
Age	
15 - 24	61 (31.3%)
25 - 34	120 (61.5%)
35 - 44	14 (7.2%)
Mean Age =26.9 ± 4.8years	
Educational status	
Primary	11 (5.6%)
Secondary	72 (36.9%)
Tertiary	104 (53.3%)
Quranic	8 (4.1%)
Religion	
Islam	132 (67.7%)
Christian	63 (32.3%)
Occupational status	
Student	41 (21.0%)
Housewife	70 (35.9%)
Business	38 (19.5%)
Civil servant	46 (23.6%)
Parity	
< 5 children	170 (87.2%)
≥ 5 children	25 (12.8%)
Mean parity = 3 ± 1.85	
Pregnancy status	
Pregnant	136 (69.7%)
Not Pregnant	59 (30.0%)
Frequency of scans	
< 5	154 (79.0%)
≥ 5	41 (21.0%)

Table 2. knowledge of the uses and indications of Ultrasound scan in Pregnancy

Variable	Yes No (%)	No No (%)
To assess gestational age	178 (91.3%)	17 (8.7%)
To show presentation of the baby	183 (93.8%)	12 (6.2%)
To determine lie of baby	175 (89.7%)	20 (10.3%)
To estimate the EDD	186 (95.4%)	9 (4.6%)
To locate placenta position	174 (89.2%)	21 (10.8%)
To detect cord round the neck	150 (76.9%)	45 (23.1%)
To see abnormalities in the womb of the mother	162 (83.2%)	33 (16.9%)
Too many USS are harmful to the baby	61 (31.3%)	134 (68.7%)
USS can lead to cancer	27 (13.8)	168 (86.2%)

Table 3. Source of information about Ultrasound

Source of information	No (%)
Media (Radio / Television	13 (6.7%)
Health talk in hosp	141 (72.3%)
Friends/relations	27 (13.8%)
Read about it	14 (7.2%)

About three quarters of the respondents got their information during health talks in the hospital and only 6.7% got their information from the media.

Table 4. Uses and reasons for obtaining an Ultrasound scan

Who requested for the last USS	No (%)
Doctor	160 (83.3)
Myself	23 (12.0)
Husband	9 (4.7)
Reasons for the request	
To know sex of baby	14 (7.3)
To know EDD	57 (29.7)
To know baby's viability	73 (38.0)
Routine	48 (25.0)
Reasons for the scan	
Am looking for a particular sex	3 (13.0))
My husband has a preferred sex	4 (17.4)
I need to know sex to start buying wares for the baby	16 (69.6)
Pressure from Husband on sex of baby	
Yes	13 (6.7)
No	182 (93.3)
False information from scan results	
Yes	55 (28.2)
No	140 (71.8)
The false information	
About sex of baby	6 (10.9)
About EDD	40 (72.7)
About abnormalities in baby	2 (3.6)
About abnormalities in womb	7 (12.7)
Asked questions during the scan	
Yes	88 (45.8)
No	104 (54.2)
Response of sonographer	
Friendly	64 (72.7)
Helpful	21 (23.9)
Unfriendly	2 (2.3)
Indifferent	1 (1.1)

The main reason for having a scan in pregnancy (38%) was to check the state of the baby and in majority of cases (83.3%) the scan was requested by the doctor.

A total of 28.3% of the respondents have previously been given false information from the scan results, mostly about the expected date of delivery (EDD)72.7%.

A one between groups MANOVA was conducted to examine level of educational differences with respect to the participants' knowledge on the use and indications for obstetric ultrasound scan. Two dependent variables were used namely Knowledge score and adequacy of knowledge while the independent variable was the level of educational attainment of the participants. The test for assumptions for MANOVA were performed and both the Box's *M* test of equality of covariance matrices was significant - F (6, 6.893) = 43.26, p <. 001; and the Levenes test of equality of error variances was also significant - F (3) = 11.55, p <. 001 and multivariate test of significance will be interpreted not only based on Wilks' Lambda but also with Pillai's Trace significant values since our sample size (N=195) is large[23]. There was significant statistical difference on participant's knowledge on the use and indications for obstetric ultrasound scan in relation to the participants level of educational attainment on the two dependent variables

(Knowledge score and adequacy of knowledge): F (6, 380) = 2.24, p = . 039 (Wilks' Lambda); F (6, 382) = 2.21, p = 0.041 (Pillai's Trace). The partial eta squared was 0.03 representing 3% of the variance in participant's knowledge on the use and indications for obstetric ultrasound scan as the impact (effect size) of the differences in the educational level (table 5).

Looking at the results of the dependent variables separately (Knowledge score and adequacy of knowledge) to review the statistical significance using a Bonferroni adjusted critical/alpha level of 0.013, participant's knowledge on the use and indications for obstetric ultrasound scan was F (1, 191) = 4.312, p = . 006 and partial eta of 0.06 moderate effect size of education level on participants level of knowledge (Table 6) and thus hypothesis confirmed.

4. Discussion

In this study, the mean age of the respondents was 26.9±4.8 yrs. This is similar to the mean age recorded in the United Kingdom[24] but lower than 30.1 years recorded in Ibadan, South west Nigeria[25]. The mean age recorded in our may not be unrelated to the fact that in the study area females marry early with the median age of marriage being 15.6 years[7].

Table 5. Determinant of knowledge of participants

Multivariate Tests[c]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	,903	8,802E2[a]	2,000	190,000	,000	,903
	Wilks' Lambda	,097	8,802E2[a]	2,000	190,000	,000	,903
	Hotelling's Trace	9,265	8,802E2[a]	2,000	190,000	,000	,903
	Roy's Largest Root	9,265	8,802E2[a]	2,000	190,000	,000	,903
Education level	Pillai's Trace	,067	2,213	6,000	382,000	,041	,034
	Wilks' Lambda	,933	2,235[a]	6,000	380,000	,039	,034
	Hotelling's Trace	,072	2,257	6,000	378,000	,037	,035
	Roy's Largest Root	,069	4,387[b]	3,000	191,000	,005	,064

a. Exact statistic

b. The statistic is an upper bound on F that yields a lower bound on the significance level.

c. Design: Intercept + NEduStatus

Table 6. Tests of Between-Subjects Effects

Source	Dependent Variables	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Knowledge adequacy	,511[a]	3	,170	2,167	,093	,033
	Knowledge score	3564,867[b]	3	1188,289	4,312	,006	,063
Intercept	Knowledge adequacy	55,075	1	55,075	700,959	,000	,786
	Knowledge score	486114,752	1	486114,752	1,764E3	,000	,902
NEduStatus	Knowledge adequacy	,511	3	,170	2,167	,093	,033
	Knowledge score	3564,867	3	1188,289	4,312	,006	,063
Error	Knowledge adequacy	15,007	191	,079			
	Knowledge score	52632,313	191	275,562			
Total	Knowledge adequacy	178,000	195				
	Knowledge score	1507030,000	195				
Corrected Total	Knowledge adequacy	15,518	194				
	Knowledge score	56197,179	194				

a. R Squared = ,033 (Adjusted R Squared = ,018)
b. R Squared = ,063 (Adjusted R Squared = ,049)

The respondents in this study knew the uses and indications for Ultrasound as majority (96.4%) of them had good knowledge, obtaining more than 50% of the scores for knowledge. This is not surprising considering the fact that majority, (95.8%) of the subjects had formal education, but is suggestive of the possibility of selection bias[26] because the formal education might have multiple influence on participants level of knowledge of services (including USS) available in the study center, affordability of these services since education partly determines socioeconomic gradient and the ability to understand health talks provided by health care providers[27]. Formal education has severally been found to influence the opinion and experience of pregnant women on the reasons and benefits of obstetric ultrasound utilization[16].

Participants' commonest source of information on the use and benefits of ultrasound was from health workers (72.3%) who conduct health talk for all cases of newly booked cases/pregnancies. The health workers usually take advantage of the high turnout of patients in clinics to give health talks on important health issues with opportunity for participants to ask questions for further clarification on their specific knowledge needs and therefore accounts for health talk being the commonest source of information about ultrasound. This is in contrast to the findings in Tanzania[28] and Uganda[29] that reported the commonest source of information was family, friends and mass media. Although no reported comparison was made on accuracy of the sources of information, however, information from family and friends are likely to be speculative and has minimal scientific basis, while information from the media might be generalized and less client/patient specific; this could further explain the lower levels of participants knowledge in the Ugandan and Tanzanian studies compared to our findings.

As it is with most diagnostic procedures, the fear of side effects of ultrasound on the mother or child cannot be ruled out. Some of our respondents were of the opinion that too many exposures to ultrasound are harmful to the body or could lead to cancer. These opinions are in total agreement with the findings from similar studies in Uganda and Tanzania where their subjects expressed feelings about their safety and that of their babies due to over exposure to scan[28,29] and hence underscored the need for including safety issues in the health talks provided in the study center.

Majority (83.3%) of the participants were referred for ultra-sonography by their clinicians. This is in contrast to the findings in the North eastern part of Nigeria where all participants were referred by the clinicians[21], but in agreement with the findings from the Lagos University teaching Hospital[30]. Plausible reason that might explain the observed differences from different parts of Nigeria is the fact that the North eastern region has the lowest female and all adult literacy rates compared to the other parts of the country and therefore likely to have lower health literacy which accounted for the reason that no participant made request for obstetric ultrasound or had initiation to ask for information on the growth and development as observed in other studies[16,17] or on the sex of their fetus as was reported from some parts of the North western Nigeria[31]. The commonest reason why the study subjects were referred for ultrasound was to assess the fetal viability. As a diagnostic tool, ultrasound facilitates the accurate estimation of gestational age, assesses fetal viability and enables checks to be made for multiple gestation and abnormalities[11]. Findings from previous studies have collaborated the use of ultrasound to determine the baby's viability[21,25,28,29]. In the study from Tanzania, the respondents reported that "viewing the baby moving in the womb was the most enjoyable feature of the ultrasound as it was pleasurable, confirmed life and pregnancy and brought some closeness with their baby"[28]. Similar feelings were expressed by women from other study centers[5,9,14]. The importance placed on the assessment of fetal viability by most women may not be unrelated to the general anxiety among pregnant women in different settings that is devoid of their educational status, parity and race[31,32]. As observed by Enakpene and colleagues, the assessment of fetal viability may just be the reason why the woman and her immediate family members eagerly look forward to pregnancy confirmation after her missed menstrual periods in a society that hinges matrimonial success on the conception and eventual delivery of a live baby[25].

Among the many reasons why most women request for ultrasound scanning in pregnancy is to know the sex of the baby. Sex determination has received serious attention in many countries of the world. Laws barring sex determination do exist in some countries while in others, like Nigeria, sonologists are not under any obligations to withhold information regarding the sex of the baby. Findings from this study showed that only 7.3% of the women requested to know the fetal sex during the scanning. This is in consonance with findings from other centers where, 2%, 11.5% and 22.6% of their subjects respectively requested to know the fetal sex during scanning[25,30,34]. However our findings are in contrast to findings from other studies where more than half of their study participants requested for fetal sex determination[14,29]. The few women in our study who requested for fetal sex determination may not be unrelated to the socio-cultural beliefs in the study area where majority are Muslims and have strong beliefs in whatever God has willed unto one. In a separate study, it was observed that women from this study area could not have asked for sex determination during ultrasound due to shyness among Hausa and Fulani women, especially if the sonologist was a male[31]. It has been observed that revealing the fetal sex during obstetrics scans raises several psychological, legal and ethical dilemmas especially when sexes are falsely assigned[29]. This could result in dare consequences for the woman and families which could result in litigations against the sonologist/sonographer and the hospital. In their study from Syria, Bashour and his colleagues had proposed that avoidance of incorrect diagnosis was the reason for refusal by some doctors to inform their patients of the fetal sex in Syria[14].

In most African societies including Nigeria, the coming of a new baby brings a lot of anxiety which is often associated with the prospective name the child would bear, the gender balance in the family, the urgent need for a male child (perceived heir apparent) and the possibility of acquiring another wife to bore the desired sex for the man if he had no male child previously.

More than half of the women who requested for ultrasound wanted to know the fetal sex so as to start purchasing baby items. This is in consonance with findings from a similar study carried out among women attending the Antenatal clinics at the Thai-Burmese border[35].

In this study, only 6.7% of the women admitted to being under pressure about a particular sex of baby, usually a male. Parents' gender preferences for children are often embedded in cultural and religious traditions and community norms, shaping individual attitudes and behaviors. Children of a particular sex are often desired in order to provide certain utilities or to minimize financial or psychological costs[36]. In traditional societies, male children are presumed to have greater economic net utility than daughters, since they provide assistance in agriculture as well as a primitive social security system[37]. Arnold finds a high persistence of son preference even in the face of rapid modernization in developing countries[38]. In different parts of Nigeria, when the desire for a particular sex especially a male child is not met, serious consequences are abound including non fulfillment of family roles, outright divorce for the woman, or the addition of more wives and sometimes out right refusal to sleep with the woman for fear of pregnancy resulting in another female child.

Findings from our study showed that majority of women had less than five scans with a mean scan of 3 per woman. The mean number of scans per woman recorded in our study is consistent with findings observed in the study from the United Kingdom where the mean scan was 2.6 per woman [24]. However, it is in contrast to the study carried out in Vietnam where the mean scan was 6.6 per woman[4]. The frequency of scanning invariably depends on the gestational age at booking and also on health status of the mother and fetus.

Ultrasound scan in recent times has been enjoying considerable use in the health sector with medical professionals agreeing to its importance in aiding diagnosis. However, of late there has been some concern associated with its use especially as it relates to its reliability when it yields wrong and sometimes ambiguous results.

In this study, 28.2% of the subjects opined that they were given false information including information about expected date of delivery (EDD), abnormalities in the womb and in the child among others. In agreement with the findings from our study, Gonzaga in an exploratory study of the views of Ugandan women and health practitioners on the use of sonography to establish fetal sex, observed that most of his respondents expressed some reservations about some scan results[29]. The use of ultrasound in obstetrics has become commonized and profit oriented in Nigeria that practitioners no longer need to undergo any formal training thus questioning the reliability of results from such practitioners. This lack of adequate training on the use of ultrasound could have accounted for the number of subjects in our study (28.2%) who reported receiving negative information during scanning.

Such information could have serious psychological effects on the mother especially for those seeking a particular sex of baby. The woman who goes for scanning has several expectations and worries that need to be clarified by practitioners. However, in most settings the practitioners probably out of ignorance or being over whelmed by the number of patients to be scanned, most often than not, would not answer to most questions posed by the women and this has seriously influenced patients' perception of the health worker. This underscores the need for the health worker to be properly trained on interpersonal communication skills to ensure that the health worker communicates with patients effectively which will in turn ensure patient satisfaction with services rendered. In our study, about a quarter of the women asked questions with majority, (72.7%) observing that the practitioners were friendly in their response.

5. Conclusions

The use of obstetric sonography has become a veritable tool in prenatal care. The high knowledge exhibited by the study subjects shows the wide acceptability of ultra-sonography in modern day health care delivery system.

However, there is the need to train and retrain sonologists to place them in a better position to deliver effective services. This will go a long way in reducing incidents of false information that sometimes have devastating psycho-social effects on clients.

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Conflict of Interest

The authors declare no conflicts of interest.

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