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UTILISATION OF OBSTETRIC ULTRASOUND AT THE HO TEACHING HOSPITAL IN GHANA

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Abstract

Introduction. Although obstetric ultrasound (US) is routinely performed at the Ho Teaching Hospital (HTH), no study has been conducted to examine trends in its clinical application.

Methods. A retrospective analysis of 763 obstetric US examinations performed at the HTH was conducted. Maternal age, clinical history, cardiac activity and clinical findings were recorded. For the first trimester cases, data on crown rump length (CRL) and foetal cardiac activity were extracted for cases with foetal pole(s), whereas data on gestational sac diameter (GSD) were extracted for cases without foetal pole(s). Data on placentation were extracted for second and third trimester cases. However, data on foetal presentation were extracted for third trimester cases only. The variables were entered into the Statistical Package for Social Sciences (SPSS) software version 25 for analyses.

Results. The ages of the pregnant women ranged between 14-48 years (mean = 30±6.4 years). Of the patients, 741 (97.1%) had singleton pregnancies, and 22 (2.9%) had twin gestations. For the twin gestations, nine (40.9%), seven (31.8%) and six (27.3%) were dichorionic diamniotic, monochorionic diamniotic and monochorionic monoamniotic respectively. The number of first, second and third trimester cases were 351 (46%), 125 (16.4%) and 287 (37.6%) respectively. Among the first trimester patients, the mean CRL was 29.0 ± 21.7mm, and the mean GSD was 12.8±6.0mm. The majority of the US findings (646, 83.5%) were normal. However, foetal cardiac activity was assessed in 694 of the pregnant women, of whom 48 (6.9%) had no cardiac activity. In all, 64 (8.3%) patients had myomas, and 16 (2.1%) were diagnosed with oligohydramnios. Among the 412 second and third trimester patients, five (1.2%) had praevia whereas 52 (12.6%) had fundal placentation. On foetal presentation, 52 (18.1%) of the 287 third trimester cases had breech presentations.

Conclusion. The ages of women who presented for an obstetric US at the HTH fell within the lower risk range of maternal age. Majority of the obstetric US scans were normal, although some recorded placenta praevia, amniotic fluid abnormalities and breech presentations. Our study revealed a greater prevalence of absent foetal cardiac activity than other studies. This could possibly expose Ghanaian women to inhumane cultural and traditional practices. The recommendation for clinical practice is that health professionals must ensure that all pregnant women receive the appropriate US scans to improve perinatal outcomes. Future research should investigate the trend of obstetric US examinations and their clinical outcomes across the wider Ghanaian population.

INTRODUCTION

Ultrasound (US) is a non-invasive medical imaging modality used for the diagnosis and treatment of several diseases. Ultrasound being affordable, readily available and easily accessible caused the number of US requests in clinical settings to increase in both developed and developing countries.[1,2] Specifically, obstetric US accounts for a significant proportion of diagnostic investigations because it is recommended that all pregnant women undergo at least two obstetric US examinations before term, one in the first trimester (preferably between 6-12 weeks) and another in the second trimester (preferably between 18-22 weeks), to provide comprehensive prenatal health information.[3,4] Obstetric US examinations are essential because key foetal parameters (cardiac activity, placental location, gestational age, weight and presentation) and maternal pathologies

(myomas, dilated cervix and ovarian hyperstimulation syndrome) can be evaluated with obstetric US.[3,5,6]

Globally, over 2.6 million women experience stillbirths annually and the majority of these, an estimated 98%, are recorded in developing countries.[7,8] In addition, 99% of avoidable foeto-maternal deaths occur in developing countries, of which 66% occur in sub-Saharan African countries such as Ghana.[7,8] Although the statistics for avoidable foeto-maternal deaths in sub-Saharan Africa are extremely high, these mortality statistics may have worsened without the increased utilisation of obstetric US.[9] To improve clinical outcomes, obstetric US is patient-tailored based on gestational age, clinical indication(s), and hospital protocol(s).[10] For instance, a clinical request querying intrauterine growth restriction (IUGR) will require a foetal well-being assessment protocol, such as biophysical profile, umbilical artery Doppler and contraction stress tests, which may not be performed in routine obstetric US examinations.[11,12]

Various studies have been conducted on the utilisation of obstetric US worldwide and have provided important data on various parameters. A study in India[6] indicated that 25% of pregnant women had breech presentations at full term, while a study in Ethiopia reported that 92% of patients presenting for obstetric US had routine examinations as the clinical indication.[13] In Nigeria, a study[14] reported a placenta praevia prevalence of 1.6%, while another study reported anterior (48%), posterior (39%), fundal (7%), and lateral (6%) placental locations.[15] Also, Eze et al.[9] observed that the risk of macrosomia increased with maternal age and parity across a group of Nigerian women. According to the available evidence, 26% of transabdominal obstetric US examinations were performed in the first trimester with an early gestational age at 5 weeks 5 days.[16] These studies provide useful information on the trends and clinical applications of obstetric US in different countries. Although obstetric US examinations are widely conducted at the Ho Teaching Hospital (HTH), there is no review of these examinations to determine the trends of clinical utilisation of US in obstetrics. This descriptive study reviewed obstetric US examinations conducted at the HTH to determine the demographic characteristics of patients accessing these examinations, their clinical indications and the clinical impressions/diagnoses to provide useful information for healthcare professionals seeking to improve perinatal care in hospitals and to provide baseline data for a nationwide study.

METHODOLOGY

Ethics approval was obtained from the Research Ethics Committee of the University of Health and Allied Sciences [UHAS-REC A.58(1),19-20]. Permission was also obtained from the head of the radiology department of the HTH before data retrieval.

» Study setting

The study was conducted at the radiology department of the HTH. The 300-bed capacity hospital provides a wide range of services, including outpatient, inpatient, mental health, dialysis, orthopaedic and radiology services. The teaching hospital was selected because it has the largest radiology department in the region and receives diverse patients from different parts of the region and neighbouring countries (predominantly Togo and Benin). The department is equipped with conventional radiography, ultrasound, fluoroscopic and computed tomography (CT) equipment and operates a 12-hour shift daily.

» Study design

The study employed a retrospective research design and involved an analysis of the reports of all obstetric US examinations performed between July 2020 and June 2022.

» Target population and sample size

The target population was all patients who underwent obstetric US examinations at the HTH between July 2020 and June 2022. Ultrasound reports with missing patient data such as age, clinical history and clinical impression were excluded. A total of 1,168 obstetric US examinations were conducted during the period under review. However, 405 reports were excluded due to missing patient data, resulting in a sample size of 763.

» Data collection

The US reports were retrieved from the radiology archive system of the hospital. Demographical data such as maternal age and clinical history, as well as foetal parameters such as cardiac activity, number of foetus(es), amniotic fluid volume (AFV), estimated gestational age (EGA) in weeks and estimated foetal weight (EFW) in grams were extracted from the ultrasound reports. The EGAs were used to determine the trimester for each pregnancy. The trimesters were classified as follows: trimester 1, zero to 12, second trimester, 13-27 and third trimester, 28-40 weeks.[17] For the first trimester cases, data on crown-rump length (CRL) and foetal cardiac activity were extracted for cases with foetal pole(s), whereas data on gestational sac diameter (GSD) were extracted for cases without foetal pole(s). Data on placentation were extracted for second and third trimester cases. However, data on foetal presentation were extracted for third trimester cases only. Data were captured on a self-developed Excel spreadsheet.

» Statistical analysis

The extracted data for the 763 patients were inputted into the Statistical Software for the Social Sciences (SPSS) version 25 for analyses. Descriptive statistics comprising frequencies, percentages, range (minimum and maximum), mean and standard deviations were adopted for reporting the findings. For each obstetric US variable, the mean represents the average value of the dataset and provides an idea of where the centre value is located, whereas the range and

standard deviations define the spread of the data. The final results are presented in tables. Data extraction and analysis were conducted by SKA and SS.

RESULTS

The study involved 763 patients aged 14-48 years with a mean age of 30 ± 6.4 years. A breakdown of the maternal age groups is indicated in Table 1. A total of 741 (97.1%) of the patients had singleton gestations, whereas 22 (2.9%) had twin gestations. For the twin gestations, nine (40.9%), seven (31.8%) and six (27.3%) were dichorionic diamniotic, monochorionic diamniotic and monochorionic monoamniotic respectively. The number of first, second and third trimester cases were 351 (46%), 125 (16.4%) and 287 (37.6%), respectively. For the first trimester cases, CRL and cardiac activity were assessed in 282 (80.3%) patients, whereas GSD was measured in 69 (19.7%) patients. The CRL ranged from 3.9-99.7 mm (mean = 29.0 ± 21.7), whereas the GSD ranged from 3.7-25.3 mm (mean = 12.8 ± 6.0). Detailed analyses of the clinical history across the patients, the presence of foetal cardiac activity across the three trimesters, foetal presentation and placentation are shown in Table 1.

The mean EGA was analysed across all the trimesters, whereas the mean EFW was analysed across the second and third trimester cases. The mean EGA was 8.6, 22.1 and 35.3 weeks for first, second and third trimester cases respectively. Also, the mean EFW was 606.4 and 2679 grams for second and third trimester cases, respectively. The full details of the EGA and EFW are shown in Table 2.

The majority (646, 83.5%) of the obstetric US findings were normal. However, some of the findings were abnormal. For instance, 64 (8.3%) of the pregnant women had myomas, of which 35 (54.7%) were aged 25-34 years. Similarly, 16 (2.1%) of the pregnant women had oligohydramnios, of which 8 (50%) were aged 25-34 years and another 8 (50%) were aged 35-48 years. The distributions of the clinical impressions and abnormalities identified across the pregnant women in different age groups are detailed in Table 3.

DISCUSSION

Obstetric US examinations are characterised by parameters such as foetal biometry, foetal presentation, placenta presentation and grading, cardiac activity and amniotic fluid index volume which provide comprehensive information on prenatal well-being to enhance patient management and outcomes. Several studies[9,13,14] have investigated the trends and utilisation of obstetric US to inform clinical decision-making. Although obstetric US is widely conducted at the HTH, there are no studies on their clinical findings. This study reviewed obstetric US examinations conducted at the HTH to determine the demographic characteristics of patients accessing these examinations, their clinical indications and the clinical impressions/diagnoses to improve perinatal care and to provide baseline data for a nationwide study. The results of this study showed a mean age of

Table 1. Distribution of maternal age, foetal cardiac activity, presentation, placentation and clinical history across the pregnant women

Maternal Age Groups		
Age (in years)	**Frequency**	**Percentage**
14-24	159	20.8
25-34	422	55.3
35-48	182	23.9
Total	**763**	**100**
Cardiac Activity		
Trimester	**Present**	**Absent**
1st	245	37
2nd	120	5
3rd	281	6
Total	**646**	**48**
Foetal Presentation		
Variable	**Frequency**	**Percentage**
Cephalic	235	81.9
Breech	52	18.1
Placentation		
Variable	**Frequency**	**Percentage**
Anterior	199	48.3
Posterior	136	33.0
Fundal	52	12.6
Undetermined	20	4.9
Low-lying praevia	4	1.0
Complete praevia	1	0.2
Clinical History		
Variable	**Frequency**	**Percentage**
Routine cyesis examination	542	71.0
Bleeding per vagina	45	5.9
Pre-eclampsia, eclampsia, pregnancy induced hypertension (PIH)	37	4.8
Lower abdominal pains	32	4.2
Threatened abortion	17	2.2
Ectopic	15	2.0
Intrauterine Growth Restriction (IUGR)	13	1.7
Preterm	5	0.7
Placenta praevia	4	0.5
Diabetes	4	0.5
Rupture of membrane	4	0.5
Oligohydramnios	2	0.3
Post-date	2	0.3
Sickle cell disease	2	0.3
Others	39	5.1

Table 2. Distribution of EGA (weeks) and EFW (grams) across the pregnant women

		First Trimester	Second Trimester	Third Trimester
Estimated Gestational Age [(EGA) in weeks]	Minimum	5	15	29
	Maximum	13	27	42
	Mean	8.6	22.1	35.3
	Standard Deviation (SD)	2.5	4.2	3.1
Estimated Foetal Weight [(EFW) in grams]	Minimum	Not Applicable	137	1195
	Maximum		1286	4434
	Mean		606.4	2679
	Standard Deviation (SD)		342.1	749.3

Table 3. The distribution of clinical impressions and pathologies and/or anomalies among the pregnant women

Pathology	Number (%)	14-24 years n (%)	25-34 years n (%)	35-48 years n (%)
Normal	646 (83.5)	151 (23.4)	353 (54.6)	142 (22.0)
Myoma	64 (8.3)	6 (9.4)	35 (54.7)	23 (35.9)
Open Cervix	17 (2.2)	4 (23.5)	9 (53.0)	4 (23.5)
Oligohydramnios	16 (2.1)	0(0.0)	8 (50.0)	8 (50.0)
Subchorionic bleed	8 (1.0)	0 (0.0)	8 (100)	0 (0.0)
Foetal structural abnormalities	8 (1.0)	2 (25.0)	4 (50.0)	2 (25.0)
Placentation Abnormality	5 (0.6)	0 (0.0)	5 (100)	0 (0.0)
Abnormal Umbilical Velocimetry	5 (0.6)	0 (0.0)	3 (60.0)	2 (40.0)
Polyhydramnios	4 (0.5)	0 (0.0)	0 (0.0)	4 (100)
Bradycardia	1 (0.1)	0 (0.0)	0 (0.0)	1 (100)
Total	**774 (100)**	**163 (21.1)**	**425 (54.9)**	**186 (24.0)**

30.0±6.4 years across the pregnant women who presented for obstetric US within the study period. This finding is consistent with a similar study by Edzie et al.[11] in Cape Coast, Ghana, which indicated that the mean age of the pregnant women receiving obstetric US was 30.0 ± 5.1 years. The clinical implication of this is that Ghanaian women are less likely to experience pregnancy-related conditions that are directly related to older maternal age, such as miscarriage, chromosomal abnormalities, stillbirth, foetal growth restriction, preterm birth, pre-eclampsia and gestational diabetes mellitus.[18-20] The range of maternal age, at which it is less risky to give birth, is 20-30 years.[18-20]

The findings of this study imply that out of the three trimesters of pregnancy weeks, second trimester obstetric US was the least common (125, 16.4%) at the HTH during the period under review. This could have adverse clinical implications for maternal and foetal health because the pregnant women were deprived of the numerous benefits of second trimester scanning. For example, second trimester scanning, preferably between 18-22 weeks, is recommended for foetal anomaly assessment to provide accurate diagnostic information on foetal morphology, improves safe birth and enables the delivery of suitable and timely life-saving care.[21-23] Furthermore, foetal anomaly assessment enables prospective parents to benefit from counselling on foetal prognoses and management strategies.

Among the 412 second and third trimester patients, five (1.2%) had praevia: four (1.0%) had low-lying praevia, and one (0.2%) had complete praevia. Placenta praevia is widely known to be associated with adverse pregnancy outcomes such as postpartum anaemia, increased risk of respiratory distress syndrome, IUGR and preterm birth.[25] The results of this study also indicated that 52 (12.6%) of the pregnant women had fundal placentation. Although fundal placentation is not usually considered to be an adverse pregnancy risk factor, Granfors et al.[26] indicated that fundal placentation could lead to adverse pregnancy outcomes such as preterm birth, small-for-gestational-age birth and manual removal of the placenta in vaginal births. On foetal presentation, 52 (18.1%) of the 287 third trimester cases had breech presentations. Breech presentation is associated with increased perinatal morbidity and mortality, premature deliveries and increased risk of intrapartum trauma.[27,28] Twenty-two (2.9%) of the pregnant women who presented for obstetric US had twin gestations, which could have clinical implications, as multiple gestations are associated with preterm birth, gestational hypertension, and placental and umbilical cord anomalies.[29] Similarly, multiple gestations increase the risk of anaemia, miscarriage, birth defects and post-partum haemorrhage.[29] Although regular antenatal care is important for all pregnant wom-

en, those with fundal placentation, breech foetal presentation and multiple gestations require additional care to ensure early and appropriate management and safe delivery. However, this could be challenging in the Ghanaian setting due to the poor health-seeking behaviour of Ghanaians. In Ghana, health-seeking behaviour and choices are influenced mostly by cultural, religious and traditional beliefs.[30] For instance, according to Baba et al.,[31] most expectant mothers, particularly in rural Ghana, prefer the services of traditional birth attendants (TBAs) to orthodox medical services because they believe in the skills/expertise of TBAs and also trust that a woman's ability to deliver at home is a sign of strength and faithfulness to both her husband and tradition. The strong dependence on spirituality and traditional beliefs may result in under-utilisation of essential and life-saving medical services such as antenatal care and could result in prenatal and postnatal complications.[32]

Foetal cardiac activity was assessed in 694 of the pregnant women, of whom 48 (6.9%) had no cardiac activity. Comparatively, this finding is much greater than those recorded across three East African countries (Burundi = 2.3%, Tanzania = 1.6% and Rwanda = 1.5%).[33] The difference between the figure recorded in our study and the study conducted by Tesema et al.[33] could be attributed to the inclusion of early gestation cases in our study. In our study, the presence of foetal cardiac activity was assessed in all the patients, except those without a foetal pole. Research has shown that the majority of foetal deaths occur in the early stages of pregnancy.[16] The high proportion of patients without foetal cardiac activity could have a negative psychological impact on pregnant women and their families. In Ghana, women who experience stillbirths are exposed to inhumane cultural and traditional practices. For example, they are shunned, driven out of their matrimonial homes and forbidden from mourning the loss of the pregnancy for fear that the spirit of the dead foetus will seek a vulnerable new pregnancy.[34]

Finally, of the 412 second and third trimester cases, 20 (4.9%) of the pregnant women had abnormal amniotic fluid index volume, of whom 16 (80%) were diagnosed having oligohydramnios. This finding is inconsistent with a study by Twesigomwe et al.[35] in Uganda, a country with similar socio-economic characteristics to that of Ghana, which indicated an oligohydramnios prevalence of 9.4%. The difference in these statistics could be attributed to the different categories of pregnant women enrolled in the two studies. While our study included second and third trimester patients, the study conducted by Twesigomwe et al.[35] only included women with gestational ages >36 weeks. For polyhydramnios, our study recorded a prevalence of 1.0%, which is consistent with that of Zambia (0.7%) but significantly lower than that recorded in the Democratic Republic of the Congo (10%).[36] The results of this study showed that pregnant women who presented at the HTH and by inference Ghana, could be susceptible to amniotic fluid index volume anomalies, thereby increasing their risk of adverse pregnancy outcomes such as oligohydramnios secondary to premature membrane rupture which could lead to neonatal sepsis and death.[37]

LIMITATIONS

This is a single centre study so the findings may not be representative of the larger Ghanaian population. Hence, the results should be generalised with caution.

CONCLUSION

The result of this study demonstrates that the ages of women who presented for obstetric US examinations at the HTH fell within the less risky range of maternal age to carry a foetus (i.e., 20-30 years). The majority of the obstetric US scans were normal, although some of the pregnant women recorded praevia and fundal placentation, amniotic fluid abnormalities and breech presentations. Finally, our study revealed a greater prevalence of absent foetal cardiac activity than studies in other African countries. This could expose Ghanaian women to inhumane cultural and traditional practices such as being shunned, driven out of their matrimonial homes and forbidden from mourning the loss of the pregnancy for fear that the spirit of the dead foetus will seek a vulnerable new pregnancy. The recommendation for clinical practice is that health professionals must ensure that all pregnant women receive the appropriate US scans to improve perinatal outcomes. Future research should investigate the trend of obstetric US examinations and their clinical outcomes across the wider Ghanaian population.

CONFLICT OF INTEREST

The authors declare no competing interests.

INFORMED CONSENT

Ethics approval to conduct this study was granted by the ethics committee of the University of Health and Allied Sciences [UHAS-REC A.58(1),19-20].

AUTHOR CONTRIBUTIONS

SKA and SS (University of Health and Allied Sciences) were the main researchers and were responsible for data capturing and presentation of the results; SKA, SS, NAA, PNA (University of Health and Allied Sciences) assisted with interpretation of the results. SKA, SS, NAA, PNA and JOK (University of Health and Allied Sciences) drafted the manuscript. SKA, KKK (University of Health and Allied Sciences) and KDT (Korle-Bu Teaching Hospital) provided critical comments and recommendations regarding literature review.

DISCLAIMER

The views and opinions expressed in the article are those of the authors and do not necessarily reflect the views of the publisher and editorial board.

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