

# Routine prenatal ultrasound anomaly screening program in a Nigerian university hospital: Redefining obstetrics practice in a developing African country

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## ABSTRACT

**Background:** Congenital anomalies are among the leading causes of fetal and infant morbidity and mortality worldwide. Prenatal ultrasound (US) screening has become an essential part of antenatal care in the developed world. Such practice is just evolving in the developing countries such as Nigeria. The aim of this article is to present our initial experience and demonstrate the effectiveness of a prenatal US screening program in detecting congenital malformation in a developing country. **Materials and Methods:** This was a prospective evaluation of the prenatal US screenings conducted at a major referral hospital in Southwestern Nigeria. All pregnant women referred to the antenatal clinic for mid-trimester screening during the period of study were assessed. **Results:** Two hundred and eighty-seven pregnant women (5 with twin gestations) were presented for fetal anomaly scan during the study period. Twenty-nine anomalies (9.9%) were detected among the scanned population. Sixteen of the anomalies were followed to delivery/termination with a specificity of 93.5%. The commonest malformations were demonstrated in the genitourinary tract (34.5%) followed by malformations within the central nervous system (27.6%). Six (20.6%) of the anomalies were lethal. Five of the anomalies were surgically correctable. **Conclusion:** Institutions and hospitals across Nigeria and other low- and middle-income countries need to develop policies and programs that would incorporate a standardized routine screening prenatal US in order to improve fetomaternal well-being and reduce the high perinatal mortality and morbidity in developing nations.

**Key words:** Anomaly screening, obstetrics practice, prenatal, ultrasound

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## INTRODUCTION

Congenital anomalies are among the leading causes of perinatal and infant morbidity and mortality, as well as fetal mortality worldwide. They are present in 14% of newborns with major anomalies in 2-5% accounting for 20-30% of perinatal deaths.<sup>1-5</sup> The psychological trauma to the parents and cost associated with the care of fetal abnormalities, which is greater because of attendant morbidities of late diagnosis has led to use of ultrasound (US) for prenatal diagnosis as an essential part of antenatal care.<sup>4</sup>

Prenatal US screening can detect several anomalies, about 90% of which occurs in fetuses born to parents with unrecognizable risk factors.<sup>6,7</sup>

Detection of structural fetal anomalies is, however, dependent on numerous factors, such as maternal and gestational ages, skill and experience of sonographers as well as the quality and resolution of the equipment used.<sup>8,9</sup>

The National Institute for Health and Clinical Excellence clinical guideline<sup>10</sup> used in the UK and recognized globally stipulates that pregnant women should be offered an US scan to screen for structural anomalies, ideally, between 18 and 20 weeks of gestation by an appropriately trained sonographer with equipment of appropriate standard. The overall aim of fetal anomaly screening is to identify potential problems so that parents can make informed choices as well as to improve the safety of birth. Several studies<sup>9,11-13</sup> have also shown that second trimester US shows high specificity for identifying fetal anomalies.

Although routine fetal anomaly screening with US has become an established practice in developed countries,<sup>3-5</sup> such practice is just evolving in developing countries such as Nigeria. To the best of our knowledge, there are no standardized criteria or guidelines for the US evaluation or screening of pregnant women with high-risk pregnancies for congenital anomalies in Nigeria.

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The aim of this article is to present our initial experience and demonstrate the effectiveness of a prenatal US screening program in detecting congenital malformation in a developing country.

## MATERIALS AND METHODS

This was a prospective evaluation of the prenatal US screenings conducted between August 2012 and September 2014 at a major referral hospital in southwestern Nigeria. The University College Hospital is a tertiary hospital covering a population of about 10 million. A consultant radiologist who had been trained in fetal anomaly scanning performed all the scans. A mean time of 30 min was allocated for each scan procedure, which was designed to confirm viability, verify the number of fetuses, determine the placenta location, and allow performance of a comprehensive review of fetal anatomy using the International Society of Ultrasound in Obstetrics and Gynecology guidelines for performing mid-trimester US scans.<sup>14</sup> If there was difficulty in completing a scan satisfactorily, another scan was scheduled to obtain patient's full details and characteristics. All findings of detected anomalies were initially discussed with the obstetrician following which the parent(s) were counseled. In cases of lethal anomalies, mothers were counseled on the need for termination of the pregnancy. Those with correctable anomalies were referred to the relevant specialist and the pregnancy followed up till delivery with prompt planned interventions, as there were previously no adequate facilities for fetal intervention in the hospital. The examinations were performed transabdominally using an UltraSonix SP touch screen US machine. All patients, who referred to the antenatal clinic for mid-trimester screening during the period of study, were assessed. Statistical analysis was performed using SSPS version 21.0 for windows with all tests being two-tailed. Student *t*-tests were used to compare continuous variables while Chi-square test was used for categorical variables, and a *P* < 0.005 was considered significant.

## RESULTS

Two hundred and eighty-seven pregnant women (5 with twin gestations) were presented for fetal anomaly scan during the study period. Their ages ranged from 18 to 51 years with a mean age of 31.3 ± 4.95. A total of 48 (16.4%) patients evaluated were high-risk [Table 1]. Twenty-nine anomalies (9.9%) were detected among the scanned population [Table 2].

The commonest malformations were demonstrated in the genitourinary tract (34.5%) followed by malformations within the central nervous system (CNS) (27.6%). Nine (31%) of the 29 anomalies were among the high-risk group.

A total of 16 (55.1%) patients were followed up to either termination of pregnancy or delivery, while the remaining 13 (44.9%) were lost to follow-up.

Out of the 16 anomalies followed to term or termination of pregnancy, only the patient with cerebellar vermis defect could not be verified at the time of delivery, that is, the specificity of prenatal screening US in the hospital was 93.8%. Six (20.6%) of the anomalies were lethal, of which five mothers opted to terminate their pregnancies after counseling while one mother whose baby had multiple

**Table 1: Pattern of distribution of the high-risk pregnancies**

Indications	n (%)
Advanced age	4 (8.3)
Elderly primigravida	8 (16.7)
Known medical conditions	7 (14.6)
Previous malformed baby	10 (20.8)
Previous IUFD/NND	5 (10.5)
Multiple gestation (5 twin gestation)	10 (20.8)
Suspected anomaly in index pregnancy	4 (8.3)
Total	48 (100.0)

NND – Neonatal death; IUFD – Intrauterine fetal death

**Table 2: Pattern of distribution of fetal anomalies**

System affected	Frequency (%)
CNS	8 (27.6)
Encephalocele	1 (12.5)
Anencephaly	3 (37.5)
Choroid plexus cyst	1 (12.5)
Hydrocephalus	2 (25.0)
Cerebellar vermis defect	1 (12.5)
GUS	10 (34.5)
Hydronephrosis	5 (50.0)
Megaureter (unilateral)	1 (10.0)
Bladder ureterocele	1 (10.0)
Posterior urethral valve	1 (10.0)
Prune belly syndrome	1 (10.0)
Abdominal cyst? Ovarian	1 (10.0)
Respiratory	3 (10.3)
Isolated pleural effusion	1 (33.3)
Pulmonary sequestration	2 (66.7)
Cardiac	1 (3.4)
Echogenic focus-left ventricle	1 (100.0)
GIT	2 (6.9)
Omphalocele	1 (50.0)
Gastroschisis	1 (50.0)
Maxillofacial	1 (3.4)
Lower jaw cyst (ranula)	1 (100.0)
Multiple/others	4 (13.8)
Body stalk defect	1 (25.0)
Hydrops fetalis	1 (25.0)
Thanatophoric dysplasia	1 (25.0)
Bilateral multicystic kidneys with polydactyly and umbilical hernia	1 (25.0)
Total	29 (100.0)

CNS – Central nervous system; GUS – Genitourinary system; GIT – Gastrointestinal tract

anomalies opted to continue with the pregnancy to term. However, the baby died some hours after delivery. Five of the anomalies were surgically correctable; four babies (with gastroschisis, ranula, pleural effusion, and hydronephrosis from obstructive uropathy) had corrective surgery immediately after birth and the fifth with omphalocele major had an initial nonoperative management and ventral herniorrhaphy at the age of 6 months. The baby with gastroschisis died within 24 h after surgery whereas the baby with pleural effusion died after 3 weeks due to complications of prematurity. The remaining three babies survived postintervention and are being followed up in the clinic.

## DISCUSSION

Over a 2-year period, 287 pregnant women were evaluated for fetal anomaly with ultrasonography. This represents <5% of the yearly antenatal visits by pregnant women to our institution. This pilot study presents our preliminary experience with a fetal anomaly screening program in Southwest Nigeria. Majority of women and antenatal caregivers in Ibadan and other parts of Nigeria are unaware of this service and do not routinely request for prenatal anomaly screening outside the routine biophysical or fetal well-being scans. It is also noteworthy that over 80% of pregnant women present for antenatal care later than 22 weeks of gestation.<sup>15</sup> The prevalence of abnormalities also depends upon the population being scanned with this being higher among women from referral centers compared to the general population. The prevalence of anomalies of 9.9% in our study population was relatively high compared to Eurofetus studies<sup>16</sup> where the prevalence ranged from 0.2% to 3.2% with an average prevalence of 2.0%. This unusual high proportion may be due to the possible selection bias as our center is one of the main referral hospitals in the Southwestern region of Nigeria serving a population of about 10 million.

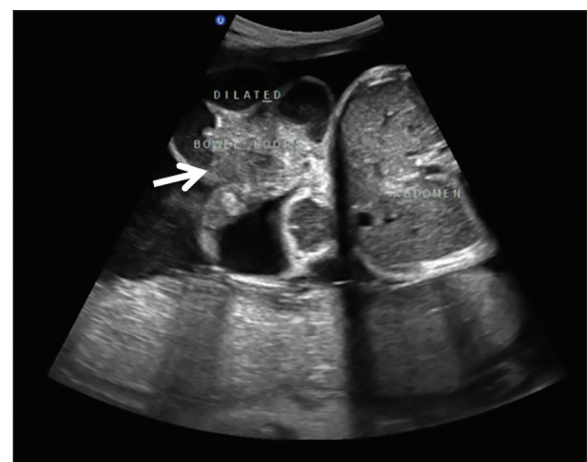
Our prenatal screening program being the first in our region has only until recently received minimal awareness from expecting mothers. Most of the referrals were from specialist doctors in the clinic who may recommend an additional scan for patients within the acceptable criteria following a routine scan from an outside facility.

A broad spectrum of anomalies ranging from mild to lethal was found during the screening. The most frequently seen fetal anomalies were in the genitourinary system (34.5%) followed by CNS abnormalities (27.6%). This result is similar to findings by Carrera *et al.* and Munim *et al.*<sup>2,17</sup> In the genitourinary system, the commonest anomaly was hydronephrosis, a finding, which agrees with reports from the works of Beke *et al.*<sup>18</sup> and Agunloye *et al.*<sup>19</sup>

The sensitivity of US in the detection of fetal anomalies is largely dependent on the expertise of the examiner,

the gestational age at the time of scanning, the definition of anomaly as major and minor, and the postnatal ascertainment of anomalies.<sup>20,21</sup> The 93.8% sensitivity of our initial prenatal screening program appears to be greater than what was reported by similar scan studies that reported values of 22-41%<sup>8,20,21</sup> to as high as 74-85%.<sup>22-24</sup> These may be due largely to the level and experience of the people performing the examination. The performing Radiologist in this study had received extensive training from a renowned center in the UK before initiation of the program. Levi *et al.*<sup>20</sup> found a lower sensitivity in the earlier part of their study that improved later as the examiners/sonographers mastered the techniques, gained more experience, and training was enhanced. There were three fetuses in this study that had severe anomalies and were followed to term. Due to early prenatal diagnosis, these patients had appropriate specialists present at the delivery and appropriate interventions were instituted as soon as it was possible. The mode of delivery was changed in two of the cases with gastroschisis [Figure 1] and pleural effusion [Figure 2]; an earlier delivery date was recommended for the fetus with unilateral megaureter [Figure 3] to prevent further damage to the contralateral kidney. All three cases underwent surgical interventions.

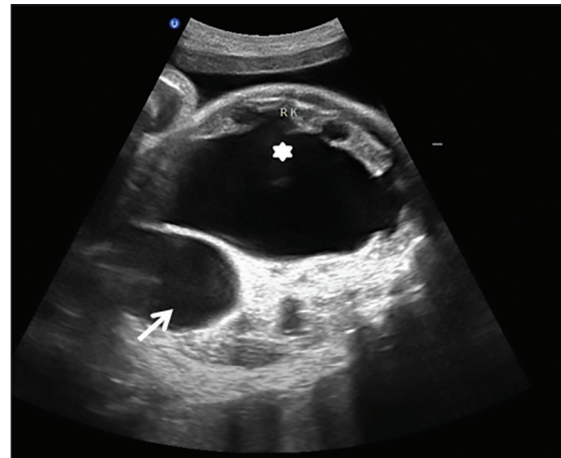
A common option for women with a prenatally detected lethal or severe fetal anomaly is the interruption of the pregnancy. Such interruption, especially when done early, results in a lower perinatal mortality rate and lower health care cost because of the avoidance of long-term care that children with severe and lethal major congenital malformations need for survival. Of all the anomalies detected in this study, five were lethal and four of the mothers, that is, 80% decided to terminate the pregnancies. In a study by Chitty *et al.*,<sup>22</sup> 93 (1.1%) congenital anomalies were detected prenatally, of which 72 (77%) were lethal and 52 (72%) of the women with lethal abnormalities



**Figure 1:** Transabdominal ultrasound scan showing a 20-week fetus with gastroschisis. The dilated loops of bowel are seen outside the abdomen (arrow)



**Figure 2:** A transabdominal ultrasound scan of a 22-week-old fetus showing a fetus with left sided pleural fluid collection, which has displaced the heart to the right



**Figure 3:** A transabdominal ultrasound scan of a 22-week-old fetus with unilateral megaureter with severe hydronephrosis showing a severely dilated tortuous ureter (arrow) with grossly dilated pelvicalyceal system (star)

opted for termination of pregnancy. This decision to terminate their pregnancies may be due to the established counseling program among the study population and possible greater acceptance of the circumstances due to varied reasons ranging from level of education to religious and cultural beliefs.<sup>25</sup>

Congenital heart defects are among the most frequent malformation affecting fetuses and newborn babies (5-10/1000 live births), yet the antenatal detection rate among the general population remains low. Detection of cardiac anomalies usually depends on the expertise of the sonologist as well the sophistication or resolution of the equipment being used. The prevalence from this study of only 1 (3.4%) case of cardiac anomaly is low compared with previous studies. In a large study with 4799 affected fetuses, Bull<sup>26</sup> reported an antenatal detection rate of cardiac anomalies of 23.4% in the UK, with large geographic variability. The Euroscan study<sup>27</sup> reported a prevalence of between 14% and 45%.

Several benefits have accrued from this initial US-screening program. These were both medical and financial. Informed parents who had fetuses with anomalies had been prepared for anticipated problems, whereas those with normal findings had been assured of delivering a normal fetus. Antenatal fetal anomaly screening may reduce the number of postnatal investigations and also lessen late clinical presentation in high-risk mothers and other groups. The need for training personnel to appropriately perform routine prenatal anomaly scans in peripheral and tertiary hospitals cannot, thus, be over emphasized. For many anomalies, early prenatal diagnosis of structural anomalies provides the opportunity to influence perinatal management favorably by changing the site of delivery for immediate postnatal treatment; altering the mode of delivery to prevent hemorrhage or dystocia; early delivery to prevent ongoing fetal organ damage; or treatment in

utero to prevent, reverse, or minimize fetal organ injury as a result of a structural defect.<sup>28</sup>

This initiative is the first formal step in the establishment of a prenatal anomaly screening program in the region.

The eventual effectiveness of this screening program would be dependent on many factors, including, increasing the level of awareness among the public regarding the screening program, the appropriate training of more sonographers, and the availability of a high quality US machine with good resolution.

## CONCLUSION

Congenital anomalies or abnormalities are a major global problem affecting perinatal morbidity and mortality. The development and establishment of a standardized prenatal anomaly screening program for the early detection and management of fetal anomalies is essential and feasible in developing countries where hitherto these programs had been nonexistent.

Institutions and hospitals across Nigeria and other low and middle-income countries need to develop policies and programs that would incorporate a standardized routine anomaly screening US. Physicians and other health workers should lead advocacy for early registration of pregnant women and proper timing for mid-trimester anomaly screening as well as encourage programs for genetic and prenatal counseling.

Our experience has demonstrated the attainability and benefits which potentially improves fetomaternal well-being and contributes to reduce the ever plaguing challenges of high perinatal mortality and morbidity in developing nations.

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