

Single Umbilical Artery Detected on First-Trimester Ultrasound

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ABSTRACT

Objective: Our research sought to evaluate the utility of a first-trimester ultrasonography diagnostic of a single umbilical artery as a possible indicator of chromosomal abnormalities.

Study Design: Retrospective Study

Place and Duration: Department of Radiology, Khyber Teaching Hospital Peshawar for the duration from January 2021 to March 2022.

Methods: There were 68 pregnant females were of first trimester were presented in this study. Age of the patients was between 18-40 years. After getting informed written consent detailed demographics of enrolled females were recorded. Ultrasound was taken to diagnose single umbilical artery among all cases. SPSS 24.0 was used to analyze all data.

Results: Among all, 25 (36.8%) females were aged 18-25 years, 36 (52.9%) cases had age 26-35 years and 17 (25%) females had age >35 years. 37 (54.4%) patients had BMI <25kg/m² and 31 (45.6%) had BMI >25kg/m². 30 (44.1%) cases were primigravida and 38 (55.9%) cases were multigravida. 40 (58.8%) cases were from rural areas and 33 (48.5%) cases were literate. Overall frequency of single umbilical artery (SUA) was 3 (4.4%) in which 1 (1.5%) in single pregnancy and 2 (2.9%) in twin pregnancy. The first trimester finding had 85% sensitivity, a 97% specificity, a 0.4% false positive rate, and a 14.9% false negative rate. Frequency of malformations was 13 (19.1%). Most cases of severe foetal deformity were detected using ultrasonography in the 16th week.

Conclusion: Based on the results of this study, we can say that SUA is a valuable marker for foetal malformation pathology in the first trimester, allowing for the early detection of many instances of malformations before 20 weeks of gestation.

Keywords: Ultrasonography, Pregnant Females, First Trimester, Single Umbilical Artery

INTRODUCTION

Common birth defects include SUA (single umbilical artery). There must be a prenatal diagnosis of SUA. Previous studies found that the prevalence of SUA varied from 1:500 (0.2%) to 1:50 (2.0%) [1-3]. It occurs three to four times as often in pairs of twins as it does in singles [4]. Color, high-powered, and high-definition (HD) Doppler ultrasonography has made it possible to more accurately determine which side of the UA is absent by the use of umbilical cord blood flow imaging. Left UA was less common than right UA in previous investigations [5-7]. There has been no research on why more fetuses from Taiwan are born without a UA on one side than the other.

Persutte and Hobbins¹ conducted a literature analysis on SUA and found that the incidence of SUA ranged from 0.2% to 1.6% among euploid fetuses undergoing prenatal ultrasound testing, 9% to 11% among aneuploid fetuses, and 0.5% to 2.5% among newborns with no complications. Aborted babies and autopsy have the greatest reported incidence of SUA, but ultrasonography and full-term newborns had lower reported incidences. [8,9] Despite the lack of evidence for a genetic aetiology or familial propensity, it is known that SUA is more common in deliveries involving many individuals (4.6% vs. 1%). 4,9

Infants with SUA have a higher chance of being born with a congenital defect. instances identified at ultrasound or at term delivery still have a greater risk of abnormalities compared to infants with two umbilical arteries, however the risk varies depending on the technique of ascertainment (autopsy having the greatest rate). Thummala et al.[10] found that the incidence of abnormalities ranged from 8.7% to 66.7% in 23 studies based on screening of placentas or umbilical stumps of term newborns, whereas it ranged from 25% to 81.8% in 9 autopsy-based investigations, with a mean of 61.4%. Anomalous development is most commonly seen in the genitourinary, gastrointestinal, circulatory, pulmonary, and central nervous systems, as well as the face. [11] Prenatal instances with similar ultrasonography abnormalities have been confirmed. Multiple fetopathological investigations have found that the rate of early prenatal identification of an SUA by sonography is only 21%-36% when

compared to specimens from elective or spontaneous abortions.[12]

Sonography has an accuracy rate of about 65% for early prenatal identification, as shown by several live birth studies performed in the 1990s. When sonography was done between 17 and 36 weeks of pregnancy, the success rate rose to 85%. 1,2,4,13,14 Assisting in mother counselling and follow-up, early prenatal identification of an SUA is also crucial for directing foetal care. [11]

Our research aims to find out if isolated SUA during the first trimester allows reassuring parents or if otherwise it wants to keep the uncertainty about the development of pregnancy, and to determine the reliability of the diagnosis of SUA in the first prenatal ultrasound and its significance as a marker of malformations or genetic disorders.

MATERIAL AND METHODS

This retrospective study was conducted at the department of Radiology, Khyber Teaching Hospital Peshawar for the duration from January 2021 to March 2022 and comprised of 68 pregnant females. After getting informed written consent detailed demographics of enrolled females included age, BMI, education status and area of living were recorded. Females had severe medical illness, trimester >1 and those did not provide any written consent were excluded.

The first trimester ultrasounds were performed by senior obstetricians who have expertise in prenatal diagnosis. At 12 weeks, we perform an ultrasonographic assessment of the pregnancy to check for things like the foetal biometry with a CRL, the standard measure of nuchal translucency, the assessment of temporal bones, the vas deferens venosus, and the tricuspid rehash index, as well as to make a subjective evaluation of amniotic fluid. The test performed during the first trimester of pregnancy, along with a thorough evaluation of the foetal anatomy, allows us to estimate the likelihood of gene mutations in our patients (like the ultrasound made in the 20th week, although considering the limitations of gestational age). To see all of these things, an ultrasound was performed on a pregnant woman during her first trimester through both the abdominal and vaginal routes.

Somewhere about 95% of first-trimester ultrasounds required a foetal examination from both sides.

First trimester ultrasonography evaluated the number of cord vessels by counting the arteries surrounding a cross section of the bladder at the level of the foetal pelvis, as shown in Doppler colour. This was performed before the umbilical artery and vein fused in the front abdominal wall. We used the bidirectional power Doppler where it was necessary. A diagnostic of SUA was made if any of the following arteries were absent (Figures 1 and 2). Both the approach described in the preceding paragraph and the counting of umbilical arteries in a cross section of a cord that had been sliced into a free loop were used to determine the total number of arteries in the umbilical cord in subsequent scans [4]. Performing invasive diagnostic techniques would be recommended only if this finding was followed by a noticeable morphological change. However, if it was determined that the finding was isolated, the patient was advised to undergo a thorough pre-20 weeks ultrasound, which is normally done around the 16th week of pregnancy.

Inclusion criteria for the study were only high and low hazard pregnancies that underwent at least one ultrasound examination between the twelve and twenty weeks of pregnancy. Patients who were diagnosed with SUA after a 12-week ultrasonography were located in our database. We looked into these instances to determine whether there was a morphological change or a sign of defective chromosomes, and we also considered the outcomes of any genetic studies that had been conducted. To evaluate the frequency of incorrect positive and negative SUA diagnoses in the first trimester, we compared the results of this scan with those from the 20th week of pregnancy. An obstetric history was reviewed as part of the follow-up procedure, and in situations where a delivery occurred, a paediatric examination of the newborn was also examined in the postpartum period.



Figure-1:



Figure-2:

RESULTS

Among all, 25 (36.8%) females were aged 18-25 years, 36 (52.9%) cases had age 26-35years and 17 (25%) females had age >35 years.(Fig-1)

We found that 37 (54.4%) patients had BMI <25kg/m² and 31 (45.6%) had BMI >25kg/m². 30 (44.1%) cases were primigravida and 38 (55.9%) cases were multigravida. 40 (58.8%)

cases were from rural areas and 33 (48.5%) cases were literate.(table-1)

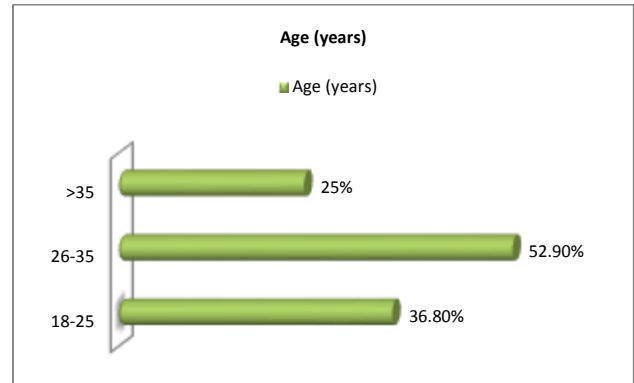


Figure-1: Age of the pregnant females

Table-1: Patients with included characteristics

Variables	Frequency	Percentage
BMI		
<25kg/m ²	37	54.4
>25kg/m ²	31	45.6
Gravidity		
Primigravida	30	44.1
Multigravida	38	55.9
Area Of Living		
Rural	40	58.8
Urban	28	41.2
Education Status		
Educated	33	48.5
Non-Educated	35	51.5

Overall frequency of single umbilical artery (SUA) was 3 (4.4%) in which 1 (1.5%) in single pregnancy and 2 (2.9%) in twin pregnancy.(table-2)

Table-2: Frequency of SUA among all cases

Variables	Frequency	Percentage
SUA		
Yes	3	4.4
No	65	95.6
Pregnancy type		
Single	1	1.5
Twin	2	2.9

The first trimester finding had 85% sensitivity, a 97% specificity, a 0.4% false positive rate, and a 14.9% false negative rate.(Fig-2)

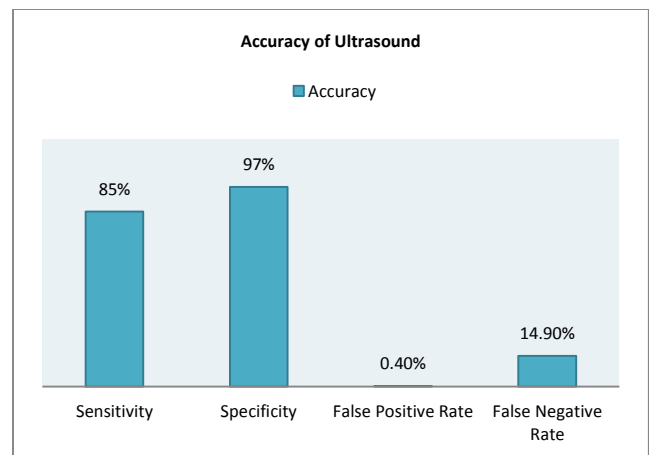


Figure-2: Diagnostic accuracy of ultrasound

Frequency of malformations was 13 (19.1%). Most cases of severe foetal deformity were detected using ultrasonography in the 16th week.(Table-3)

Table-3: Association of malformations

Variables	Frequency	Percentage
Malformations		
Yes	13	19.1
No	55	80.9

DISCUSSION

Congenital abnormalities, premature birth, and other negative obstetric outcomes for the foetus have all been linked to SUA [13]. While genitourinary and cardiac anomalies are the most common, the SUA has also been linked to those of the gastrointestinal and central nervous systems, as well as less common conditions like diaphragmatic hernia, foetal hydrops, musculoskeletal anomalies, exstrophy of the cloaca sequence, sirenomelia sequence, or VATER syndrome [14].

Fetuses with SUA are more likely to have chromosomal abnormalities, with this happening in about 10% of cases. Even while trisomy 18 is the most prevalent, trisomies 13 and 21 are also rather common [15]. The most common chromosomal abnormality, trisomy 21, is not linked to this disorder, but it is nonetheless often discovered in tandem with it [16]. The presence of a single umbilical artery does not warrant an amniocentesis unless there are other related ultrasonography abnormalities [17], as in most situations there are other severe problems. Twin pregnancies, velamentous insertion, advanced maternal age, smoking, diabetes, hypertension, and seizure disorders are all risk factors for SUA [18].

In current study 68 patients were presented. Among all, 25 (36.8%) females were aged 18-25 years, 36 (52.9%) cases had age 26-35 years and 17 (25%) females had age >35 years. 37 (54.4%) patients had BMI <25kg/m² and 31 (45.6%) had BMI >25kg/m². 30 (44.1%) cases were primigravida and 38 (55.9%) cases were multigravida. 40 (58.8%) cases were from rural areas and 33 (48.5%) cases were literate. These results were comparable to the previous studies.[19,20]

At 20 weeks, an ultrasound may count the cord vessels and give an estimate of their total size. Finding the amount of cord arteries during a routine 12-week ultrasound is of dubious value and is not part of standard clinical practise [21]. The SUA may be more challenging to show during the first trimester than the second. Sensitivity, specificity, and positive and negative predictive values for the diagnosis have been reported in the literature as follows: 57.1%, 98.9%, 50.0%, and 99.2% in the first trimester; & 86.6%, 99.9%, 92.9%, and 99.7% in the second trimester [22]. The sensitivities, specific, and positive and negative predictive values we observed, however, were all very close to the values previously reported for the second trimester. This was accomplished by vaginal delivery when required and with the use of a bidirectional power Doppler. When a search for cord vessels is conducted between the 20th and 22nd week of pregnancy, our prevalence of SUA is 1.1%, which is consistent with the literature [23]. Consistent with the previous data [24], we discovered that the prevalence was 3.3% in twin pregnancies, or three times that in singleton pregnancies.

Overall frequency of single umbilical artery (SUA) was 3 (4.4%) in which 1 (1.5%) in single pregnancy and 2 (2.9%) in twin pregnancy. The first trimester finding had 85% sensitivity, a 97% specificity, a 0.4% false positive rate, and a 14.9% false negative rate. Frequency of malformations was 13 (19.1%). Most cases of severe foetal deformity were detected using ultrasonography in the 16th week. These results were in line with the previous studies.[24,25] In summary, we are able to state that the

evaluation of the number of cord vessels that takes place during the 12th week ultrasound is beneficial since SUA has the potential to be regarded as a sign of foetal anomalies that may be diagnosed at this stage of gestation. In addition, a single SUA during the 12th week of pregnancy necessitates the completion of an ultrasound during the 16th week of pregnancy.

CONCLUSION

Based on the results of this study, we can say that SUA is a valuable marker for foetal malformation pathology in the first trimester, allowing for the early detection of many instances of malformations before 20 weeks of gestation.

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