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Dr. Shilpi Srivastava
Post Graduate (3rd Year),
Department of Radiodiagnosis,
Saraswathi Institute of
Medical Sciences, Hapur,
Uttar Pradesh, India

Dr. Subhash C Sylonia
HOD and Professor,
Department of Radiodiagnosis,
Saraswathi Institute of
Medical Sciences, Hapur,
Uttar Pradesh, India

Dr. Ishfaq Ayoub
Senior Resident, Department
of Radiodiagnosis, Saraswathi
Institute of Medical Sciences,
Hapur, Uttar Pradesh, India

Scoring system in the fetal echogenic kidneys detected during mid trimester anomaly scan

Dr. Shilpi Srivastava and Dr. Subhash C Sylonia and Dr. Ishfaq Ayoub

Abstract
Aim: The present study aimed to evaluate the prognostic scoring system for fetal echogenic kidneys to diagnose the fetal kidney diseases in mid trimester by determining the kidney volume, laterality, bladder size, amniotic fluid and other associated anomalies.
Methodology: 27 fetuses diagnosed with the "Echogenic kidneys" were enrolled in the study based on subjective assessment in sonography. The scoring was performed based on the certain parameters including renal size, laterality, bladder size, amniotic fluid and associated anomalies. The prognosis of the live births was assessed during the post natal life.
Results: Out of 27 fetuses enrolled in the present study, 11 were live births, 9 were NND, IUD and miscarriage and 7 were terminations. 10 live births had the scoring of 4, 5 and 6 and 1 live birth had a scoring of 8.
Conclusion: Within the limitations of the study we can conclude that the scoring system could be a good tool to identify the anomalies in the fetal kidneys during the mid-trimester. With the identification of the fetal echogenic kidneys the prognosis can be ruled out which helps in easing out the parental anxiety and renders them correct advice to opt for termination or not.

Keywords: Echogenic kidneys, ultrasound, mid trimester

Introduction

The normal echogenic kidney is similar to that of the liver tissues. The fetal renal echogenicity refers to the entire kidney appearance and involves the cortex, medulla and the pyramids. The assessment of the fetal echogenicity is a subjective observation which could have inter and intra observer variations. The renal cortex consist the glomeruli and tubules which provides an interface contributing to the renal echogenicity. The renal medulla has lower echogenicity due to the absence of glomeruli in the medulla and radial arrangement of the tubules [1].

The normal sized and the enlarged echogenic kidneys have wide diversified differential diagnosis. The differential diagnosis can be narrowed down by assessment of the renal architecture, renal size, cortico-medullary differentiation, associated abnormalities and amniotic fluid volume must all be assessed. On ultrasound examination there are some conditions which present the echogenic renal parenchyma. The increase renal echogenicity could be a normal variant or could be associated with the nephrotic syndrome, glomerulonephritis, and renal dysplasia [2]. In premature infants there could be an increased incidence of renal echogenicity [3]. Kidneys which are brighter than the liver tissues in ultrasound examination can be considered echogenic. The presentation of echogenic kidney could be a strong indicator of fetal kidney disease which includes chromosomal abnormality, adult and infantile polycystic kidney disease, Pearlman syndrome, Beckwith–Wiedemann syndrome, and cytomegalovirus infection. The increased echogenic presentation in these conditions is largely unknown.

Very less number of investigations has been conducted to identify the incidence of echogenic kidneys in normal fetuses or with underlying pathology. De La Vega and Torres (2005) [4] have investigated that in their retrospective study that among 7714 ultrasound studies 13 cases of prenatally diagnosed renal diseases which present an incidence of 0.16% or 1.6 cases per 1000 sonograms.

Corresponding Author:
Dr. Shilpi Srivastava
Post Graduate (3rd Year),
Department of Radiodiagnosis,
Saraswathi Institute of
Medical Sciences, Hapur,
Uttar Pradesh, India

To identify the underlying pathology, it is crucial to evaluate the other sonographic features along with the echogenic kidney that are associated with aneuploidy, especially trisomy 13, including ventriculomegaly, holoprosencephaly, agenesis of the corpus callosum, cleft lip or palate, cyclasia, or microphthalmia. If the renal abnormalities are presented with echogenic kidney during the second trimester (14 weeks to 26 weeks) then they can result in increased echogenicity from renal dysplasia. The presentation of adult and infantile polycystic kidney disease can also be echogenic, but they look usually much larger than normal.

Very little data till date is available in regard to the fetal echogenic kidneys during the mid-trimester for the diagnosis of fetal kidney diseases using a scoring system. The present study aimed to assess a prognostic scoring system for fetal echogenic kidneys to diagnose the fetal kidney diseases in mid trimester by determining the kidney volume, laterality, bladder size, amniotic fluid and other associated anomalies.

Methodology
The present study is a prospective study conducted by enrolling 27 fetuses over the period of 3 years from May 2018 – December 2020 diagnosed with the "Echogenic kidneys" (Figure 1) on subjective assessment in sonography. Prior to the initiation of the study, ethical clearance was obtained from the Institutional Ethics Committee. A written informed consent, in a language known to them, was obtained from all parents prior to the study.
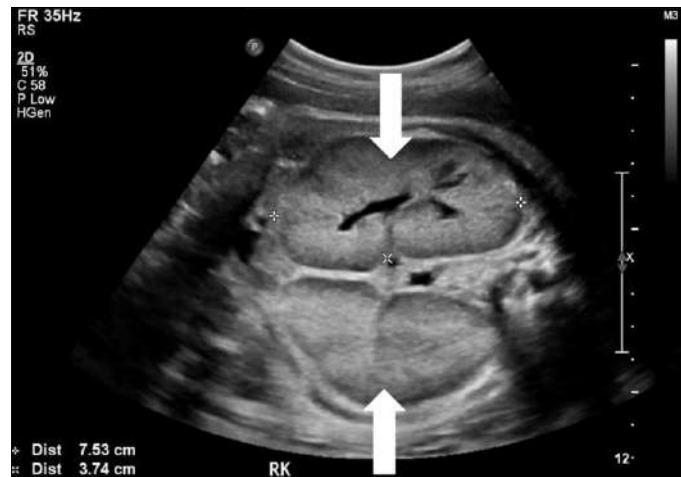

Fig 1: Fetal echogenic kidney

Criteria to confirm the echogenic kidneys
1. The renal parenchyma should be of higher echogenicity of the liver tissues
2. The subjective assessment of echogenicity should be confirmed by 2 specialists

The scoring was performed based on the certain parameters including renal size, laterality, bladder size, amniotic fluid and associate anomalies based on the criteria developed by Chavda *et al.,* [5]. (Table 1) The outcomes of all the pregnancies were blinded for the operator for the accurate assessment and removing the chances of the biased outcomes. The post natal renal scans were taken for the live births to evaluate the renal functions and wellbeing of the newborn.

Table 1: Scoring system for various parameters used in the study

Components	Variables	Score
Kidney size/volume	Small/Large	2
	Normal	1
Laterality	Bilateral	2
	Unilateral	1
Bladder size	Small/Large	2
	Normal	1
Amniotic fluid	Oligo/Poly	2
	Normal	1
Associated anomalies	Present	2
	Absent	0
Poor scoring = 7 – 10	Good scoring = 4 – 6	

Results
A total of 27 fetuses were enrolled for this prospective study out of which 11 were live births and 9 fetuses were grouped under NND/IUD and miscarriage.5fetuses underwent miscarriage, 2 IUD and 2 NND. The 7 pregnancies were terminated during the study period.
Among all the live births, 10 fetuses had the scoring of 4, 5 and 6. 1 fetus had a scoring of 8. Among the NND/IUD and miscarriage group 7 fetuses had the score of 5 and 6. 2 fetuses had score of 8 and 10 respectively. 4 out of 7 terminations had a score of 4-7. 2 terminated fetuses had score 9 and one terminated fetus had a score 10. In live births, the postnatal scans were taken which had confirmed the abnormalities. (Table 2, Fig 2)
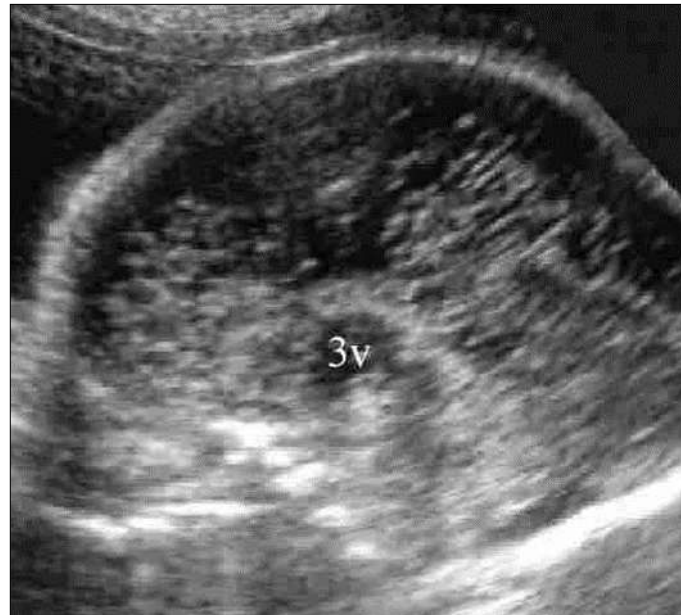
Fig 2: Agenesis of the corpus callosum

Table 2: Data representation of scoring in the live births, NND, IUD, miscarriage and terminations (N = 27)

Score	NND/IUD and miscarriage (n = 9)	Terminations (n = 7)	Live births (n = 11)	Accuracy of prediction
4	0	0	3	3/3
5	4	2	5	5/5
6	3	1	2	2/1
7	0	1	0	
8	1	0	1	1/1
9	0	2	0	
10	1	1	0	

The accuracy of prediction of the scoring system was found to be 90.9% (10/11).

Discussion
The nephrologists use the prenatal ultrasound for the view of kidneys and urinary tract while they develop in utero, to assess any fetal abnormalities. The sonographic prenatal assessment could aid in allowing the families to prepare for the associated complications that could arise after the birth in the kidneys. The nonspecific presentation of increased echogenicity of kidneys could be a transient finding or could be a possibility of serious kidney diseases that warrants evaluation by a pediatric nephrologist [2].

The present study had stated a scoring system to assess the fetal echogenic kidneys in the mid trimester for any abnormalities by scoring the renal size, laterality, bladder size, amniotic fluid and associated anomalies. The study stated that most of the live births had a scoring of 4, 5 and 6. Only one live birth had a scoring of 8. The abnormalities in the live births were confirmed in the post natal scans.

The NND/IUD and miscarriage fetuses had higher scores of 5, 6, 8 and 10. On the other hand 7 fetuses were chosen to be terminated following the prediction of abnormalities. The accuracy of prediction in the present study was found to be 90.9% which is definitely a higher count. Therefore, the scoring system could be used for the prediction of the abnormalities in the kidneys in the mid trimester and can be used to prognosticate the anomaly. The present prospective study revealed that the increased renal size, bilateral involvement, large small or absent bladder, oligohydroamnios or anhydroamnios presented a higher score in the fetuses which depicts the poor prognosis. Based on the results of the present study we could state that this could be an objective method to evaluate the fetal echogenic kidney and their prognosis which would avoid unnecessary terminations and advice termination when it is really required.

If the echogenicity in the kidneys is investigated then it is necessary to look for other sonographic features that are associate with aneuploidy, especially trisomy 13, including ventriculomegaly, holoprosencephaly, agenesis of the corpus callosum, cleft lip or palate, cyclasia, or microphthalmia. Choong *et al.,* [6]. have suggested that if the association of echogenic kidneys is established then attention should be paid to assess the presence of intracranial calcifications, echogenic bowel, ascites, hydrops, or cardiomegaly. If the renal pathology is indicated with echogenic kidneys during the second trimester then it is highly predictable to be due to renal dysplasia.

Further prospective studies and the investigations with a larger sample size are needed to reevaluate the assessments and observations concluded by the present study.

Table 3: Association of sonographic features along with the echogenic kidney

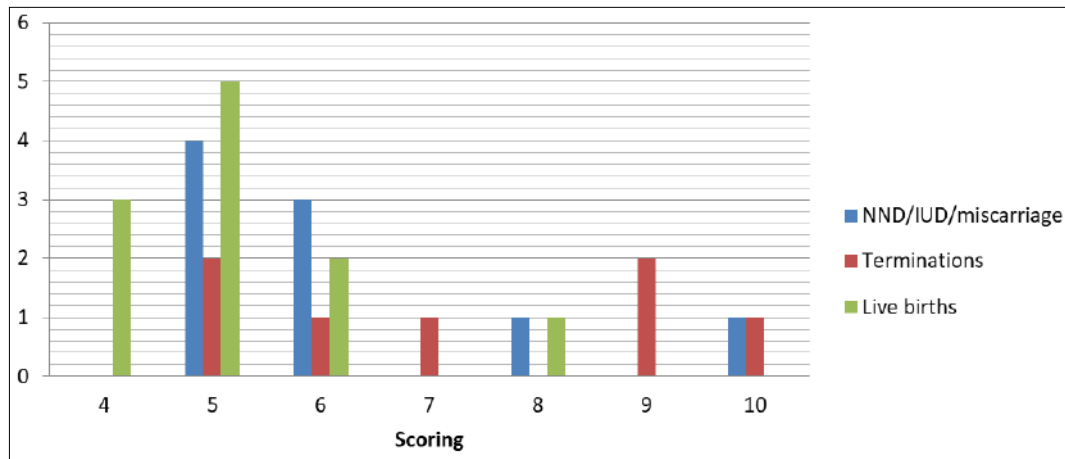| Sonographic features	N	%
Ventriculomegaly	1	3.70
Holoprosencephaly	2	7.41
Agenesis of the Corpus Callosum (Figure 2)	2	7.41
Cleft Lip or Palate	1	3.70
Microphthalmia	1	3.70

Fig 3: Graphical representation of the scoring in the live births, NND, IUD, miscarriage and terminations (N = 27)

Conclusion

Within the limitations of the study we can conclude that the scoring system could be a good tool to identify the anomalies in the fetal kidneys during the mid-trimester. As per the present prospective study it has been determined that increased renal size, bilateral involvement, large small or absent bladder, oligohydroamnios or anhydroamnios presented a higher score which states the poor prognosis. With the identification of the fetal echogenic kidneys the prognosis can be ruled out which helps in easing out the parental anxiety and renders them correct advice to opt for termination or not. Further studies are required to confirm the outcomes of the present prospective study.

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