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Original Research Article

Study of Common Congenital Renal Anomalies

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Abstract:

Background: Congenital anomalies are not uncommon; some remain asymptomatic, while the same lead to considerable morbidity and early death.

Method: 90 congenital renal anomalies were observed in pregnant women during an ultrasound study. A 2-5 MHz sector or linear transducer is used to scan the urinary tract. The kidneys are scanned in the transverse and coronal planes.

Results: Out of 90 fetuses, 70 (77.7%) were male, 19 (21.1%) were female, and 1 (1.1%) was ambiguous. Age of mother was 30.2 (± 5.80) range between 20-42. The major anomalies were hydronephrosis: 22 (24%) bilateral, 17 (18%) right, and 15 (16%) left; 11 (12%) multi cystic dysplastic kidney disease; 6 (6.6%) renal agenesis; 6 (6.6%) congenital poly cystic kidney disease; 3 (3.3%) pelvic kidney; 2 (2.2%) echogenic kidney; and 2 (2.2%) renal dysplasia.

Conclusion: Congenital renal anomalies are commonly encountered on ultrasound imaging studies. Despite dramatic improvements in MRI, CT, and nuclear studies, sonography continues to occupy a central role in the evaluation and detection of congenital renal diseases due to its advantages of rapid scanning time, lack of radiation exposure, cost-effectiveness, and easy feasibility.

Keywords: USG Congenital, Bilateral, Fetal, Still born, Telangana.

Introduction

A congenital malformation is a physical, metabolic, or anatomic defect that is apparent before birth or detected during the first year of life. Congenital anomalies can present themselves in a single organ system or may involve multiple organs of the body. Early detection of major anomalies can be indicative of induced abortion to reduce the high morbidity of neonates due to congenital malformation [1].

Congenital anomalies of the kidney and urinary tract are collectively one of the most diagnosed antenatal conditions, comprising around 20% of all congenital anomalies [2]. Congenital anomalies and urinary tracts can range from mild unilateral hydronephrosis to dysplastic kidneys with multiple cysts and can have varying prognosis. Some will have normal kidney function with no impact on a child's day-to-day life, while others can lead to chronic kidney disease and kidney failure requiring dialysis and transplant [3]. Some of the renal anomalies remain asymptomatic throughout the life without altering the life span of subjects, while others are associated with considerable morbidity and mortality [4]. Hence, an attempt is made to evaluate the life span of a newly born fetus or fetus yet to be born.

Material and Method

90 congenital renal anomalies were studied in the Ankura hospital, Madinaguda, Hyderabad, Telangana-500049 were studied.

Method: 90 pregnant women having congenital renal anomalies were observed during ultrasonographic study. 2-5 MHz sector curvilinear or linear transducer is used to scan the urinary tract. Although no specific preparation is required for scanning the kidneys, fasting optimizes the visualization. Evaluation of renal vessels is augmented by adequate patient hydration. Harmonic imaging is often useful for difficult-to-scan patients (e.g., obese patients); additional recent software advances, including compound imaging and speckle reduction, may increase lesion conspicuity and decrease artifacts.

The kidneys are scanned in the transverse and coronal planes. Optimal patient position varies; supine and lateral decubitus positions often suffice, although oblige and occasionally prone positioning may be necessary. Usually a combination of subcostal and intercostal approaches is required to evaluate the kidneys fully. The upper pole of the

left kidney may be particularly difficult to image without a combination of approaches.

The duration of the study was January 2022 to August 2024.

Statistical analysis: The study was undertaken as per the grading system of the fetal urology society; congenital anomalies were classified as bilaterally, right and left, sexual dimorphism; demographic features were studied with classification. The statistical analysis was carried out in SPSS software. The ratio of male and female was 2:1.

Observation and Results

Table 1: Study of society of fetal urology grading system

Table 2: The Laterality of Antenatal Diagnosis on Ultrasound Sites

- Hydronephrosis: 22 (24%) bilateral, 17 (18%) right, 15 (16%) left
- Multicystic dysplastic kidney disease: 5 (5.5%) bilateral, 4 (4.4%) right, 2 (2.1%) left
- Renal agenesis: 3 (3.3%) bilateral, 2 (2.1%) right, 1 (1.1%) left
- Infantile polycystic kidney disease: 6 (6.6%) bilateral
- Pelvic kidney: 1 (1.1%) bilateral, 1 (1.1%) right, 1 (1.1%) left
- Echogenic kidney: 2 (2.2%) on left
- Renal dysplasia: 2 (2.2%) bilateral

Table 3: Sexual dimorphism of fetus: 70 (77.7%) male, 19 (21%) female, 1 (1.1%) unknown

Table 4: Demographic features Age of mother: 302 (± 5.80), range 20-42

- Gestational age at ultrasound (weeks) 28 (± 7.4) range 12-40.
- Gestational age at birth (weeks): 38 (± 3.52) range 22-40
- Birth weight: 2.6 (± 0.65) range 0.8-4.10

Table 1: Society of foetal Urology grading system

Grade 0	Normal examination with no dilatation of the renal pelvis
Grade I	Mild dilatation of renal pelvis only
Grade II	Moderate dilatation of the renal pelvis including few calyces
Grade III	Dilatation of the renal pelvis with visualisation of all the calyces, which are uniformally and normal renal parenchyma
Grade IV	Similar pelvis and the renal pelvis and calyces as grade III plus thinning of the renal parenchyma

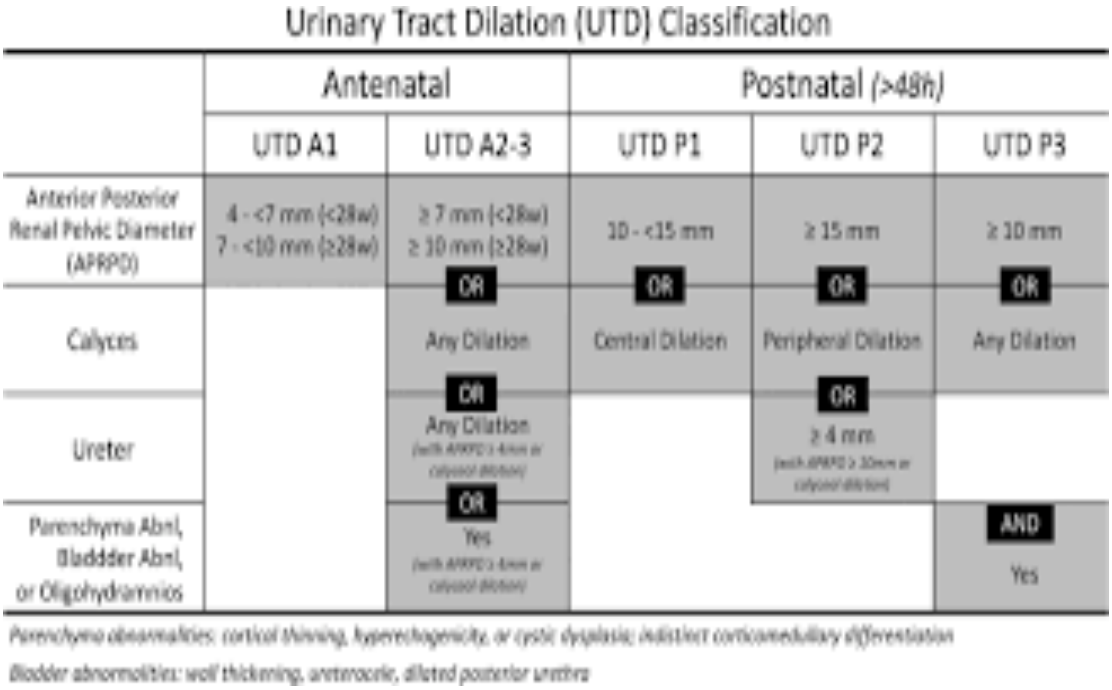

Figure 1:

Table 2: The laterality of antenatal diagnosis on ultra sound site (Total no. of patients: 90)

Antenatal diagnosis	Bilateral (%)	Right (%)	Left (%)
Hydronephrosis	22 (24%)	17 (18%)	15 (16%)
Multicystic dysplastic kidney disease	5 (5.5%)	4 (4.4%)	2 (2.9%)
Renal agenesis	3 (3.3%)	2 (2.2%)	1 (1.1%)

Infantile poly cystic kidney disease	6 (6.6%)	--	--
Pelvic kidney	1 (1.1%)	1 (1.1%)	2 (2.2%)
Echogenic kidney	0	0	2 (0.2%)
Renal dysplasia	2 (2.2%)	--	--

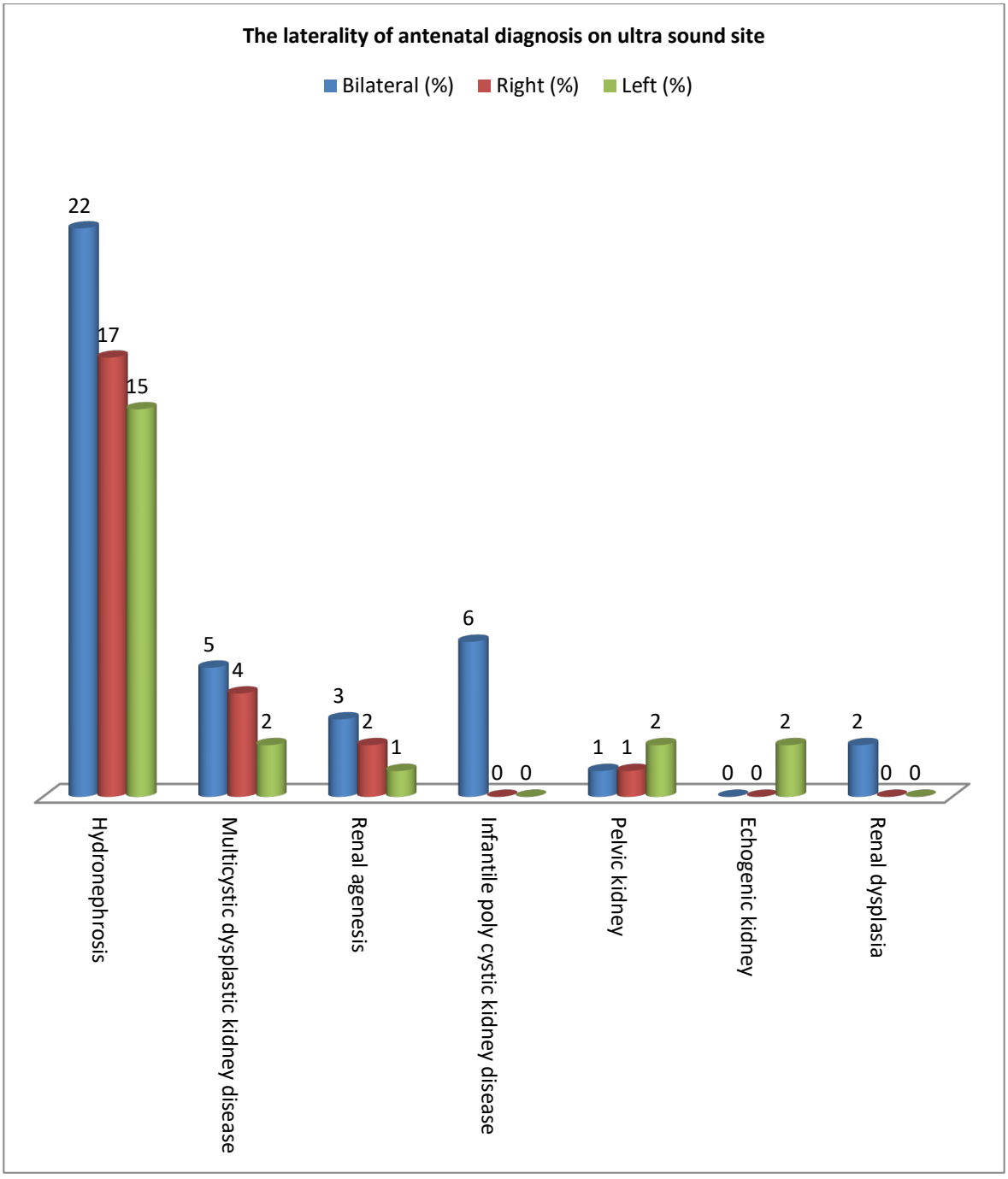

Figure 2: The laterality of antenatal diagnosis on ultra sound site

Table 3: Sexual dimorphism of foetus (Total no. of patients: 90)

Gender	Number	Percentage (%)
Male	70	77.7
Female	19	21.1
Ambiguous	1	1.1

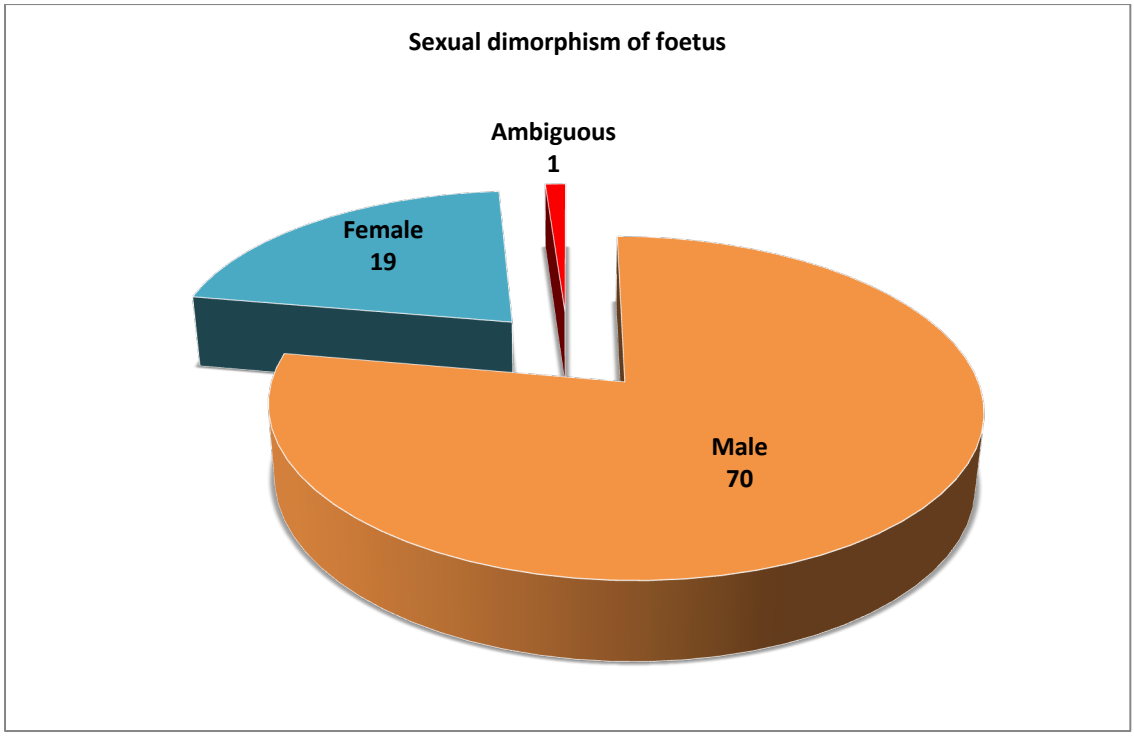

Figure 3: Sexual dimorphism of foetus

Table 4: Study of Demographic features

Maternal and Neonatal	Mean (± SD)	Range
Age of Mother (year)	30.2 (± 5.80)	20-42
Gestational age at ultra sound (weeks)	28 (± 7.4)	12-40
Gestational age at birth (weeks)	38 (± 3.52)	22-40
Birth weight (kg)	2.6 (± 0.65)	0.86-4.10

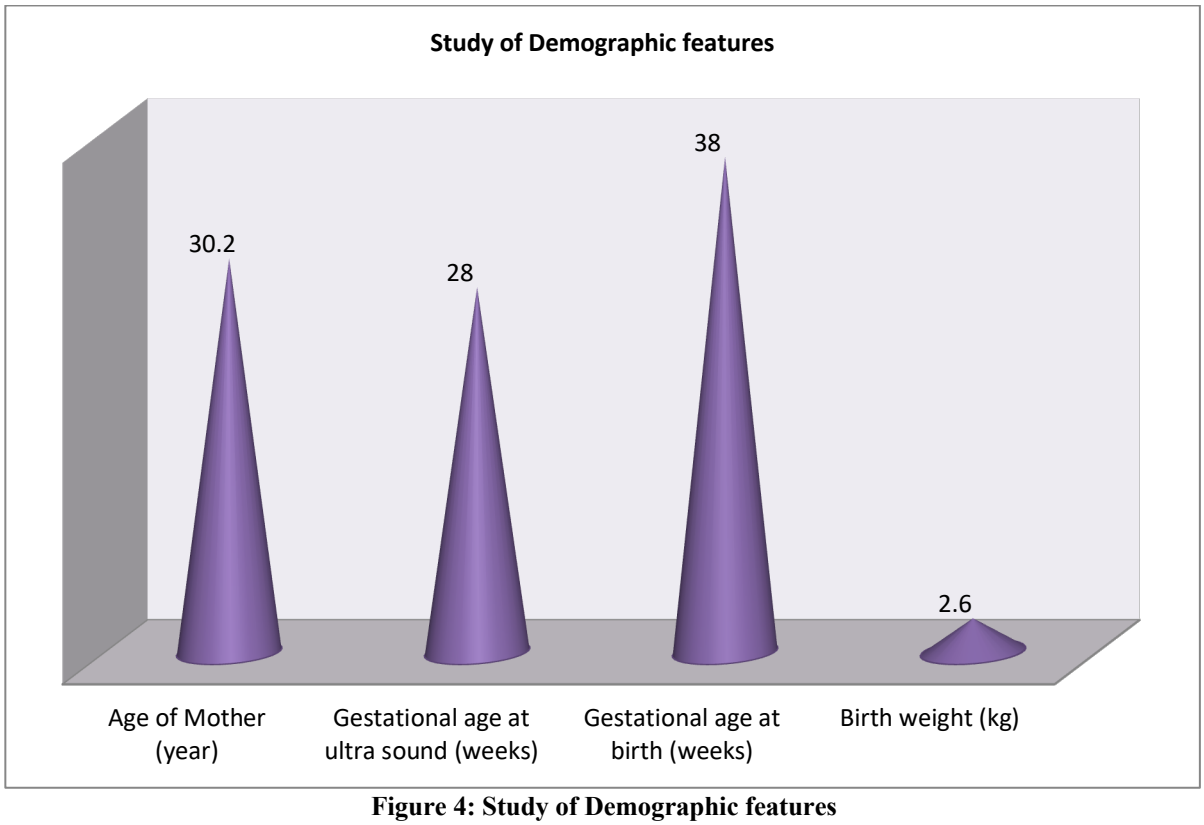

Figure 4: Study of Demographic features

Discussion

The present study of common congenital anomalies was studied as per the fetal urology grading system (Table 1). In the ultrasound study, the laterality of antenatal diagnosis had major congenital anomalies: 54 (60%) hydronephrosis, 11 (12.2%) multicystic dysplastic kidney disease, 6 (6.6%) renal agenesis, 6 (6.6%) infantile polycystic kidney disease, 3 (3.3%) pelvic kidney, 2 (2.2%) echogenic kidney, and 2 (2.2%) renal dysplasia (Table 2). Out of 90 fetal studies, 70 (77.7%) were male, 19 (21%) were female, and 1 (1.1%) was ambiguous (Table 3). In the study of demographic features, age of mother was 30.2 (± 5.80) range between 20-42, gestational age at ultra 20-42, gestational age at ultrasound was 28 (± 7.4) range between 12-40, gestational age at birth was 38 (± 3.52) range between 22-40, birth weight of fetus was 2.6 (± 0.65) range between 0.86-4.10 (Table 4)**.** These findings are more or less in agreement with previous studies [5,6,7].

Initially fetal kidneys are found in the pelvis with fetal growth; the kidney comes to lie in the upper retroperitoneum in the ninth gestational week with ascent; the kidney rotates medially 90O, so that renal pelvis is directed anteromedially; with kidney ascend, they drive their blood supply from nearby vessels; adult blood is from abdominal aorta; failure to ascend leads to pelvic kidney and ectopic kidney too [8]. It could be due to abnormal rotation and failure to reach the lumber region. Abnormal fusion between metanephros and mesonephros leads to horseshoe-shaped kidneys. Renal agenesis may be unilateral or bilateral. It is a rare anomaly that is compatible with life. It is traditionally known as Potter's syndrome [9]. Incomplete fusion between collecting part and secretary part of kidney leads to formation of infant polycystic kidney.

The affected kidney (or renal segment) has no functioning renal tissue and is replaced by multiple cysts. It leads to multi-cystic dysplastic kidney disease [10]. Echogenic kidneys appear bright on ultrasound imaging and can be caused by polycystic kidney disease, multicystic dysplastic kidney, and renal dysplasia. Echogenic kidney associated with chromosomal abnormalities and cytomegalovirus (CMV) infection cause urinary tract obstruction. The exact cause of echogenic kidney is yet to be known. Obstructive cystic renal dysplasia can occur from prolonged obstruction of the bladder outlet or urethra during gestation. These anomalies are associated with CVS and CNS fetal anomalies [11].

Summary and Conclusion

The majority of congenital renal anomalies are associated with CNS and CVS anomalies; hence, it indicates that it is due to chromosomal anomalies or aberrations. It is also noted that proper nutritional status and environmental factors enable the chromosomes to function efficiently; otherwise, they are termed “silence genes." The present ultrasonographic study plays a central role in the evaluation and detection of congenital renal anomalies due to its advantages of rapid scanning time, lack of radiation exposure, cost effectiveness, and easy feasibility.

Limitation of study:

Owing to the tertiary location of the research center, the small number of patients, and the lack of the latest techniques, we have limited findings and results.

This research work was approved by the ethical committee of the Ankura hospital, Madinaguda, Hyderabad, Telangana-500049.

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