e-ISSN: 0975-5160, p-ISSN: 2820-2651

Available online on www.ijtpr.com

International Journal of Toxicological and Pharmacological Research 2022; 12(3); 144-149

Original Research Article

A Study on the Diagnostic Assessment of Congenital Urinary Tract Abnormalities at a Tertiary Medical Facility

Avadhesh Kumar Gupta[1], Jagdish Kumar[2]

[1]Assistant Professor Dept. of Pediatrics Venkateshwara Institute of Medical Sciences Gajraula U.P. India

[2]Assistant Professor Dept. of Pediatrics Saraswathi Institute of Medical Sciences Pilkhuwa Hapur U.P. India

Received: 10-01-2022 / Revised: 15-02-2022 / Accepted: 30-03-2022
Corresponding author: Dr. Jagdish Kumar
Conflict of interest: Nil

Abstract

Background: Congenital illness prenatal diagnosis gives information for pregnancy decisions and proper parental treatment, which is thought to improve perinatal and long-term outcomes. Twenty to thirty percent of all detectable defects are kidney malformations, which are frequently discovered in the prenatal period.

Aims & objectives: The purpose of the current study was to examine the diagnostic procedures for congenital urinary tract abnormalities at a tertiary medical facility.

Material and Methods:A prospective observational study was conducted on neonates who were born at our institute, referred there within 24 hours of birth, followed up for 6 months, or who passed away within 6 months of birth and whose antenatal anomaly scans had revealed the presence of CAKUT (Congenital anomalies of the kidney and urinary tract).

Results: 136 instances were examined over the study period. Initial USG examinations (antenatally, 86.76 percent; postnatally, 13.24 percent) identified every anomaly. Few patients obtained further radiological tests, such as MRIs (7.35 percent during pregnancy and 5.88 percent afterward), and postnatal CT scans (5.88 percent) (as antenatally CT is relatively contraindicated). In the current study, polycystic kidney disease (20.59 percent), pelviureteric junction obstruction (19.12 percent), the posterior urethral valve (17.65 percent), ambiguous genitalia (4.41 percent), epispadius (2.94 percent), duplicated collecting system (2.94 percent), hypospadias (1.47 percent), and bladder exstrophy were the next most common congenital malformations of the urinary tract (1.47 percent).

Conclusion: The most frequent CAKUT seen both antenatally and postnatally was hydronephrosis. Compared to other renal anomalies, defects of the renal collecting system were easier to detect by prenatal imaging.

Keywords: Hydronephrosis, CAKUT, antenatal USG, anomaly scan.

Introduction

Congenital disease prenatal diagnosis gives information for pregnancy decisions and suitable parental treatment (timed delivery at tertiary care centers), it is thought to improve perinatal and long-term prognosis [1]. Congenital malformations are more common in some nations than others, and India accounts for about 28% of the world's neonatal mortality from congenital defects. Congenital abnormalities are said to be the cause of 8–15 percent of perinatal and 16 percent of newborn deaths in India [2,3]. Twenty to thirty percent of all detectable defects are kidney malformations, which are frequently discovered in the prenatal period. From moderate prenatal pelvic agenesis to bilateral renal agenesis, severity might vary [4]. These conditions affect about 2% of all pregnancies and are frequently linked to other developmental problems or genetic diseases [5]. The most frequent anomalies detected by sonography are congenital disorders of the genitourinary tract, which affect 1 to 4 out of every 1000 pregnancies. As a result, they account for 15–20% of all congenital malformations identified during pregnancy, with obstructive uropathies making up the majority of cases [6]. Approximately 60% of children who undergo surgery for renal or urinary tract issues in their first five years of life are detected by prenatal ultrasound thanks to the introduction of contemporary ultrasound screening programs [7].

Aims & objectives: The purpose of the current study was to examine the diagnostic procedures for congenital urinary tract abnormalities at a tertiary medical facility.

Material and Methods

In a tertiary care hospital in India, the department of pediatrics conducted a prospective observational research. The Institutional Ethics Committee gave their approval. Over two years were spent on the study. The present study focused on newborns who were delivered at our institute, referred within 24 hours of birth, completed 6 months of follow-up, or passed away within 6 months of birth and whose antenatal anomaly scans had revealed the presence of CAKUT (Congenital anomalies of the kidney and urinary tract). Detailed obstetric history of any risk factor for the development of congenital renal or urinary tract defects, such as history of oligohydramnios, inadequate weight gain or hypertension, diabetes, obesity, increased salt intake, alcohol consumption, exposure to teratogens, etc.During pregnancy was obtained from mother’s hospital records. Details of postnatal events including gestational age, Apgar scores, birth weight presence of another associated congenital anomaly was also documented and was confirmed. A postnatal ultrasonography was performed by a skilled observer using the ALOKA Prosound alpha 6 ultrasound machine having a frequency of 3 to 7 MHZ using curvilinear probe.

the degree and progression of CAKUT and comparison with prior scans, any surgical intervention, the results of additional investigations such as MCU, DMSA, and DTPA scans, if done, were noted, the development of other complications due to CAKUT such as UTI, deranged renal function, and outcome at the end of the six-month follow-up period were the parameters used to evaluate outcomes. Microsoft Excel was used to gather and compile the data, and SPSS 23.0 was used to analyze it. Descriptive statistics were used in the statistical analysis.

Results

136 instances were examined over the study period. The age group 21–25 years was the most prevalent for mothers (32.35 percent), followed by 26–30 and 31–35 years (22.06 percent each). In 27.94% of the instances, parental consanguity was observed. Primigravida made up the second-largest

portion of the population (39.71%). (32.35 percent). Baby boys made up 72,06 percent of the population, females made up 23.53 percent, and 4.41 percent had ambiguous genitalia. Babies were delivered at term in 48.53 percent of cases, vaginally in 57.35 percent of cases, and surgically in 39.71 percent of cases. The majority of instances (55.68%) were found in the third trimester, followed by the second trimester (30.88%) and the postpartum diagnosis (13.24%). Even though 30.88 percent of patients had second-trimester diagnoses, they did not choose abortion.

Table 1: General Characteristic.

Characteristic	No of neonates (n=136)	Percentage (%)
Maternal age (years)		
<20	10	7.35%
21-25	44	32.35%
26-30	30	22.06%
31-35	30	22.06%
>35	22	16.18%
Parental Consanguinity		
Present	38	27.94%
Absent	98	72.06%
Order of pregnancy		
G 1	44	32.35%
G 2-3	54	39.71%
G 4 or more	38	27.94%
Gender of baby		
Male	98	72.06%
Female	32	23.53%
Ambiguous	6	4.41%
Pregnancy termination according to gestational age		
21-28 weeks	24	17.65%
29-37 weeks	46	33.82%
>37 weeks	66	48.53%
Mode of delivery		
Vaginal delivery	78	57.35%
Caesarean section	54	39.71%
Instrumental	4	2.94%
Time of detection of anomaly.		
1st trimester	0	0.00%
2nd trimester	42	30.88%
3rd trimester	76	55.88%
After delivery	18	13.24%

Initial USG examinations (antenatally, 86.76 percent; postnatally, 13.24 percent) identified every anomaly. Few patients obtained further radiological tests, such as MRIs (7.35 percent during pregnancy and 5.88 percent afterward), and postnatal CT scans (5.88 percent) (as antenatally CT is relatively contraindicated).

Table 2: Diagnostic modality

Diagnostic modality	No of cases	Percentage (%)
USG examination		
Antenatal	118	86.76%
Postnatal	18	13.24%
MRI examination		
Antenatal	10	7.35%
Postnatal	8	5.88%
CT		
Postnatal	8	5.88%

In the current study, polycystic kidney disease (20.59 percent), pelviureteric junction obstruction (19.12 percent), the posterior urethral valve (17.65 percent), ambiguous genitalia (4.41 percent), epispadius (2.94 percent), duplicated collecting system (2.94 percent), hypospadias (1.47 percent), and bladder exstrophy were the next most common congenital malformations of the urinary tract (1.47 percent)

.**Table 3: Congenital malformations**

CAKUT anomaly	No of cases	Percentage (%)
Hydronephrosis	42	30.88%
Polycystic kidney disease	28	20.59%
Pelviureteric junction obstruction	26	19.12%
Posterior urethral valve	24	17.65%
Ambiguous genitalia	6	4.41%
Epispadias	4	2.94%
Duplicated collecting system	4	2.94%
Hypospadias	2	1.47%
Bladder exstrophy	2	1.47%

Discussion

Due to the early detection and treatment of serious blockages and urinary tract infections, as well as the prevention of additional renal damage and loss of renal function, prenatal diagnosis improves the outcome of the affected child [8-10] . Fetal magnetic resonance imaging and Doppler analysis are two significant advancements in prenatal imaging. To identify predictive indicators of fetal kidney damage, proteomics of urine and amniotic fluid has been investigated. The obstetrician can decide whether to perform a premature birth using high resolution ultrasonography, which clearly shows a variety of structural problems. Nuclear imaging, magnetic resonance imaging, and ultrasonography are essential for diagnosis and subsequent monitoring. To assess the lower urinary tract's functionality, noninvasive urodynamic investigations like uroflow and postvoid residual measurement are frequently sufficient [11].

With an incidence of 1 in 1500–3200 live births and being more prevalent in men, renal agenesis is typically unilateral. One of the most severe kidney malformations, renal agenesis is characterized by a complete lack of kidney development and frequently includes a missing ureter [12]. The inability of the metanephric bud to form despite a normally present mesonephros, early metanephros regression, poor mesonephros development, and non-development of

pronephros leading to non-growth of mesonephros are the four theories put out as possible causes. Chromosome abnormalities such 45 X mosaicism, 22q11 microdeletion, and trisomies 21, 22, 7, and 10 have also been linked to renal agenesis [13]. In a study of antenatally identified renal and excretory tract abnormalities, Hekmat C et al. found that MCDK was the most frequently identified fetal abnormality (44.44 percent), followed by posterior urethral valves (PUV) (22.22 percent), renal agenesis (13.89 percent), autosomal recessive polycystic kidney disease (ARKD) (11.11 percent), ureteropelvic junction (UPJ) obstruction Participants in the study by Saryu Gupta et al. had a mean age of 29 3 years [14]. Of the participating moms (N = 18), 41% (N = 13) had reduced or no amniotic fluid, whereas 59% (N = 18) had normal amniotic fluid. The multicystic dysplastic kidney (MCDK) and urine blockage were the two anomalies that were observed most frequently overall (29 percent each) (22 percent).All mothers with signs of anhydramnios, including B/L MCDK (N = 3), autosomal recessive polycystic kidney disease (ARPKD) (N = 2), posterior urethral valves (PUV) (N = 2), B/L renal agenesis (N = 3), and megacystis (N = 1), were found to have bilateral renal illness. One case each of fusion abnormalities (horseshoe kidney) and rotation anomalies (malrotation) was found [15]. In 35% (N = 11) of the patients, additional extrarenal abnormalities were detected on fetal MRI. By greater morphological delineation, fetal MRI increases diagnosis accuracy in abnormalities affecting the fetal kidney and genito-urinary systems. Males were more likely to have CAKUT, according to Chougule A. et al. In prenatal imaging, hydronephrosis was the most typical CAKUT.93.9 percent of all CAKUT found on a prenatal anomaly scan were renal collecting system anomalies, and 57.4 percent of these corrected themselves by six months of age. Together, abnormalities of the renal collecting system made up 93.9 percent of all antenatally diagnosed CAKUTs, which was higher than the 6.1 percent made up by abnormalities of the renal parenchyma. Regardless of the site, postnatal remission of moderate hydronephrosis with prenatal diagnosis was observed in seven out of 22 (31.8%) cases on day three USG. 11 (39.3%) of the 28 cases of hydronephrosis that were detected antenatally and were followed for six months were resolved [16]. Primary VUR, PUJO, MCDK, non-obstructive hydronephrosis, and PUV were the most frequent CAKUTs, according to Kumar BH et al.In contrast, PUV (36.4%), main VUR (19.6%), and PUJO were the most prevalent according to Soliman et al (18.7 percent). PUJO was reported to be 62.7 percent, followed by VUR at 16.6 percent, by Aksu et al. According to Lee et almeta-analysis, .'s every dilatation of the urinary tract, regardless of its severity, was linked to a 36 percent higher probability of an underlying uropathy.If the hydronephrosis was mild (APPd > 7 mm in the second trimester and 9 mm in the third trimester), the risk was 12 percent; if the hydronephrosis was moderate (APPd 7-9 mm in the second trimester, 9- 15 mm in the third trimester); and if the hydronephrosis was severe (APPd > 10 mm in the second and > 15 mm in the third trimester), In order to assess any related spinal abnormalities, MR imaging is essential. [17,18]

Conclusion

The most frequent CAKUT seen both antenatally and postnatally was hydronephrosis. Compared to other renal anomalies, defects of the renal collecting system were easier to detect by prenatal imaging. Although they are inappropriate for routine screening, computed tomography and magnetic resonance imaging (MR) offer exceptional anatomic detail and increased diagnostic specificity. Ectopic extravesical ureteric insertions can be seen during MR urography, giving a comprehensive picture of the abnormality. For an accurate diagnosis

and suitable care, one must be familiar with lower urinary tract anomalies.

References

1. Liu L, Johnson HL, Cousens S, Perin J, Scott S, Lawn JE, Rudan I, Campbell H, Cibulskis R, Li M, Mathers C, Black RE, Child Health Epidemiology Reference Group of WHO and UNICEF. Lancet. 2012 Jun 9; 379(9832):2151-61.
2. Taksande A., Vilhekar K., Chaturvedi P., Jain M. Congenital malformation at birth in central India. Ind. J. Human Genet. 2010: 16:159-63.
3. Seikaly MG, Ho PL, Emmett L, Fine RN, Tejani A. Chronic renal insufficiency in children: the 2001 Annual Report of the NAPRTCS. Pediatr Nephrol. 2003; 18(8):796–804.
4. Sanna-Cherchi S, Westland R, Ghiggeri GM, Gharavi AG. Genetic basis of human congenital anomalies of the kidney and urinary tract. J Clin Invest. 2018; 128(1): 4–15.
5. Nielsen GL, Norgard B, Puho E et al. Risk of specific congenital abnormalities in offspring of women with diabetes. Diabet Med 2005; 22: 693–696
6. Adalat S, Bockenhauer D, Sarah E et al. Renal malformations associated with mutations of developmental genes: messages from the clinic. Pediatr Nephrol 2010; 25: 2247–2255
7. Srivastava RN. Challenge of congenital abnormalities of the kidney and urinary tract. Asian J Pediatr Nephrol 2018;1:49-51.
8. Mishra A. Renal agenesis: report of an interesting case. Br J Radiol 2007; 80: e167–e169
9. Hiraoka M, Tsukkahara H, Ohshima Y et al. Renal aplasia is the predominant cause of congenital solitary kidneys. Kidney Int 2002; 61: 1840–1844
10. Woolf AS, Hillman KA. Unilateral renal agenesis and the congenital solitary functioning kidney: developmental, genetic and clinical perspectives. BJU Int 2007; 99: 17–21
11. Hekmat Chaara et al. Antenatal Diagnosis of Renal and Excretory Tract Abnormalities: A Report of 36 Cases and Review of the Literature. Sch Int J Obstet Gynec, 2021:4(4): 114-123.
12. Gupta, S., Mohi, J.K., Gambhir, P. et al. Prenatal diagnosis of congenital anomalies of genito-urinary system on fetal magnetic resonance imaging. Egypt J Radiol Nucl Med 2020:51, 155.
13. Chougule A, Purkayastha J, Lewis L, Aiyappa G, Barche A. Study of Congenital Anomalies of the Kidneys and Urinary Tract in Neonates. J Nepal Paediatr Soc 2018;38(3):176-81.
14. Kumar BH, Krishnamurthy S, Chandrasekaran V, Jindal B, Ananthakrishnan R. Clinical Spectrum of Congenital Anomalies of Kidney and Urinary Tract in Children. Indian Pediatr. 2019 Jul 15;56(7):566-570.
15. Soliman NA, Ali RI, Ghobrial EE, Habib EI, Ziada AM. Pattern of clinical presentation of congenital anomalies of the kidney and urinary tract among infants and children. Nephrol (Carlton). 2015;20:413-8.
16. Aksu N, Yavaþcan O, Kangin M, Kara OD, Aydin Y, Erdoðan H, et al. Postnatal management of infants with antenatally detected hydronephrosis. Pediatr Nephrol. 2005:20:1253.
17. Lee RS, Cendron M, Klnnamon dd et al. Antenatal hydro nephrosis as a predictor of postnatal outcome: a metaanalysis. Pediatrics. 2006;118;586-93.
18. Darmal, D. I., Khan, A., Ahmad, D. S., & Gowani, A. Frequency of Type II Diabetes Mellitus in ST Segment Elevated MI patients presented to French Medical Institute for Mothers and Children: A Cross Section Study. Journal of Medical Research and Health Sciences, 2022: 5(6), 2023–2038.