ORIGINAL RESEARCH PAPER
Volume - 15 | Issue - 02 | February - 2026 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

A STUDY OF INCIDENCE OF HYDRONEPHROSIS AND CONGENITAL ANOMALIES OF KIDNEY AND URINARY TRACT (CAKUT) IN ANTENATALLY DETECTED FETAL HYDRONEPHROSIS

Neonatology

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ABSTRACT

Background- Fetal hydronephrosis is defined as dilation of fetal renal collecting system on prenatal ultrasonography. It includes a spectrum of urological conditions affecting 1-5% of all pregnancies1. Hydronephrosis is one of the most frequently identified renal findings on prenatal ultrasound, especially in the later stages of pregnancy. While many detected dilatations resolve spontaneously and have no long-term impact, congenital anomalies of the kidney and urinary tract (CAKUT) including obstructive uropathies and vesicoureteral reflux (VUR) may also present in this manner. The key clinical task is to identify which infants need continued surveillance or intervention. Any newborn with an abnormal antenatal renal scan should have a postnatal ultrasound soon after delivery, followed by a repeat assessment at around 4 to 6 weeks of age to determine the persistence or progression of hydronephrosis.6 **Objective-**To study incidence of hydronephrosis and congenital anomalies of kidney and urinary tract (CAKUT) based on antenatally detected hydronephrosis. **Study Design-** This is a retrospective observational study where antenatally detected hydronephrosis was followed up with postnatal ultrasonography after day 3 of life except in cases with bilateral hydronephrosis and solitary kidney with hydronephrosis where postnatal ultrasonography is done within 48 hours of life to detect hydronephrosis and CAKUT in neonates. **Inclusion Criteria –** Neonates with antenatally detected fetal hydronephrosis with renal pelvic diameter (RPD) of ≥ 4 mm in second trimester and ≥ 7mm in third trimester ultrasonography. **Exclusion Criteria-** Neonates who showed resolution of hydronephrosis (RPD ≤6mm) during third trimester fetal ultrasonography. **Result-** a total of 76 newborns with antenatally detected hydronephrosis were included in the study. Among them 60 (79%) newborns were detected with hydronephrosis postnatally. Of these 6 (10%) newborns were detected to have vesicoureteral reflux, 10 (16%) were detected to have ureteropelvic junction obstruction (UPJO),3 (5%) were detected to have multicystic dysplastic kidney, 2 (3%) were detected to have posterior urethral valve (PUV) and the rest (66%) with non-obstructive pelvic dilation. **Conclusion-**Isolated pelviectasis is often a transient finding and tends to resolve spontaneously within the first year of life. However, when dilation extends to the infundibulum or calyces, more vigilant follow-up is warranted. Approximately 70% of affected infants can be managed conservatively with structured surveillance, including renal ultrasonography every 3–6 months and appropriately timed functional studies, depending on the severity of the hydronephrosis. A subset of infants may require early surgical intervention, and it is essential to evaluate for any associated congenital or chromosomal abnormalities that could influence management and prognosis.

KEYWORDS

CAKUT, Fetal Hydronephrosis, Antenatal, Renal

INTRODUCTION

Fetal hydronephrosis is defined as dilation of fetal renal collecting system on prenatal ultrasonography. It encompasses a spectrum of urological conditions affecting 1-5% of all pregnancies[1].

Congenital anomalies of the kidney and urinary tract (CAKUT) are important causes of fetal hydronephrosis that should be diagnosed soon after birth as they are associated with chronic kidney disease and urinary tract infection.[8]

The ultrasound for postnatal evaluation is recommended to occur at greater than 48hrs after birth, as earlier evaluation can lead to false negative results due to relative oliguria that occurs on first day of life in newborns.[3]

A postnatal ultrasound should be considered immediately after birth if evidence of obstructive uropathy is seen on the prenatal ultrasound.[4]

Most generally accepted method to define and grade fetal hydronephrosis is ultrasound measurement of the maximum anteroposterior diameter of the fetal renal pelvis (APPD), also referred to as RPD, in the transverse plane.[7]

Objective

To estimate incidence of hydronephrosis and congenital anomalies of kidney and urinary tract (CAKUT) based on antenatally detected hydronephrosis.

Methods

Study Design - Retrospective observational studySample size (n)- 76 neonatesCalculated using the formula:

$$n = \frac{(z1-\alpha/2)^2 P(100-P)}{d2}$$

Z1-α/2 = 1.96 level of significance at 95% confidence interval.
P= 5%
D = allowable error =5%
n = 76

Sampling Method: Universal sampling method.
Study Area: KVG Medical College And Hospital, Sullia.
Study Period: AUGUST 2022 - APRIL 2023

MATERIALS

In this study, infants who had been flagged for hydronephrosis during antenatal scans were reassessed after birth using renal ultrasonography. For the majority, this evaluation was scheduled after the third day of life. Earlier imaging within the first 48 hours was reserved for newborns with hydronephrosis affecting both kidneys or those with a single kidney showing dilatation, as these situations required prompt documentation of urinary tract abnormalities, including CAKUT.

Several criteria are available for interpreting fetal renal dilatation, but among them, the renal pelvic diameter (RPD) measurement continues to be the most widely applied index during prenatal imaging.[8]

Following the initial postnatal scan, a micturating cystourethrogram (MCUG) was recommended for most infants in whom hydronephrosis persisted, primarily to evaluate for vesicoureteral reflux or structural anomalies of the lower urinary tract.

Table 1: Grading of Antenatal Hydronephrosis Based on APPD[4,6]

	Second trimester	Third trimester
Mild	4-6mm	7-9mm
Moderate	7-10mm	10-15mm
Severe	11-15mm	>15mm

Inclusion Criteria

Neonates with antenatally detected fetal hydronephrosis with renal pelvic diameter (RPD) of ≥4 mm in second trimester and ≥7 mm in third trimester ultrasonography.

Exclusion Criteria

Neonates who showed resolution of hydronephrosis (≤6mm) during third trimester fetal ultrasonography.

RESULT

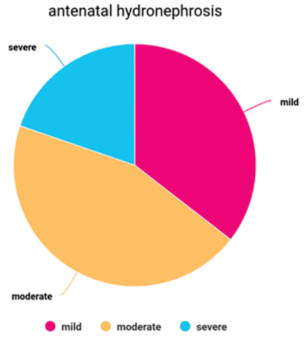
A total of 76 newborns with antenatally detected hydronephrosis were included in the study.

Among them 60 (79%) newborns were detected with hydronephrosis postnatally.

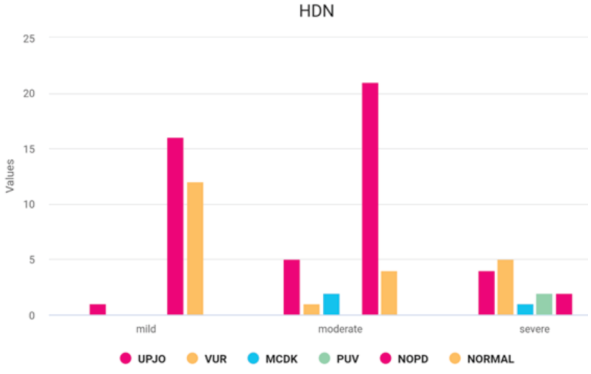
Mild hydronephrosis – 38 percent, 29 of 76 cases including UPJO (n=1), NOPD(n=16) and normal study in 12 cases.

Moderate hydronephrosis – 43 percent, 33 of 76 cases including VUR (n = 1), UPJO(n =5), MCKD(n =2), NOPD(n=21) and normal in 4 cases.

Severe hydronephrosis – 19 percent, 14 of 76 cases including VUR (n = 5), UPJO (n =4),PUV (n=2), MCKD(n=1) and NOPD(n=2)



Graph 1: Pie Chart Showing Division Of Cases Based On Antenatal Grading Of Hydronephrosis



Graph 2: Bar Graph Depicting Division Of Cases Based On Postnatal Findings

Table 2: Postnatal Findings Divided Based On Grades Of Antenatal Hydronephrosis

	UPJO	VUR	PUV	MCDK	NOPD	Normal
Mild	1	0	0	0	16	22
Moderate	5	1	0	2	21	4
Severe	4	5	2	1	2	0

DISCUSSION

- A French prospective study conducted at a single center followed fetuses with marked antenatal renal pelvic dilatation (initial RPD >10 mm). Out of 70 infants monitored, 33 (approximately 47%) ultimately required surgical management, with the procedure typically performed around five months of age.[9]
- Several prenatal ultrasound features increase the likelihood of identifying CAKUT, including greater degrees of renal pelvic dilatation, bilateral involvement, and findings suggestive of distal obstruction such as ureteral dilation or bladder wall thickening. Additional markers of concern include renal cortical thinning or increased echogenicity and reduced amniotic fluid volume.[4,5]
- When ureteral obstruction develops early in gestation, it can severely impair renal development. The resulting abnormalities range from multicystic dysplastic kidney to atresia at the ureter or ureteropelvic junction, as well as milder forms of cortical dysplasia associated with partial obstruction.[2]
- Postnatally, urinary stasis due to obstruction predisposes the infant to infections, which can further exacerbate renal injury.[2]
- Categorizing the risk level of urinary tract dilatation during both the antenatal and postnatal periods assists clinicians in determining the appropriate diagnostic work-up and the need for intervention.

CONCLUSION

- As the renal pelvic diameter increases, so does the probability of detecting an underlying CAKUT lesion. Follow-up imaging in the third trimester provides better insight into which newborns are likely to have anomalies that could ultimately require surgical correction.
- When both kidneys show dilatation, the chances of finding a clinically important pathology are higher. This pattern is often linked to lower urinary tract obstruction, particularly posterior urethral valves, which can compromise renal function after birth.
- Nearly 70% of affected infants can be managed conservatively with structured follow-up. This typically includes serial ultrasounds every 3–6 months and carefully selected renal scans based on the progression or stability of the hydronephrosis.
- Some infants do need earlier operative intervention, and it is important to evaluate for any additional congenital anomalies or chromosomal disorders, as these may influence both management and prognosis.

Abbreviations

UPJO- Ureteropelvic Junction Obstruction
NOPD- non obstructive pelvic dilatation
VUR – Vesicoureteric Reflux
PUV – Posterior Urethral Valve
MCDK – Multicystic Kidney Disease

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