ORIGINAL RESEARCH ARTICLE

Antenatally Detected Hydronephrosis: Predictors for Future Follow-up

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DOI: http://dx.doi.org/10.21276/ijcmsr.2021.6.4.8

How to cite this article: Shagufta Wahab, Hari Krishna, Rizwan Ahmad Khan, Dalia Rafat. Antenatally detected hydronephrosis: predictors for future follow-up. International Journal of Contemporary Medicine Surgery and Radiology. 2021;6(4):D44-D47.

ABSTRACT

Introduction: Fetal hydronephrosis is the most common anomaly identified on antenatal ultrasound. The present study was planned to differentiate between cases that require long term follow up or surgical intervention through antenatal and postnatal sonographic study.

Material and methods: Fifty women in their third trimester underwent ultrasound scanning. Postnatal ultrasound of baby was done at 2 weeks post-delivery. Cut-off value was taken as <5 mm. Cases were categorized into those with borderline (5-6.9 mm), mild (7-9.9 mm), moderate (10-14.9 mm) and severe dilatation (≥15 mm). Postnatal evaluation of renal system of neonates was done at 2 weeks of birth and correlation between prenatal and postnatal measurements was done.

Results: The fetal right kidney AP diameter of pelvicalyceal system was normal (<5mm) in 44 (88%) cases and fetal renal pelvis dilatation was seen in 6(12%) cases. Analysis of association revealed that the correlation coefficient was 0.948. The fetal left kidney AP diameter was normal in 43 (86%) cases and fetal renal pelvis dilatation was seen in 7(14%) cases. There was very strong correlation (r=0.985).

Conclusions: Findings of the present study showed that all borderline antenatal renal pelvic dilatation cases resolve and improve to normal condition. A 7 mm cut off for renal pelvic dilation was found to be more specific for postnatal persistent hydronephrosis requiring intervention.

Keywords: Ultrasonography, Renal Pelvis, Hydronephrosis, Antenatal, Postnatal

INTRODUCTION

Fetal hydronephrosis is defined as "dilatation of the renal pelvis of ≥4mm before the 27th week of pregnancy and ≥ 7 mm after the 28th week of pregnancy" There are three gradations of hydronephrosis: mild, moderate, or severe. Based on gestation and diagnostic criteria, "antenatally detected hydronephrosis (ANH)"prevalence varies from 0.6-5.4% [1].Various studies show that in 41-88% of patients ANH settles during infancy or by birth[2,3,4]. However, urinary tract infections (UTI) and vesicoureteric reflux (VUR) occurrence rates are exceptionally high[5,6] . As per Ring and Zobel, it's feasible to detect many urinary tract irregularities prenatally, but a majority of abnormalities are detected during infancy when UTI occurs. So In a normal fetus, mild pelvic dilatation is common, but after it is detected, follow-up is a must.

The predictors of unfavorable outcome include severe renal parenchymal changes like renal parenchymal hyperechogenicity and cortical cysts, oligohydramnios, especially when discovered early in pregnancy, severe extrarenal abnormalities, and severe extrarenal abnormalities[7,8]. Though the renal pelvic antero-posterior diameter (APD) is dependent on many factors like maternal hydration, gestation, and bladder distension, it still is considered an objective parameter. Therefore, the present study was planned to assess antenatal pelvic diameter and correlate the findings with postnatal renal pelvic assessment .

MATERIAL AND METHODS

The study was conducted at the Department of Radiodiagnosis and Obstetrics and Gynaecology of Jawaharlal Nehru Medical College and Hospital, AMU, Aligarh after ethical committee clearance and included 50 pregnant women who were referred to the department for 3rd trimester ultrasound scanning from Department of Obstetrics and Gynaecology and was done over a period of 2 years from October 2019 to October 2021. The detailed demographic information regarding maternal age, and information related to gestational age and gravida was collected and findings of relevant clinical examination was also filled. Patients were subjected for antenatal ultrasonography and fetal renal pelvis diameter was assessed on Toshiba istyle aplio XG machine with low frequency (3-5MHz) and high frequency (5-12 MHz) transducers. These women were followed-up and postnatally ultrasound of baby was done to re-evaluate the fetal pelvis diameter 2 weeks post-delivery. Cut-off value was taken as <5 mm. Each of them were categorized into borderline (5-6.9 mm), mild (7-9.9 mm), moderate (10-14.9 mm) and severe

dilatation (≥15 mm) [1,9]. Postnatal evaluation of renal system of neonates was done at 2 weeks of birth.Categorical variables were presented in number and percentages (%). Comparison of means was done using pared t- test and a p-value <0.05 was considered significant. Correlation between antenatal and postnatal measurements was performed with r-0-0.19- showing very weak association, 0.2-0.39- weak association, 0.4-0.59-moderate association, 0.6-0.79-strong association, 0.8-1-very strong association.

RESULTS

Clinical Information regarding maternal age, gestational age and gravida was collected. Patients were subjected for antenatal ultrasonography and fetal renal pelvis diameter assessment was done. Re-evaluation of the fetal pelvis diameter was done at 2 weeks post-delivery. The mean age of the mothers was found to be 25.1 ±3.64 years with majority in 21-25 years age group. There were 15 primigravida (30%) and 35 multigravida (70%). The gestational age in majority was 32-35 weeks. The fetal right kidney AP diameter of pelvicalyceal system was normal (<5mm) in 44 (88%) cases and fetal renal pelvis dilatation was seen in 6(12%) cases: borderline (5 to 6.9) in 3 (6%), mild (7 to 9.9) in 1(2%), moderate (10 to 14.9) in 1(2%), and severe (≥ 15) in 1(2%) cases (Table 1). The mean diameter was calculated as 4.16mm± 2.69 mm.

The fetal left kidney AP diameter was normal (<5mm) in 43 (86%) cases and fetal renal pelvis dilatation was seen in 7(14%) cases: borderline (5 to 6.9) in 3 (6%), mild (7 to 9.9) in 1(2%), moderate (10 to 14.9) in none of the case (Figure 1), and severe (Figure 2) (≥ 15) in 3(6%) cases (Table 1). The mean diameter was calculated as 4.67mm± 3.80 mm.

On post-natal 2 weeks, the fetal right kidney AP diameter was normal (<5) in 47 (94%) cases and fetal renal pelvis dilatation was seen in 3(6%) cases: borderline (5 to 6.9) in 0%, mild (7 to 9.9) in 0%, moderate (10 to 14.9) in 2(4%) cases, and severe (≥ 15) in 1(2%) cases (Table 1). The mean diameter was calculated as 4.46mm±2.68 mm. Comparison of the means between antenatal and postnatal measurement using paired t- test showed t=0.57 and the difference was not significant (p>0.05). Similarly on post-natal 2 weeks USG, the fetal left kidney AP diameter was normal (<5mm) in 46 (92%) cases and fetal renal pelvis dilatation was seen in 4(8%) cases: borderline (5 to 6.9) in 0%, mild (7 to 9.9) in 1(2%), moderate (10 to 14.9) in 0% cases, and severe (≥ 15) in 3(6%) cases(Table 1). The mean diameter was calculated as 5.14mm± 3.99 mm. Comparison of the means between antenatal and postnatal measurement using t- test showed t=0.60 and the difference was not significant (p>0.05). Analysis of correlation between fetal right kidney pelvicalyceal system AP diameter (3rd trimester) and post-natal 2 weeks fetal right kidney PCS AP diameter revealed that 44 normal kidneys on 3rd trimester were normal on

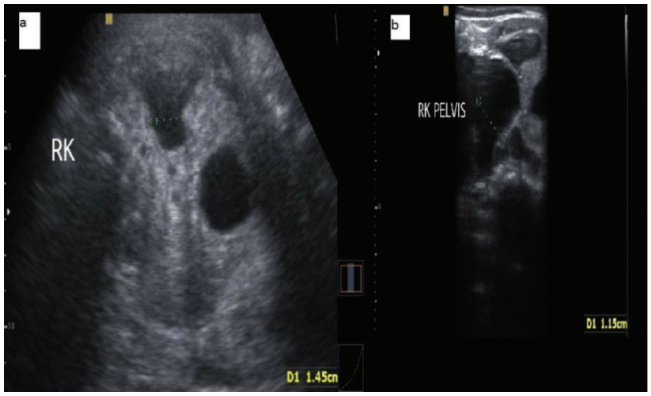

Figure-1: Shows a moderate case of antenatal (a) and postnatal at 2 weeks (b) status of pelvicalyceal system.

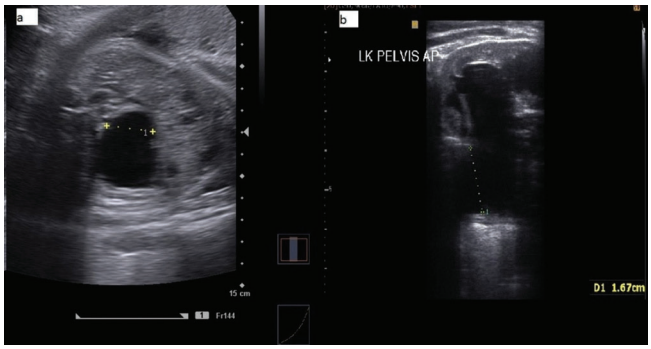

Figure-2: Shows a severe case of antenatal (a) and postnatal at 2 weeks (b) status of pelvicalyceal system.

S. No	Anteroposterior Kidney diameter groups (mm)	No. of cases in Antenatal period (3rd Trimester)		No. of cases in Postnatal Period (2 weeks)	
		Right	Left	Right	Left
1	<5	44 (88%)	43 (86%)	47 (94%)	46 (92%)
2	5 to 6.9	3 (6%)	3 (6%)	0(0%)	0(0%)
3	7 to 9.9	1(2%)	1(2%)	0(0%)	1(2%)
4	10 to 14.9	1(2%)	0(0%)	2 (4%)	0(0%)
5	>=15	1(2%)	3 (6%)	1(2%)	3 (6%)

Table-1: Distribution of right and left kidney AP diameter in antenatal and postnatal period.

S. No	AP diameter of renal pelvis	Mean ±SD	t-value	P-value	Correlation coefficient (r)
1.	Antenatal right PCS	4.15±2.67	0.57	>0.05	0.948
2.	Postnatal right PCS	4.45±2.66			
3.	Antenatal left PCS	4.67±3.80	0.60	>0.05	0.985
4.	Postnatal left PCS	5.14±4.00			

Table-2: Correlation of antenatal pelvicalyceal diameter with postnatal measurement and comparison of means

ISSN (Online): 2565-4810; (Print): 2565-4802 | ICV 2019: 98.48 |

post-natal 2 weeks scan. The borderline kidneys 3 (6%) turned to normal kidneys postnatal; 1 mild kidney turned to moderate kidney postnatal; 1 moderate kidney remained as moderate; and 1 severe kidney remained as severe postnatal. Correlation coefficient was found to be 0.948 showing very strong association (Table 2).

The study also showed a very strong correlation r=0.985 between fetal left kidney AP diameter (3rd trimester) and post-natal 2 weeks fetal left kidney AP diameter. The 43 normal kidneys on 3rd trimester were normal on post-natal 2 weeks scan. The borderline kidneys [3 (6%)] turned to normal kidneys postnatal; 1 mild kidney remained mild kidney postnatal; and 3 severe kidneys remained as severe postnatal (Table 2).

DISCUSSION

In this study on 50 patients referred to the Department of Radiodiagnosis of Jawaharlal Nehru Medical College and Hospital, AMU, Aligarh for third trimester ultrasound and subsequently postnatal 2 weeks scan,we found that ultrasound findings during the last trimester of pregnancy showed a significant association with fetal renal pelvis diameter during postnatal two weeks thereby indicating that ultrasound can be used as a screening tool line for an early intervention in cases of renal pelvis dilatation. In the present study, the third trimester scan showed that a total of 13 renal pelvic units had renal pelvis dilatation. Among them 1 patient had bilateral renal pelvis dilatation. So, overall 12 fetuses showed renal pelvis dilatation. The fetal kidney AP diameter was normal (<5mm) in 87 (87%) renal pelvic units and fetal renal pelvis dilatation was seen in 13(13%) renal pelvic units: borderline (5 to 6.9 mm) in 6 (6%), mild (7 to 9.9mm) in 2(2%), moderate (10 to 14.9 mm) in 1(1%), and severe (≥ 15 mm) in 4(4%) units.The post-natal follow-up at 2 weeks showed that borderline cases resolved, 1 mild case remained as such and 1 case became moderate case. Moderate (n=1) and severe cases (n=4) remained as such. Thus, postnataly there was no borderline case, 1 mild case, 2 moderate cases, and 4 severe cases of antenatal hydronephrosis.

In this study, the mean age of the mothers was 25.1 ± 3.64 years. The majority of the mothers were in the age group of 21-25 years (44%). There was no significant association of age of the mother with foetus renal pelvis size. Among other studies, Hurt L et al. in 2019[10] reported that out of 138 cases with renal pelvic dilatation, most of the mothers (44.9%) belonged to 25-34 years, followed by <25 years (38.4%) and >35 years (16.67%). Edevbie JP et al. [11]reported that the age of study participants undergoing USG for measurement of fetal kidney length was in range of 18 to 44 years; the mean age was 29.90 years.Joshi et al. estimated fetal gestational age in third trimester using mean fetal kidney length, and found no significant association between age and parameters of renal USG scan. In his study 43% patients were in 20-25 years age group[12]. In our study, the number of primigravida and multigravida in the study were 30% and 70%, respectively. There was no significant association between gravida of the mother with fetus renal pelvis size (P>0.05).

In the study by Joshi et al[12], 55% of the women were primigravida and 45% were multigravida. No significant association was found between gravida and parameters of renal USG scan.

An appropriate gestational age is important for the diagnosis of growth disorders in fetus and the time of elective delivery; the failure of these can lead to iatrogenic prematurity or post maturity, with perinatal morbidity as well as mortality [11].

In the present study, the gestational age in majority was 32-35 weeks (56%), followed by 28-31 weeks (28%) and ≥36 weeks (18%). There was no significant association between gestational age of the mother with fetus renal pelvis size (P>0.05).

Among previous studies, Kim JH et al. in 2012 reported that the mean age of the participants in the early third trimester who need surgery was 29.69 and who resolved was 30.08 weeks, respectively, and in late third trimester was 35.70 and 36.09 weeks, respectively. The mean gestational age for assessing fetal hydronephrosis was comparable in the gestational periods[13] .In the study by Edevbie JP et al., out of 400 participants, 72% (n=288) were in the third trimester[11] . Kent et al. in 2000 reported that the gestational age was in the range of 16 to 21 weeks. The mean gestational age was 18 weeks[14]. In the study by Karthika S et al. , mean gestational age of the participants was 34 weeks. A significant association was found between gestational age and parameters of renal USG scan (renal length) at third trimester[12]. To sum up, ultrasound screening during the last trimester of pregnancy can appropriately assess fetal renal pelvis diameter which shows similarity with postnatal two weeks fetal renal pelvis diameter thereby indicating that ultrasound can be used as a screening tool line for an early intervention in cases of renal pelvis dilatation. Findings of the present study also showed that all borderline antenatal RPD cases resolve and improve to normal condition. The mild hydronephrosis cases either remain unchanged or worsen to moderate case before delivery. The moderate case or severe hydronephrosis cases less possibly resolve spontaneously in utero and are more likely to worsen or remain unchanged. A 7 mm cut off for renal pelvic dilation was found to be more specific for postnatal persistent hydronephrosis requiring intervention without any compromise on sensitivity. Thus, no intervention is required in borderline cases; however mild cases should be closely monitored for progression to moderate cases. Moderate and severe cases need continuous monitoring and interventions.

Limitations of the study

- One of the limitations was that small number of cases was included in subgroups, which could have affected statistical analysis. So, findings should be interpreted cautiously.
- Another limitation was that less severe outcomes like UTI were not included in the study.
- In addition, it was challenge to obtain details of radiological investigations in late pregnancy and postpartum.
- More prolonged follow up of babies is required for better assessment of outcome.
- As present study was conducted at single center, it needs further validation.

ISSN (Online): 2565-4810; (Print): 2565-4802 | ICV 2019: 98.48 |

CONCLUSION

In conclusion, ultrasound screening during the last trimester of pregnancy can appropriately assess fetal renal pelvis diameter which shows similarity with postnatal two weeks fetal renal pelvis diameter thereby indicating that ultrasound can be used as a screening tool line for an early intervention in cases of renal pelvis dilatation. Demographic characteristics of the mother carry no significant effects on fetal renal pelvis size. Children having mild cases can be discharged early; however those with moderate and severe RPD require close follow-up by multidisciplinary team.

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Source of Support: Nil; **Conflict of Interest:** None

Submitted: 06-11-2021; **Accepted:** 28-11-2021; **Published online**: 31-12-2021