Original Research Article

A study on outcome of hydronephrosis among preschool children in tertiary care hospital

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Abstract

Background: Hydronephrosis refers to the dilation of the renal collecting system caused by incomplete or complete obstruction. The ureteropelvic junction (UPJ) obstruction is the most common cause of congenital hydronephrosis, others are fibrous bands, kinks, crossing vessels, vesicoureteric reflux, multicystic kidney, ureterocoele, posterior urethral valve etc. If left untreated it may lead to chronic renal failure. Genetic and environmental factors may also influence hydronephrosis. **Aim:** The hydronephrosis is one of the most common renal abnormalities detected during routine pre and postnatal ultrasonography (USG). The Renal pelvic diameter (RPD) 4 mm at 18-23 weeks and 10mm after 28 weeks are considered as the upper limit of normal. Our study is to assess the outcome of hydronephrosis among preschool children. **Materials and Methods:** 21 cases (aged less than 5yrs) who were diagnosed as hydronephrosis by pre and postnatal USG attended the pediatric OPD. In a few cases, the function of the kidney was assessed by 99Tc- diethylene triamine penta-acetic acid scan (DTPA). Based on the old records, the outcomes of hydronephrosis were assessed. **Results:** The ureteropelvic junction (UPJ) obstruction was the main cause of hydronephrosis in 5 cases. Among these 2 cases were static (09.52%) and 3 cases were progressed (14.28%) and underwent pyeloplasty. **Conclusion:** 16 cases of hydronephrosis (76.19%) resolved within 1-3 years of life. Surgery is indicated only in persistent progressive dilatation of renal pelvis with cortical thinning, abnormal biochemical parameters and extrinsic causes. The cases identified as pre and postnatal hydronephrosis are to be advised for regular follow up and to see the progress which will help to decide for surgery in progressive cases to avoid renal failure.

Key Word: Ultrasonography, hydronephrosis, Renal pelvic Diameter & DTPA.

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Received Date: 16/12/2018 Revised Date: 19/01/2019 Accepted Date: 04/02/2019
DOI: https://doi.org/10.26611/1001922

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	Accessed Date: 14 February 2019

INTRODUCTION

Antenatal hydronephrosis refers to dilatation of the renal pelvis collecting system, which is a common finding on prenatal sonography in 0.6 to 4.5 % of pregnancies. It occurs twice in males than females and bilateral involvement in 20-40% of cases. Anteroposterior diameter of the renal pelvis (or RPD) is the most common parameter for reporting antenatal hydronephrosis. Maternal hydration status, maternal pyelectasis, and size of the fetal bladder also affect the RPD measurement. The renal pelvic diameter 4 mm at 18-23 weeks and 10mm after 28 weeks is considered to be the upper limit of normal. The causes of antenatal hydronephrosis are transient (Physiological), pelvic ureteric junction obstruction, vesicoureteric reflux, mega ureter, multicystic kidney, ureterocoele, posterior urethral valve etc [1, 2]. The detection rate of antenatal hydronephrosis is 90% at 18 weeks of gestation and 95% at 22 weeks[3]. The society for fetal urology (SFA) uses a grading system (grade 0-4) based on the degree of pelvic dilatation, the presence of caliceal dilatation and the presence and severity of parenchymal thinning or atrophy[1], but it seems difficult to reproduce, so most of the authors use the anteroposterior diameter of the renal pelvis[4]. Based on the anteroposterior diameter (RPD), the pelvic ectasia was classified into four stages. Grade I< 1cm, Grade II 1 – 1.5

How to cite this article: Gnanavel A, Maheswari K, Sathish Narayan. A study on outcome of hydronephrosis among preschool children in tertiary care hospital. *MedPulse – International Journal of Anatomy.* February 2019; 9(2): 17-20. http://www.medpulse.in/Anatomy

cm, Grade III 1.6 – 2 cm, Grade IV > 2cm [5]. According to Cecil, RPD was classified into three types as mild- 5-9.9 mm, moderate 10-14.9 mm and severe ≥ 15mm[6]. Anteroposterior diameter of renal pelvis >10 mm in the third-trimester fetus or newborn suggests obstruction and needs effective screening[7, 8]. UPJ obstruction is the most common cause of pediatric hydronephrosis occurring in 1:1000-2000 newborns. Obstruction occurs more commonly in boys than in girls, especially in the newborn with a male and female ratio of 2:1. Left-sided lesions were reported in 60% and bilateral in 10 – 40% [9]. The etiology of UPJ obstruction can be divided into intrinsic and extrinsic causes. The main embryological explanation for the intrinsic cause of UPJ obstruction is inadequate recanalization of this area, the premature arrest of ureteral wall musculature development leads to hypoplastic adynamic ureteral segment (Hirschsprung's disease of ureter), intrauterine ischaemic insult and improper innervation with diminished synaptic vesicles. The extrinsic causes are fibrous bands, kinks, crossing vessels, horseshoe or pelvic kidney, duplex collecting systems, rotational abnormalities etc.[7,9,10,11]. S. Degani, Pyelectasis was influenced by genetic or environmental factors. In 10.2% of cases, recurrent pyelectasis was reported in a subsequent pregnancy. A statistically significant association found between maternal and fetal dilatation of collecting system and maternal hydration is not a major cause for this association[12].UPJ is often associated with other congenital anomalies including imperforate anus, congenital heart disease, VATER (vertebral defect, imperforate anus, tracheoesophageal fistula and radial, and renal dysplasia) syndrome, and oesophageal atresia.[4,10].The complications of UPJ obstruction are UTI, proteinuria, hypertension, stones, tubular dysfunction and renal failure[13]. FOXF1 is the only gene so far associated with UPJ obstruction-pathology[14]. Genetic cause like 1p 36 deletion syndrome is associated with renal abnormalities like unilateral renal pelvis with hydronephrosis of the upper pole, kidney ectopia with right kidney cyst and unilateral pelvic ectasia [15]. 60% of antenatal hydronephrosis is physiological and will resolve within the first year of life. Fetal urine flow is four to six times greater than neonatal urine production. This is due to the difference in renovascular resistance, glomerular filtration rate and concentrating ability before and after birth. These reasons may contribute to ureteric dilatation in utero in the absence of functionally significant obstruction [2]. Lim stated that there is a strong correlation between Society for Fetal Urology (SFU) and grade of hydronephrosis and the likelihood of spontaneous resolution. Grade I resolves approximately in 50% of patients, grade II in 36%, grade III in 16% and grade IV in 3% of cases [16]. Bennacerraf was the first to show the incidence of trisomy 21 was higher (3.3%) in fetuses with mild pyelectasis than in those with no dilatation [17]. Snijders reported the fetal karyotype was abnormal in 7.3% cases out of 1177 cases with mild hydronephrosis [18]. According to Langer, fetal karyotyping is not indicated in isolated pelvic dilatation [19]. Prophylactic antibiotics should be started soon after birth to prevent UTI[1, 2, 3]

MATERIALS AND METHODS

21 cases attended the pediatric OPD aged less than 5yrs were diagnosed as hydronephrosis by pre and postnatal USG and further the function of the kidney was assessed by diethylene triamine penta-acetic acid (DTPA) scan in few cases. The outcomes of hydronephrosis were assessed with the help of old records and this study was done between May 2016 to Dec 2018 in Meenakshi Medical College and Research Institute, Kanchipuram district.

RESULTS

Among these 21 cases of pre and postnatal hydronephrosis, seventeen cases were male and four were female children. Hydronephrosis was right sided in 4 cases (19.04%), left side in 14 cases (66.66%) and bilateral in 3 cases (14.28%). According to Pena Carson, grading of hydronephrosis was done Grade I<1cm, Grade II 1 – 1.5 cm, Grade III 1.6 – 2 cm, Grade IV > 2cm. During routine USG, 16 cases were diagnosed as prenatal hydronephrosis among which Grade I -10 cases Grade II - 6 cases and 5 were postnatal hydronephrosis out of which Grade I-2 cases and Grade II- 3 cases. Among 21 cases one case was situs inversus totalis for which karyotyping done and the report came normal (46, XY). The history of consanguinity in 5 mothers and one had a recurrence of fetal hydronephrosis in consecutive pregnancy. All prenatal hydronephrosis were followed at regular intervals (6months) by USG in the postnatal period. in prenatal hydronephrosis, 10 cases of Grade I and 4 cases of Grade II hydronephrosis became normal at 15 to 18 months of age. Only 2 cases progressed to further grades and their renal function was assessed by Diethylene triamine penta-acetic acid (DTPA), finally land up in surgery (pyeloplasty) at 4 to5 years of age. The 5 cases of postnatal hydronephrosis were diagnosed by USG while they came for a short duration of fever (UTI). Among these 5 cases, 2 cases diagnosed as Grade I hydronephrosis at 15 months and 18months of age, 3 cases of Grade II at 3 to 4 years of age. After regular follow up with USG, 2 cases of Grade I hydronephrosis became normal within 1 to 2 years of diagnosis and 2 cases of Grade II hydronephrosis remain static after 2 years of follow up and remaining one landed up in pyeloplasty.

1.	Total number of cases	21
2.	Antenatally diagnosed	16 /21 Grade I – 10 cases, Grade II – 6 cases
3.	Postnatally diagnosed	5/21 Grade I- 2 cases, Grade II – 3 cases
4.	Consanguinous marriage	5/21 (4.76%)
5.	Consecutive pregnant	1/21 (4.76%)
6.	Gender preponderance	Male-17(80.95%), Female-4 (19.04%)
7.	Side	Left-14 (66.66%), Right-4 (19.04%), Bilateral-3(14.28%)
8.	Outcome of the hydronephrosis	16 cases (76.19%) - became normal 2 cases (9.52%) - Static 3 cases (14.28%) - Progressed
9	Associated with other malformation	1 (4.76%) – Situs inversus totalis
10	Intervention	3 cases (14.28%) - Pyeloplasty

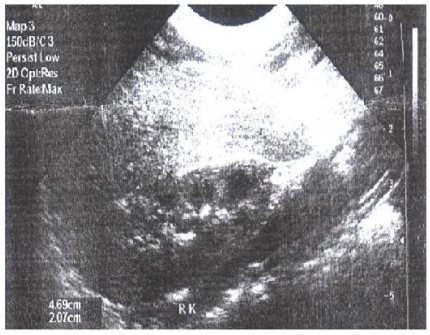
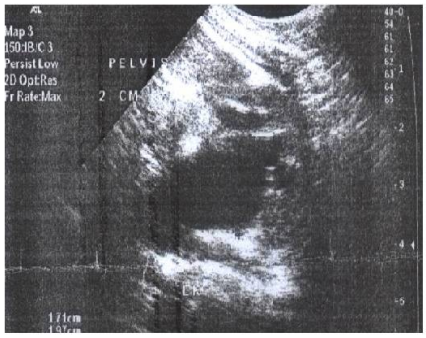


Figure 1:



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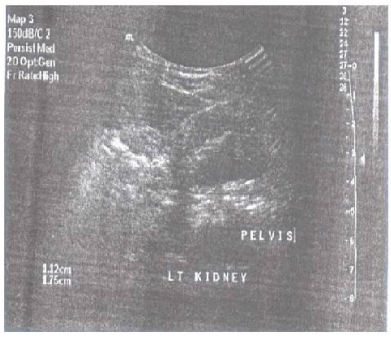

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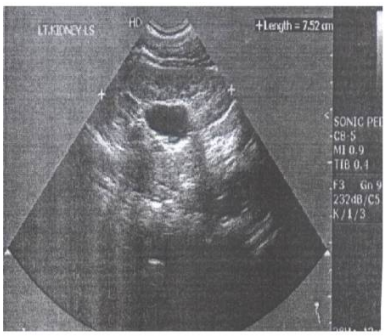

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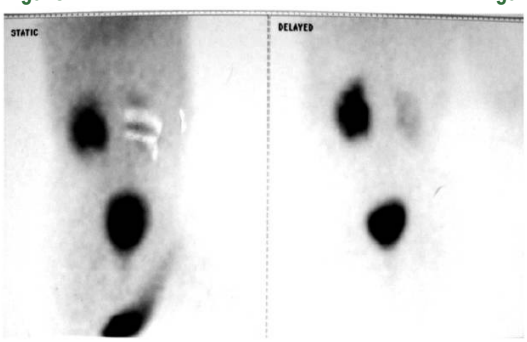

Figure 5:

Legend

Figure 1: 4th Month USG Right Kidney (Renal pelvis) – Normal, **Figure 2:** 4th Month USG Left Kidney (Renal pelvis) – 2 cm, **Figure 3:** 11th Month USG Left Kidney (Renal pelvis) – 1.1, **Figure 4:** 3y 6m USG Left Kidney (Renal pelvis) – 1.12 cm, **Figure5: In** DTPA scan – There is a delay in excretion of tracer material on left side kidney

DISCUSSION

During routine antenatal USG, around 90 -95% of prenatal hydronephrosis can be diagnosed within 22weeks of gestation. Some cases were diagnosed during the postnatal period. The RPD more than 10 mm in the third trimester and in newborn suggests obstruction and needs regular follow up. Pena Carrion *et al* classified hydronephrosis into four grades based on RPD, Grade I<1cm, Grade II 1–1.5 cm, Grade III 1.6 – 2 cm, Grade IV > 2cm and reported Grade I was 75.49%, II was 20.34%/ Grade III was 3.9% and Grade IV was in 0.24%. In the present study, the Grade I was 57.14% Grade II was 38.09%, Grade III and Grade IV were not observed. Gearhart and Sang Won Han reported left-sided lesions in 60-67%, bilateral 10-40% and male to female ratio in 2:1 and Secil Conker's study left-sided lesions in 55.1%, bilateral 18.3% and male to female ratio in 3:1. In the present study left-sided lesion was observed in 66.66%, bilateral in 14.28 %. and the male to female ratio was 4:1. In the present study, it was observed that in prenatal hydronephrosis all 10 cases of Grade I and 4 cases of Grade II became normal within 18 months and 2 cases of Grade II postnatal hydronephrosis became normal within 3years. Degani reported recurrent pyelectasis in 47%

males and 53% female, in our study only one case (0.04%) was reported. One *et al* suggested nonoperative management with close follow up during the first 2 years appears to be a safe approach even in neonates.

CONCLUSION

Our study of hydronephrosis in pre and postnatal cases is directed at general pediatricians who are responsible for weighing the choice of continued observation or referral to a pediatric urologist. The regular postnatal follow-up USG to be mandatory for all pre and postnatal hydronephrosis to assess the progress and it will be useful for deciding the need of pyeloplasty to prevent renal failure in progressive cases. In our study, 76% of cases resolve within 1-3 years of life after regular follow up. Surgery is indicated only in persistent progressive dilatation of renal pelvis with cortical thinning, abnormal biochemical parameters and extrinsic causes. Fetal karyotyping is not indicated in the presence of isolated pelvic dilation.

REFERENCES

1. Yu-Chi Chen, Victor C.Lin, Tsan-Jung Yu. Antenatal hydronephrosis, Urol Sci Sep 2010; Vol 21(3)109-112.
2. Carol M.Rumack, Stephanie R.Wilson J. William Charboneau. Diagnostic Ultrasound, Part v Obstetric and fetal sonography, volume 2, 3rd edition, p. no1408.
3. Antenatal hydronephrosis BJU International 2002,89:149, p-201&202
4. Pierre-Yves Mure, Pierre Mouriquand, Upper Urinary tract dilatation: Prenatal diagnosis, management and outcome, Seminar in Fetal &Neonatal Medicine (2008) 13, 152-163
5. Pena Carrion A *et al*, Neonatal pelvic ectasia: Long term outcome and association with ureterovesical anomalies. A Pediatr (Barc).2004 Dec; 61(6):493-8
6. Cecil Cocker, Vuset Memmedov, and Sevgi Mir.An outcome of Antenatal Hydronephrosis, Annals of clinical and laboratory research, 2016, vol-4 No.1:58, p. no 1-5.
7. Donnelly, Diagnostic Imaging Pediatrics, Section 5, Genitourinary, Congenital Abnormalities,4-112 Ureteropelvic junction Abnormalities.1st edition, Amirsys publishers,2005,p.no 5/10 – 12.
8. R.Aviram, A.Pomeran, R.Sharony etc.The increase of renal pelvic dilatation in the fetus and its significance.Ultrasound Obstet Gynecol 2000;16:60-62
9. Hyeyoung Lee, Sang Won Han Ureteropelvic junction obstruction: What we know and what we don't know, Korean journal of urologyVol.50, No.5, May 2009, p-423-431.
10. Gearhart, Rink, Mouriquand, Paediatric urology: Congenital urine flow impairment of the upper urinary tract: Pathophysiology and experimental studies, Chapter 21,p-303-306, Ureteropelvic Junction Anomalies: Congenital UPJ problems in children, Chapter 22, 321-33.
11. Muhammad Irfan Munir, Ashraf Ali Jafari, *et al*.Crossing vessels as a cause of Pelvic-ureteric junction obstruction, A.P.M.C, July to Dec 2012, Vol: 6 No.2, p. no 126-130.
12. Langman's medical embryology, Urogenital system, Chapter 16,12th edition, Wolter Kluvers,2012,p.no 236
13. S.Degani, Z.Leibovitz, I.shapiro, R.Gonen, and G.obel. Fetal pyelectasis in consecutive pregnancies: a possible genetic predisposition, Ultrasound Obstet.Gynecol.10, (1997) p-19-21.
14. RN Srivastava Aravind Bhaga, Pediatric Nephrology, Obstructive Uropathy, Chapter 22,p.no 485-488, Disease of the Newborn, Chapter 26,6th edition.
15. Stocker and Dehner. Pediatric pathology, The kidney, and lower urinary tract, chapter 17,4th edition Wolter Kluvers, 2016,p.no 806
16. Agatino Battaglia *et al*, Further Delineation of deletion 1p36 syndrome in 60 patients: A recognizable phenotype and common cause of developmental delay and mental retardation, Pediatrics: 2008 (Official Journal of the American Academy of Pediatrics), Vol 121, Number 2, p 404-410.
17. Lim DJ, Park JY, Kim JH, *et al*. Clinical characteristic and outcome of hydronephrosis detected by prenatal ultrasonography, J Korean, Med Sci,2013;18:859-62.
18. Bennacerraf BR, Mandell J, Estroff JA, Harlow BL, Frigoletto FD.Fetal pyelectasis: a possible association with Down syndrome.Obstet Gynecol 1990;76:58-60.
19. Snijders RJM, Sebire NJ, Faria M, Patel F, Nicolaides KH.Fetal mild hydronephrosis and chromosomal defect: relation to maternal age and gestation.Fetal Diag Ther 1995;10:349-55
20. B. Langer, Fetal pyelectasis, Ultrasound Obstet Gynecol 2000;16; 1-5.

Source of Support: None Declared
Conflict of Interest: None Declared