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Changing trends in characteristics of infantile hydronephrosis

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Abstract

Background: Hydronephrosis (HN) or calycial dilatation is the most common prenatal urologic abnormality. The aim of this study was to identify the possible changes in demographic and clinical manifestations of infantile HN in previously and recently diagnosed patients.

Methods: 193 children with infantile HN admitted to Ali-asghar Children's Hospital in two different periods (group 1; 1997-2003, and group 2; 2005-2011) were evaluated in this cross-sectional study. Variables such as time at diagnosis, gender, clinical manifestations, etiology, laterality, grade, and associated anomalies were also evaluated.

Results: The mean age at diagnosis was 32.3± 42.6 (group 1) and 21.4± 36.4 (group 2), respectively. 69.8% of patients were males. 75% of prenatally diagnosed patients were asymptomatic. Urinary tract infection was the most common symptom, followed by pain, hematuria, and decreased renal function. Obstruction in ureteropelvic junction was the most common etiology, accounting for 39.6% of all patients. Neurogenic bladder, vesicoureteral reflux, nephrolithiasis, and ureterovesical junction obstruction were the other common etiologies. 55.5% of all patients had unilateral HN, which was more common on the left side.
No significant difference documented between two groups of patients, except for mild HN (23.7% vs. 39%), which was more common in newly diagnosed patients (p= 0.001).

Conclusion: There was no changing trend in demographic and clinical manifestations of infantile HN. However, the severity of infantile HN has been decreased significantly in recently diagnosed patients.

Keywords: Hydronephrosis, Children, Epidemiology.

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Introduction

Hydronephrosis (HN) is the most common prenatal abnormality, occurs in 0.5-1% of fetuses (1, 2). It is a potentially self-limited disease in 30% of all pregnancies. However, pathologic changes and impaired renal growth might occur in severe and prolonged HN. Recently, prenatal diagnosis and proper management of infantile HN have improved the long term prognosis (3,4). This study was performed to identify the latest epidemiologic characteristics of infantile HN, influenced by the clinical course and prognosis of these patients.

Methods

This is a cross-sectional study on 193 children with HN admitted in Ali-asghar Children's Hospital during 1997-2011. Demographic and clinical data including age at diagnosis, gender, etiology, grade, laterality (unilateral, bilateral), clinical manifestations (asymptomatic, abdominal mass, pain, hematuria, urinary tract infection) and serum creatinine were evaluated in two groups (group1; 1997-2003 and group 2; 2005-2011). Inclusion criteria included unilateral or bilateral renal pelvic diameter more than 6 mm in the 3rd trimester, confirmed by ultrasound manifestation in at least one time between days 5-10 of postnatal life. In addition, patients diagnosed with renal pelvic diameter more than 5 mm were evaluated. Patients with incomplete

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data were excluded from the study.

The grade for HN was defined based on the antero-posterior mid-renal pelvic diameter in transverse plane as normal (<5mm), mild (5-10mm), moderate (10-15mm) and severe (greater than 15mm) dilatation. Grading in bilateral HN was done by the side of the highest grade.

Voiding cystoureterography was obtained from all of the patients to exclude vesicoureteral reflux (VUR) as the etiology of HN. The DTPA renal scan, intravenous pyelogram or rarely magnetic urography was performed to exclude urinary tract obstruction in the absence of VUR.

Hematuria was defined by the presence of more than 5 RBCs in high power field. Urinary tract infection (UTI) was defined by growth of at least 10^5 colony forming units/ml of urine in midstream or bag collection. Any growth in suprapubic bladder aspirate was considered positive. Recurrent UTI was defined as at least two episodes of UTI in a 6-month period.

Chi-square and student t-test were used to analyze data with stata 12 (www.stata.com, College Station, TX). A P value of less than 0.05 was considered to indicate statistical significance.

Results

A total of 193 patients were included in this study. The median time at diagnosis was 3 months (0-156 months), and the mean age at diagnosis for males and females were 25.6±39.6 and 29.5±40.9 months, respectively. This difference was not statistically significant (p=0.28).

Clinical manifestations of all patients are presented in Table 1. The mean time at diagnosis in patients with nephrolithiasis was 59.5± 46.7 months, which was significantly higher compared to patients with other etiologies (mean=23.1±37.4) (P=0.0001). HN was more common on the left side. Of 74 patients with UPJO, 36 (48.6%) had left sided HN, and 13 (17.5%) had right-sided HN. UPJO was the most common cause of bilateral HN (29.76%). Of the patients with unilateral HN, grade 4 was the most detected grade (41.7%), followed by grade 3(31.2%), and grade 2(19.8%).

Table 1. Demographic and clinical characteristics of all patients

Variables	N (%)
Gender	
Male	69.8%
Female	30.2%
Symptoms	
Asymptomatic	75%
UTI	40%
Pain	22%
Hematuria	16%
Decreased renal function	16%
Etiology	
UPJO	39.6%
NB	14.58%
VUR	11.46%
Nephrolithiasis	10.94%
UVJO	8.33%
Duplication	6.77%
PUV	5.73%
miscellaneous	2.60%
Grading	
2	23.8%
3	31.4%
4	34.3%
Laterality	
Unilateral	55.5%
Bilateral	44.5%

Table 2 includes demographic and clinical data of two groups separately. No significant difference found in two groups, except for grade of HN, which was significantly lower in the recently diagnosed patients (p= 0.001).

Discussion

Pathophysiologic mechanisms of HN have been recognized since eight decades ago. Nowadays, the prevalence and manifestations of congenital and postnatal HN have been influenced by the availability of extensive prenatal screening in different regions (3). The results of this study revealed no significant difference of demographic with clinical manifestations in previously and recently diagnosed patients, except for grade of HN, which was lower in recently diagnosed patients. Demographic and clinical findings of HN in our study is discussed as follows:

Gender. Genitourinary abnormalities, including HN occur more commonly in males. The majority of patients with UPJO are males (2/1), especially in patients with

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Table 2. Demographic and epidemiologic characteristics of two groups of patients

Variables	Group 1 (n= 96)	Group 2 (n= 89)	P value
Mean age at diagnosis	32.3±42.6	21.4±36.4	0.06
Gender			0.75
Male	68.75%	70.8%	
Female	31.25%	29.2%	
Grade			
Mild	23.7%	39%	
Moderate	28.7%	33.7%	0.001
Severe	47.5%	27.2%	
Laterality			
Unilateral	49.1	50.9	0.71
Bilateral	51.7	48.2	

left sided lesions (3,5). Similarly, males outnumbered females in both groups of patients in our study (2/1).

Laterality: UPJO usually occurs unilaterally (70%), 60% on the left side (6). Bilateral UPJO occur in 10-40% of patients (5), which is often asymmetrical. Likewise, unilateral HN was more common in all of our patients, especially on the left side.

Age: In the past, 75% of patients with UPJO were diagnosed beyond one year of age. By increasing use of maternal ultrasound, 30-50% of patients have been detected prenatally (5). In this study, the median time at diagnosis was 3 months and males were younger than females, similar to the previous report by Sorkhi et al (7). Patients with nephrolithiasis had the oldest age at diagnosis of HN. Age at diagnosis was higher in previous than recently diagnosed patients in our study. However, there was no significant difference between two groups in terms of diagnostic age.

Associated anomalies: Majority of patients with HN have no associated anomalies, which defined as isolated HN (2, 3). Chromosomal abnormalities, VATER association and urinary ascites occur commonly in patients with HN. Genitourinary abnormalities such as renal ectopy, duplex system and VUR might occur in 10% of patients with UPJO (5). Urologic abnormalities such as VUR and multicystic dysplastic kidney were detected in 20% of patients with UPJO in Karnak et al study. They also reported associated clinical features such as prematurity, and renal failure with developmental and neurologic disorders in their patients (6). Likewise, congenital abnormalities were not much prevalent in our patients. Renal agenesis, multicystic dysplastic kidney, hypospadias, imperforated anus, congenital heart disease, biliary atresia, meningomyelocele, omphalocele, tracheo-esophageal fistula, situs inversus, hydrocephalus, neuroflibromatosis with ambiguous genitalia, and urogenital sinus were detected in 30 % of all patient in this study, two fold in recently diagnosed patients (2/1).

Etiology: Antenatal HN might occur in obstructive (intrinsic and extrinsic) and non-obstructive uropathies (8). Park et al stated that the majority of patients might have more than one cause of obstruction (9). Three entities have been commonly considered in the pathogenesis of neonatal and infantile HN, including VUR, upper and lower urinary tract obstruction, and non-obstructive nonspecific HN such as neurogenic bladder (10). Intermittent or transient HN and UPJO account for 70-80% of neonatal HN. The VUR has been considered the next common cause of prenatal HN in 20-40% of prenatal HN (11-13). It was the most common cause of HN in normal and pyelonephritic children in 3 Iranian studies (7,8,10). Lebowitz et al reported extrinsic obstruction in half of the patients with symptomatic HN (9). Likewise, UPJO was the most common cause of HN in both groups of patients in our study, followed by neurogenic bladder and vesicoureteral reflux.

Symptoms: Clinical manifestations of UPJO depends on diagnostic age (5). Ma-

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jority of patients with perinatal HN are asymptomatic and detected incidentally. In Sherbaf et al study, 79% of patients with prenatal HN were asymptomatic, and all of those with infantile diagnosis were symptomatic (10). Prenatal diagnosis of HN (80%), UTI (8%), and abdominal mass (4.5%) were common manifestations in infants and pain (48%), UTI (24%), hematuria (10%) and prenatal HN (2.5%) were the presenting symptoms in older children in Sutherland et al study (14). By increasing use of maternal ultrasound, abdominal mass have been detected in less than 15% of neonates with UPJO (5). Neonates with prenatal HN were mostly asymptomatic in our study and majority of older children presented with UTI, pain and decreased renal function.

Grade: Our study showed higher incidence of mild HN in recently diagnosed compared to the previous group. This might be related to widespread use of prenatal ultrasound and appropriate postnatal follow-up and management in recently diagnosed patients, which might prevent progressive increment in grade of HN. In Capolicchio et al study, hydronephrotic kidneys diagnosed prenatally had better renal function than those detected postnatally. They concluded that prenatal diagnosis of HN is associated with less obstructive nephropathy and emphasized the importance of prenatal screening for urologic abnormalities (4).

We had some limitations in our study. According to the retrospective nature, some of the patients had no documented differential diagnosis and were excluded. In addition, some of the important demographic characteristics have not registered in the medical charts. Therefore, future prospective studies are recommended in patients with infantile HN.

Conclusion

Demographic and epidemiologic characteristics of HN including time at diagnosis, gender, laterality, symptoms, and etiology were similar in both groups of patients, except for higher incidence of low grade HN in recently diagnosed patients.

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