



Outcome of isolated cases of antenatal hydronephrosis and its correlation with urinary tract anomalies



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ABSTRACT

Introduction: Hydronephrosis is the most common congenital disorder diagnosed by prenatal ultrasonography.

Objectives: The aim of this study was to evaluate the outcome of neonates with prenatal hydronephrosis and to determine its correlation with urinary tract anomalies.

Patients and Methods: This cross-sectional study was conducted on 1453 neonates with prenatal hydronephrosis. The sonography was conducted on the third day after birth. In emergency conditions, it was conducted on first day to evaluate the possible anomalies. In severely positive cases, voiding cystourethrogram (VCUG) and technetium-99m diethylenetriaminepentaacetic acid (99mTc-DTPA) scan was requested too. Accordingly in cases who hydronephrosis after birth was not existed, a sonography was repeated on the sixth week after birth.

Results: The mean anteroposterior pelvic diameter (APPD) was 17.66 ± 11.2 mm. The vesicoureteral reflux (VUR) was not observed in 74.2% of 1453 case of prenatal hydronephrosis. Around, 13.8% had unilateral and 12% had bilateral reflux. In DTPA scan, 92.9% % of cases had no obstruction, while 7.1% of cases had some degree of obstruction. Ureteropelvic junction obstruction (UPJO) was seen in 72.9%, and ureterovesical junction (UVJ) obstruction was presented in 22.4% of cases.

Conclusion: Antenatal diagnosis of urinary tract anomalies allowed immediate application of prophylactic antibiotics, and decreased the risk of future complications as observed in this study. Management of congenital hydronephrosis is a clinical challenge. The natural history of hydronephrosis reveals that most cases resolve spontaneously but non-operative management with close follow-up is recommended.

Implication for health policy/practice/research/medical education:

Prenatal hydronephrosis is the most common congenital kidney disorder that is diagnosed by ultrasonography.

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Introduction

Over the last decades, ultrasound has been routinely used during pregnancy, which allows nephrologists and professionals become aware of the abnormalities of the kidneys and urinary tract. Prenatal diagnosis of urinary tract anomalies facilitates proper treatment. Hydronephrosis is the most common congenital disorder characterized by

prenatal ultrasonography (1,2). The strategy to manage, these infants should determine before birth to prevent kidney damage (3-6).

All new-borns with postnatal hydronephrosis are treated with prophylactic antibiotics. All new-borns with prenatal hydronephrosis were examined by ultrasound, re-examined the third day after birth and in emergency cases on the

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first day of birth. This procedure will conduct for high risk infants who suspected for urinary tract obstruction and for infants with kidneys dysfunction. Ultrasound will also repeat in the sixth week and third month after birth, while voiding cystourethrogram (VCUG) will perform in all infants with hydronephrosis. However around 20% of them will require DMSA scan too (5-8). When vesicoureteral reflux (VUR) is diagnosed, assessment of the upper urinary tract is necessary and it will perform with renal scintigraphy accordingly (9,10).

Objectives

The aim of this study was to evaluate the epidemiologic characteristics and outcome of prenatal hydronephrosis and urinary anomalies among Iranian children.

Patients and Methods

Study method

This is a descriptive-analytic cross-sectional observational study. The study criteria implied to pregnant women with prenatal hydronephrosis fetuses from 2012-2015, which was identified by a gynecologist. After birth, affected infants were referred to the pediatric center. A total of 1453 newborn babies with prenatal hydronephrosis were examined under ultrasound on third day after birth. When postnatal hydronephrosis was reported, the affected baby was monitored by VCUG. In the absence of postnatal hydronephrosis, patients were examined by ultrasound in the third month after birth. Only newborn babies with emergency hydronephrosis were evaluated using ultrasound examination on the first day of birth. Hydronephrosis was defined as the dilation of the anteroposterior pelvic diameter (APPD) of the fetal renal pelvis ≥ 5 mm.

Ethical issues

The research followed the tenets of the Declaration of Helsinki, and the study was approved by the ethical committee of Qom University of Medical Sciences.

Statistical analysis

Data were analyzed using SPSS software version 13. The mean and standard deviations were recorded for quantitative variables and absolute and relative frequency was recorded for qualitative ones. Statistical tests included chi-square test, Fisher's exact test, and independent *t* test. Significance level was below 0.05.

Results

Around 1453 newborn babies with prenatal hydronephrosis was enrolled to the study. The average birth weight was 3078.5 ± 256.6 g. Around 79.1% of patients were male. Moreover, 10.1% was preterm, 88.9% of patients were term, and 1% of them were post-term. About 2.1% of patients had a positive family history of anomaly in kidney and urinary system.

In 23.1% of individuals, urinary tract infection (UTI) was detected.

In 32.9% of cases, hydronephrosis was on right side; in 46.9% of patients, hydronephrosis was on left side, and in 20.2% of individuals, hydronephrosis was on both sides. The mean anterior-posterior diameter of the pelvic was 17.59 ± 11.2 mm.

Of 1453 cases with prenatal hydronephrosis, 74.2% had not VUR, while 13.8% had unilateral and 12% had bilateral reflux. DTPA scan showed patients who had not VUR, 92.9% of them had no obstruction while 72.9% of patients had ureteropelvic junction obstruction (UPJO), and 22.4% of them had ureterovesical junction (UVJ) obstruction.

We found that the relationship of birth weight and also gender with gestational age of anterior-posterior diameter of pelvic of cases was not significant ($P > 0.05$).

The relationship between birth weight and the side of hydronephrosis was significant ($P = 0.017$) while lower birth weight was more in cases with bilateral involvement.

The relationship between birth weight and VUR was not significant ($P > 0.05$).

The relationship between gender and VUR was significant ($P = 0.001$), while bilateral VUR was more prevalent in girls. Moreover, the relationship between weight and DMSA findings was not significant ($P > 0.05$).

Discussion

Over the last decades, ultrasound during pregnancy allowed urologists and pediatricians to find early about possible kidney abnormalities. After birth, all newborns with prenatal hydronephrosis were examined with ultrasound on the third day after birth and in emergency cases (high risk infants, suspected urinary tract obstruction and kidneys dysfunction) on first day. The ultrasound was repeated in the sixth week and it is recommended to be repeated in the third month after birth. Additionally VCUG is performed in all newborns whose postnatal ultrasound was positive. Around 20% of our cases need a DMSA scan too (5).

Our study included all breastfeeding infants who had an APPD of more than 5 mm or more after 20 weeks of life while there were no other problems after birth.

Considering the positive outcome of early diagnosis and treatment and reduction in complications of hydronephrosis, this study was deemed necessary. In most cases, postpartum kidney abnormalities occur when the anterior-posterior diameters of the fetal pelvis are over 6 mm at 20 weeks or over 8 mm at 20-30 weeks, and over 10 mm after 30 weeks.

In the study by Sadeghi-Bojd et al, prenatal hydronephrosis was defined as APPD ≥ 4 mm at gestational age less than 33 weeks old. They found that APPD ≥ 7 mm at gestational age of 33 weeks to 2 months after birth (11). In a study, prenatal ultrasound was performed at the third trimester by the society for fetal urology (SFU) to evaluate grade, laterality and anteroposterior diameter.

According to their prediction, an APPD of 9 mm or more and hydronephrosis with grade three or more required postnatal intervention (12).

According to the study by Zee et al, 72% of patients prenatally diagnosed with hydronephrosis were male (72%). Around 19% of their cases had VUR, and 11% had ureteral dilatation. They found that using prophylactic antibiotics, the degree of kidney dilation, gender and circumcision status had impact on UTI (13). In our study, mean APPD was 17.66 ± 11.2 mm, while 13.8% of our cases had unilateral reflux and 12% had bilateral reflux. Likewise, Gordon et al found 29% VUR among 135 study patients, which 16 (41%) had high grade VUR (14).

A recent meta-analysis study by Sidhu et al showed pelvic dilation of grades I to II compared to grades III–IV are more likely to be stabilized. They concluded that in patients with lesser degree of renal pelvis dilation, the diameter may return towards normal size or at least does not dilate further (15).

According to the study of Mallik et al, the incidence of urinary tract anomalies for childbirths have increased. Non-specific dilation and reflux were seen in 6.48% and 12% of patients respectively (16).

Similarly, the results of a meta-analysis conducted by Lee et al showed, children with any degree of antenatal hydronephrosis were at greater risk of postnatal pathology. A well-defined prospective analysis is required for further evaluation which defines the risk of pathology and the appropriate management protocols (17).

The natural history of hydronephrosis has shown that the majority of cases got resolved spontaneously. Therefore, the goal is to select the patients who would benefit from early surgical intervention (18). In this regard, the study by Onen et al showed, children with neonatal hydronephrosis after close follow-up during the first 2 years appear to be safe (19).

The study by Estrada revealed that in 3648 cases of congenital hydronephrosis, 72% were male and the majority of cases (86%) had an isolated anomaly. Most cases of congenital hydronephrosis were born alive (20). However, in our study, 79% cases of hydronephrosis were male. In fact, management of congenital hydronephrosis is a clinical challenge while there are large regional differences in prevalence of congenital hydronephrosis (21,22).

In a study conducted by Ahmadzadeh et al, 67 newborns whose hydronephrosis was diagnosed during pregnancy and confirmed by ultrasound, were prospectively examined from 2005 to 2007. Newborn infants based on the size of hydronephrosis were divided into three groups; mild, severe, and moderate. VCUG was conducted in all newborns for refractory reflux, and a scan was performed in negative cases for the diagnosis of UPJO. The causes of hydronephrosis were VUR (in 40.2%), UPJO (in 32.8%), posterior urethral valves (PUVs) (in 13.4%), and transient hydronephrosis (in 13.4%). The obstructive lesions were in 37 (55.2%) of infants. Fourteen percent of the cases

had transient hydronephrosis. As a result, newborn infants with any degree of hydronephrosis should be subjected to diagnostic tests and special treatments (23).

In our study, linear relationship between birth weight, gender and gestational age with APPD in patients was not significant ($P > 0.05$). The relationship between birth weight and site of hydronephrosis in patients was significant ($P = 0.017$) and low-birth weight was accompanied by bilateral involvement. The relationship between birth weight and VUR was not significant ($P > 0.05$). The relationship between gender and the site of involvement in patients was statistically significant ($P = 0.001$), while bilateral involvement was more frequent in female patients. The relationship between gender and VUR was statistically significant ($P = 0.001$) while bilateral involvement was more in female patients.

The relationship between gestational age and site of hydronephrosis in patients was significant ($P = 0.001$) while post-term neonates were mainly with right sided involvement.

Sharifian et al highlighted that most cases of congenital hydronephrosis got resolved spontaneously. They detected, age less than 2 years at the time of diagnosis and history of prenatal hydronephrosis are significant predicting factors for the resolution of VUR within 2 years (24). Recent studies, however, showed that dilation of the urinary system, diagnosed during prenatal ultrasound examination or at the end of the first trimester, needs a longer follow-up period (25,26).

Conclusion

Regarding newborn infants with hydronephrosis, our study is similar to those in other parts of the world. We recommended further studies on this subject especially larger and multi-center investigations.

Limitations of the study

Our study was conducted to a limited proportion of patients and study was single-center. We suggest more investigation of this subject.

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Author's contribution

MAS, RA and AGh were the principal investigators of the study. MAS, PS, MH and AGh participated in preparing the concept and design. MH participated in nano-particle synthesis. MAS, AGh and MH revisited the manuscript and critically evaluated the intellectual contents. All authors participated in preparing the final draft of the manuscript, revised the manuscript and critically evaluated the intellectual contents. All authors have read and approved the content of the manuscript and confirmed the accuracy

or integrity of any part of the work.

Conflicts of interest

The authors report no conflicts of interest.

Ethical considerations

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

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