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Epidemiological and clinical characteristics, management, and outcomes of antenatal hydronephrosis: A single-centre experience of 229 cases

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Abstract

The advances in the utilization of USG in routine antenatal follow-up resulted in an increased diagnosis of antenatal hydronephrosis (ANH). This study was conducted to elaborate on the ANH's epidemiological and clinical characteristics, management, outcomes, and possible risk factors. Two hundred twenty-nine cases diagnosed with ANH were included during the antenatal follow-up at the Obstetrics and Gynecology Department of Ondokuz Mayıs University between 2004 and 2022. The ANH was a USG finding suggesting a hydronephrosis ≥7 mm. The epidemiological and clinical characteristics, risk factors, treatment and outcomes in the postnatal period were assessed retrospectively. About 75% of the cases were male, 8% were premature births, and the mean gestational week of diagnosis was 22±3 weeks. About 43.7% of mothers had urinary tract infections, and a family history of any kidney disease was present in 24.5% of mothers' and 20.5% of fathers' family histories.38.7% of cases underwent surgery. At the end of the 6-month follow-up, 37.3% had regressed, 38.7% of them had stable hydronephrosis, and 18.9% of them had normal findings in USG. Male gender increased gestational urinary tract infections, and parents' family histories for any kidney disease were found as possible risk factors for the development of ANH. However, close follow-up and timely intervention, including surgery, provide favourable outcomes in these cases.

Keywords: antenatal hydronephrosis, antenatal ultrasonography, ANH epidemiology, risk factors, ANH surgery, ANH outcomes

1. Introduction

One of the most often observed anomalies on standard prenatal ultrasounds (USG) is antenatal hydronephrosis (ANH), which affects 1 to 4.5 per cent of all pregnancies (1). ANH is typically defined by an anterior-posterior diameter of 3 of 4 mm at less than 28 weeks of gestation and 37 mm after 28 weeks (2). Unfortunately, many patients cannot receive a conclusive diagnosis even though it is frequently regarded as an indication of congenital abnormalities of the kidney and urinary tract (CAKUT). Even though the knowledge of the causes and effects of CAKUT is growing, there has yet to be a consensus regarding the clinical importance, postnatal assessment, and treatment of newborns with AHN (3).

The main obstacle against a consensus on ANH management is partly associated with the difficulties in classifying a fetus's or a newborn's upper urinary tract dilatation, which is also a cause for the inconsistent reports on the degree and management of this condition (4). Thus, elaborating on the epidemiological features, patient characteristics, management strategies, and relevant outcomes in ANH is crucial for clinical decision-making. Furthermore, keeping the population characteristics may also play a role in the disease's epidemiology in mind, this study aimed to evaluate the general demographic and clinical characteristics, management and outcomes of our patients with ANH.

2. Material and Method

This study was conducted at the Gynecology and Obstetrics department of Ondokuz Mayis University Faculty of Medicine. Patients diagnosed with ANH between 2004 and 2022 were retrospectively evaluated. Demographic and clinical characteristics, parent characteristics, clinical management and follow-up records were obtained from electronic hospital databases and patient records. The ANH was an antenatal USG finding of hydronephrosis ≥ 7 mm.

Descriptive statistics were presented using frequency and per cent for categorical variables, and mean and standard deviation for continuous variables. All analyses were done using SPSS 25.

This study was conducted with the approval of Ondokuz Mayıs University ethics committee (Approval number: 2023/26, approval date: 04.02.2023).

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3. Results

A total of 229 patients with ANH were included in the study. The general parental characteristics of patients are presented in Table 1. Sixteen patients' parents were close relatives, and the mean ages of the mothers and fathers were 31±6 and 34±7 years, respectively. Urinary tract infections were present in 100 (43.7%) mothers but none of the fathers. However, kidney disease was present in 24.5% of mothers' and 20.5% of fathers' family histories.

Table 1. General characteristics of parents of the ANH cases

	n (%) / Mean ± SD
Parent consanguinity	16 (7)
Mother's characteristics	
Age (year)	31 ± 6
Weight gain during pregnancy	13.2 ± 4.44
UTI history	100 (43.7)
Gestational diabetes	13 (5.7)
Gestational hypertension	10 (4.4)
Medical treatment/drug use	61 (26.6)
Smoking	33 (14.4)
Kidney disease in mother's family	56 (24.5)
Father's characteristics	
Age (year)	34 ± 7
Medical treatment/drug use	21 (9.2)
Hypertension	3 (1.3)
Smoking	126 (55)
Kidney disease father's family	47 (20.5)

The demographic and clinical characteristics of the babies diagnosed with ANH in prenatal USG are presented in Table 2. Accordingly, most babies were male (73.4%), and 7.9% were premature births with a mean birth weight of 3218±497 grams. The mean gestational week of diagnosis was 22±3 weeks of pregnancy. Postnatal USG was unable for one patient, hydronephrosis diagnoses were confirmed in 224 patients (97.8%), and the remaining four patients (1.7%) had abnormal findings other than hydronephrosis.

Table 2. Demographic and clinical characteristics of patients

	n (%) / Mean ± SD
Sex	
Female	61 (26.6)
Male	168 (73.4)
Prematurity	18 (7.9)
Birth weight (gr)	3218 ± 497
Gestational week of diagnosis	22 ± 3
Postnatal USG	
None	1 (0.4)
Hydronephrosis	224 (97.8)
Abnormal finding	4 (1.7)

Follow-up USG findings in the 1st, 2nd, 3rd, and 6th-month USG assessments are presented in Table 3. Accordingly, hydronephrosis regressed from 3.1% to 37.3% and progressed in 0.9% to 5.1% of patients. At the end of the 6-month follow-up, 38.7% had stable hydronephrosis, and 18.9% had normal findings in USG.

The two approaches in clinical management included close follow-up and surgical management in indicated cases. As a result, about 61.3% of patients were followed-up without surgical intervention, and 38.7% underwent surgery. At the end of the follow-ups, ANH was resolved in 21.6%, regressed in 38.3%, and remained stable in 40.1% of the patients. Data presented table 4.

Table 3. Clinical progression of patients during 6-month follow-up USG assessments

	1st month	2nd month	3rd month	6th month
	n (%)	n (%)	n (%)	n (%)
Follow-up USG				
Normal	1 (0.4)	6 (2.6)	21 (9.3)	41 (18.9)
Hydronephrosis - regressed	7 (3.1)	47 (20.7)	86 (38.2)	81 (37.3)
Hydronephrosis - stable	217 (95.6)	138 (60.8)	101 (44.9)	84 (38.7)
Hydronephrosis - progressed	2 (0.9)	36 (15.9)	17 (7.6)	11 (5.1)

Table 4. Clinical management and outcomes of ANH

	n (%)
Surgical management	
None	138 (61.3)
Yes	87 (38.7)
Patient outcomes	
Resolved	49 (21.6)
Regressed	87 (38.3)
Stable	91 (40.1)

4. Discussion

To our knowledge, this is the most extensive case series of ANH patients in Turkey. In this study, we retrospectively evaluated our patients with ANH, and to summarize our findings, mothers and fathers of the patients with ANH were in their 30s of ages, about 15% of mothers and 55% of fathers were smoking, medical treatment for other comorbidities were present in about a quarter of mothers and 10% of fathers. Urinary tract infections were present in about half of the mothers. Regarding an inheritance pattern of kidney disease, almost 25% of mothers' and 21% of fathers' family histories had kidney disease. Most babies were male, and about 8% were premature births. About 40% of the patients underwent surgical intervention for ANH, and during the follow-up of 6 months, about one-fifth of them recovered completely, 40% regressed, and 40% remained stable.

Widespread utilization of prenatal USG during routine antenatal follow-ups resulted in increased diagnoses of ANH worldwide, and early diagnosis also provided timely interventions and decreased severe complications (5). The diagnosis is made using a 5-MHz transducer USG in the 3rd trimester of gestation (6). A USG finding suggesting visualization of the fetal urinary system and ureters, which should not be visible under normal development, indicates the presence of hydronephrosis. Various classification systems and management strategies were reported for ANH, and identifying

patients' epidemiological and clinical characteristics is essential for clinical decision-making in different populations. Based on our findings, male gender, presence of urinary tract infections during pregnancy, and a family history of kidney disease in the parents' families were found to be increased in the babies with ANH.

Several previous studies evaluated the risk factors associated with CAKUT. In one of those, Liu et al. (7) reported that male gender, preterm birth, abnormal antenatal USG, gestational hypothyroidism, and oligohydramnios were associated with increased CAKUT risk during pregnancy. Our results partly supported these risk factors, which the majority of our cases were male, and all had abnormal antenatal urinary system USG findings. However, we found no gestational hypothyroidism and oligohydramnios among our patients. The previous reports suggest that the most common causes of ANH are transient and physiological hydronephrosis, which may occur in more than half of the cases and have a benign prognosis after birth (8). Likewise, almost all of our cases in the postnatal USG had hydronephrosis remained, but more than half of them had regular or regressed USG findings in postnatal 6th-month assessments.

Besides the risk factors, there are discrepancies in ANH cases' management strategies. In general, the management strategies are associated with the persistence of hydronephrosis in the postnatal period, bilateral involvement and the severity of the disease. Antibiotic treatment is suggested to prevent urinary tract infections, but evidence for continuous antibiotic prophylaxis lacks (9). In an extensive series of 208 hydronephrosis patients with a mean follow-up of 11 years, Anderson et al.(10) recommended further evaluation and interventions for cases with symptomatic cases. Another study by Koff and Campbell (11) reported that only 5% of their cases undergone pyeloplasty surgery, however a review by Agras reported that about one-quarter of patients with an anteroposterior renal diameter of 3 cm were reported to undergo surgery in the first year (12). This was also consistent with our results that almost 40% of our patients underwent surgery in the postnatal first year.

The increased antenatal routine follow-up and widespread utilization of USG assessment during pregnancy resulted in a high diagnosis of ANH. This study evaluated our cases with ANH and reported the epidemiological and clinical characteristics, possible risk factors, treatment approaches, and outcomes in this patient group. Our results support the available evidence in the literature and suggest population characteristics in our region. To the best of our knowledge, this is the most extensive case series reported yet in Turkey. However, future studies with different areas and larger sample sizes are needed to make conclusions on the epidemiology of this prevalent disorder.

Ethical statement

This study was conducted with the approval of Ondokuz Mayıs University ethics committee (Approval number: 2023/26, approval date: 04.02.2023).

Conflict of interest

None to declare.

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Authors' contributions

Concept: M.Ö, Design: G.Ö., Data Collection or Processing: G.Ö., M.Ö, Analysis or Interpretation: G.Ö., M.Ö, Literature Search: G.Ö., M.Ö, Writing: G.Ö., M.Ö.

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