ORIGINAL ARTICLE

Profile and postnatal evolution of children with antenatal urinary tract dilation in a specialized service in the South of Brazil

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Abstract

Objectives: to describe the clinical care profile, final diagnoses, and quantify surgeries in children with antenatal urinary tract dilation followed up at a nephrology outpatient clinic.

Methods: a longitudinal, descriptive, single-center study with retrospective and prospective collection of medical record data from patients of the pediatric nephrology outpatient clinic of the Universidade Federal de Pelotas (UFPel), between 2010 and March 2025. Postneonatal investigation followed current protocols and recommendations, updated during each period. The Society for Fetal Urology classification and the Urinary Tract Dilation system were used to classify the sample according to the severity of anatomical findings. The project was approved by the Research Ethics Committee of UFPel (Opinion Number 2.692.027).

Results: the study included 112 children. The most prevalent final diagnosis was transient urinary tract dilation (45.5%), followed by ureteropelvic junction stenosis (21.4%) and vesicoureteral reflux (10.7%). Surgical management was performed in 18 patients (16.1%), primarily due to ureteropelvic junction stenosis (44.4%).

Conclusions: follow-up at a specialized service showed a predominance of conservative clinical outcomes and a low frequency of surgery. Antenatal diagnosis allowed early postnatal follow-up and etiological characterization of cases, which may favor the timely identification of cases requiring additional investigation and intervention.

Key words *Urinary tract, Urogenital abnormalities, Congenital abnormalities, Nephrology*

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Introduction

Antenatal Urinary Tract Dilation (UTD) is the most frequently detected fetal anomaly during pregnancy,[1] with an incidence of 1–2% in prenatal ultrasound (US) examinations.[2] Early detection of antenatal dilation is important for the evaluation of Congenital Anomalies of the Kidney and Urinary Tract (CAKUT) and renal damage.[1]

The evolution of antenatal US has made diagnosis more accurate, assisted in the follow-up of these conditions, and reduced the need for invasive examinations.[3] Intrauterine diagnosis identifies at-risk children who require further evaluation and care.[4] Coordination among obstetricians, sonographers, pediatricians, nephrologists, neonatologists, and urologists, through a multidisciplinary approach to diagnosis and follow-up from the antenatal period onward, is fundamental.[4] This joint approach aims to ensure early treatment, reduce the risk of subsequent morbidities, and conduct an adequate investigation.[1]

Urinary tract dilation may be physiological or transient, resolving spontaneously, or may require postnatal interventions and management, as in cases of ureteropelvic junction (UPJ) obstruction, ureterovesical junction (UVJ) obstruction, vesicoureteral reflux (VUR), posterior urethral valves (PUV), bladder outlet obstruction, or ureterocele.[5] Most cases that persist postnatally, resolve; however, follow-up is required during the first two years of life.[3]

Performing US at more advanced stages of pregnancy favors the detection of genitourinary abnormalities due to the greater fetal size,[6] as well as the fact that certain abnormalities become evident only in the third trimester.[3] It is recommended that prenatal findings be confirmed postnatally with at least two consecutive US examinations, with the first being deferred to 48 hours after birth due to the risk of a false-negative result[1]. Antenatal dilation resolves spontaneously after birth in approximately one third of the cases; another third progresses with improvement or stabilization by the third year of life, and the remaining third persists or presents a congenital malformation (CAKUT).[1]

Clinical protocols for the management of antenatal urinary tract dilation vary considerably, and there is little evidence regarding optimal monitoring and follow-up duration. Current approaches should be individualized according to subsequent findings.[1,7]

Therefore, the primary objective of this study was to evaluate the clinical and care profile of children with antenatal urinary tract dilation, describe the final diagnoses, and quantify the need for surgical intervention in patients of the pediatric nephrology outpatient clinic of the *Universidade Federal de Pelotas* (UFPel).

Methods

This is a longitudinal, descriptive, single-center study with retrospective and prospective collection of medical record data. The target population consisted of children referred to the pediatric nephrology outpatient clinic of the *Universidade Federal de Pelotas* (UFPel) with antenatal ultrasound (US) findings indicating urinary tract abnormalities. The sample was obtained by convenience (non-probabilistic), including children who met the inclusion criteria during the study period, with the aim of describing specific characteristics, without the intention of generalizing the results to a larger population or testing hypotheses. Medical records conducted from 2010 to March 2025 were included in the study.

The inclusion criteria were patients who had records of at least one antenatal and one detailed postnatal US documented in the medical record. This criterion was chosen given that medical records are written manually and are susceptible to human documentation errors. The exclusion criteria were the complete absence of necessary data in the medical records and lack of follow-up. The guardians of children who were lost to follow-up were contacted to receive evaluation and update of their follow-up, if they so wished. Some children had not yet completed the investigation; therefore, they were classified according to the diagnosis established at the time of analysis.

The care protocol used was based on the scientific evidence available at the time, being reviewed and updated in accordance with modifications. Complementary examinations were performed in the city primary healthcare network or in private services, according to patient availability and access. Antimicrobial prophylaxis was initiated at birth in children with renal pelvic dilation above 15 millimeters (mm) or ureteral dilation. In these cases, cefalexin was used at a dose of 10 mg/kg/dose, administered as a single daily dose, maintained until the conclusion of the investigation, with the aim of preventing urinary tract infection and, consequently, the possibility of septicemia during the neonatal period.

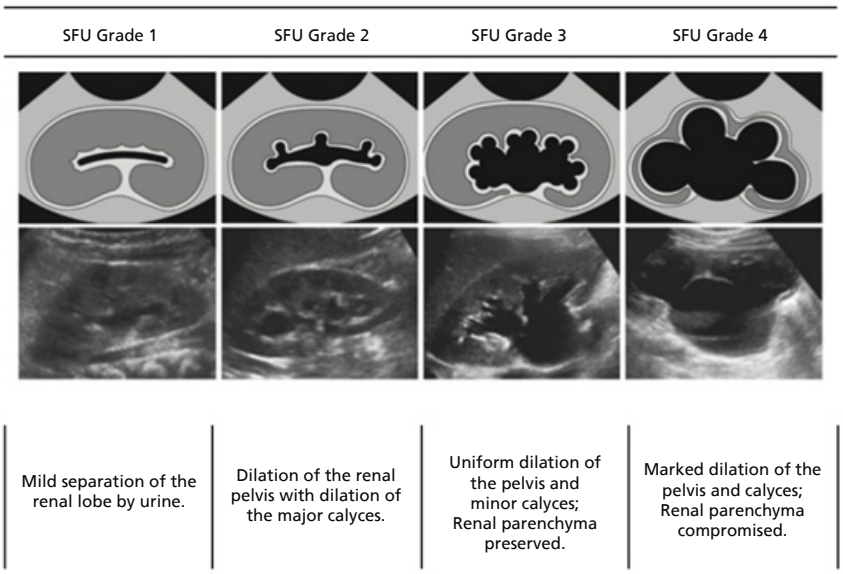
The first examination performed was a kidney and urinary tract US from 15 days of life onward, when renal involvement was unilateral and pelvic dilation was less than 15 mm. In cases of severe and bilateral involvement, US was performed after the third day. In cases of suspected posterior urethral valve (bladder with significant distension, without adequate emptying, and male sex), the examination was to be performed immediately.

The classification used was that of the Society for Fetal Urology (SFU) during pregnancy (Figure 1) and the Urinary Tract Dilation (UTD) Classification after birth (Figure 2)[1]. The SFU classifies urinary tract dilation as:

grade zero, absence of dilation; grade one, visualization of the renal pelvis only; grade two, visualization of a few calyces alongside the renal pelvis; grade three, identification of all calyces; and grade four, in addition to complete visualization of the calyces, presence of parenchymal thinning.[8] The UTD classification is based on the measurement of the anteroposterior diameter of the renal pelvis and other anatomical findings, demonstrating accuracy in detecting postnatal Congenital Anomalies of the Kidney and Urinary Tract (CAKUT) and the need for surgery. The UTD classification divides antenatal findings into three severity categories (normal, A1, and A2–3) and postnatal findings into four severity categories (normal, P1, P2, and P3).[2] In this classification, the following are primarily used: the anteroposterior diameter of the renal pelvis, calyceal dilation, renal parenchymal thickness, renal parenchymal echogenicity, ureteral dilation, and bladder abnormality.[2]

Figure 1

Classification of antenatal dilation by the Society of Fetal Urology (SFU).



Adapted from Timberlake and Herndon.[11]

Figure 2

Classification of Urinary Tract Dilatation (UTD).

Classification of Urinary Tract Dilatation (UTD)

	Antenatal		Postnatal (>48 hours)		
	UTD A1	UTD A2	UTD P1	UTD P2	UTD P3
Anteroposterior diameter of the renal pelvis (APDRP)	4 - <7mm (<28week) 7-<10mm (≥28week)	≥ 7mm (<28week) ≥10mm(≥28week)	10 - <15 mm	≥15 mm	≥10 mm
Calices		Any dilatation	Central dilatation	Peripheral dilatation	Any dilatation
Ureter		Any dilatation (with APDRP ≥4mm or calyceal dilatation)		≥4mm (with DAPPR ≥10mm or calyceal dilatation)	
Parenchymal, bladder, or oligohydramnios abnormality		Present (with APDRP ≥4mm or calyceal dilatation)			Present

Adapted from *Nguyen et al.*[2]

Voiding cystourethrography was used for the detection of vesicoureteral reflux, as well as for evaluation of bladder and urethral anatomy in children presenting with significant ureteral dilation or bladder abnormalities. Renal scintigraphy with dimercaptosuccinic acid (DMSA) was used, after the third month of life, to assess initial renal function, detecting congenital scarring, multicystic kidney, horseshoe kidney, renal agenesis, and ectopic kidneys. Renal scintigraphy with diethylenetriaminepentaacetic acid (DTPA) was used in children with suspected ureteropelvic or ureterovesical junction obstruction and was performed after the third month of life.

The project was approved by the Research Ethics Committee of UFPel (Opinion Number 2.692.027; June 5, 2018; CAAE 89954518.5.0000.5317). Patients were exempt from signing the Informed Consent Form, given that only medical record data were used for the study, with a commitment to confidentiality by the researchers.

Due to the predominantly retrospective nature of the study and the lack of standardization in medical record documentation, the possibility of information bias is acknowledged. To minimize this risk, data were collected systematically and following the same procedure for all eligible patients. The UTD classification was applied retrospectively, based on renal pelvic measurements recorded in the medical records, and was therefore not concurrent with data collection. Since the medical records contained renal pelvic measurements, the UTD was applied in a standardized and uniform manner to all patients with available data, using the most recent version of the classification system, with no risk of inconsistency between different classifications over time.

Medical records that met the aforementioned inclusion criteria were reviewed, and the data of patients with potential for study participation were collected confidentially. Data were entered into a categorized Excel spreadsheet and subsequently transferred to Stata 12.0 (Texas, USA).

Descriptive analysis included calculation of percentages for categorical variables; for continuous variables, mean and standard deviation were calculated. Variables were categorized as follows: sex (female and male), skin color (white, Black, and mixed-race), type of delivery (vaginal and cesarean), prematurity (less than 37 weeks of gestational age), Apgar score at the first and fifth minute (less than 7), birth weight (mean), age at first visit (less than one month, from one month to six months, more than six months to 12 months, more than 12 to 24 months, and more than 24 months), need for surgery (yes and no), Urinary Tract Dilation classification pre- and postnatally, and etiological diagnosis.

Regarding these categorizations, due to the study design and the lack of standardized data in the medical records used for collection, some variables present a relevant percentage of missing data. No data imputation was performed.

The present study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.[9]

Results

A total of 147 children were evaluated; however, 35 were excluded from the study due to loss to follow-up (26 children) or medical records not found at this outpatient clinic (nine children); thus, 112 children were included in the study.

The first consultation was conducted before one month of age in 12.5% of the sample, between one and six months in 53.6%, between seven and 24 months in 16.9%, and in those older than 24 months in 17.0%. Regarding sex, 69.6% were male. Most of the children were white (94.6%).

Regarding the perinatal data present in the sample, a predominance of cesarean deliveries (71.1%) was observed compared to vaginal delivery (28.9%). Information on type of delivery was absent in 22 medical records. Prematurity was identified in 29.5% of the sample, with a similar percentage distribution between sexes; however, data on gestational age were not available in 24 medical records. With respect to the Apgar score recorded in medical records, values below 7 were recorded in 13.3% of patients at the first minute of life and in 1.4% at the fifth minute in the portion of the sample with available data. This record was absent in 37 and 38 medical records, respectively. Regarding birth weight, the mean values indicated adequate weight in the studied population. This information is summarized in Table 1.

With regard to the degree of antenatal and postnatal dilation observed in the patients, it was found that, according to the UTD classification, among the cases eligible for prenatal classification, the A2–3 group (82.1%) was the most frequent. In the postnatal evaluation, among the UTD classifications in cases with available measurements, the highest prevalence was observed in the P2 group (26.8%). The finding of no dilation is noteworthy in this sample, as it shows that 40.8% of cases with available postnatal measurements presented no dilation at the first postnatal US. It is also important to highlight the predominance of cases without measurements in the medical records, representing 73 cases in the prenatal period and 41 cases in the postnatal

period. The complete distribution of dilation grades, with breakdown by sex, is presented in Table 2.

The most prevalent etiological diagnosis in the studied sample was transient dilation, corresponding to 45.5%, being more frequent in males, with 36 cases. UPJ stenosis corresponded to 21.4% of final diagnoses, being more prevalent in males with 16 cases. Vesicoureteral reflux was the third most prevalent diagnosis, with 10.7% of cases, followed by UVJ stenosis with 6.3% of cases. The main etiological findings during follow-up are described in Table 3. Some patients are still under follow-up, especially those with transient dilation, who are monitored until dilation disappears, and were classified in this study according to the diagnosis established at the time of analysis.

Surgery for correction of the underlying condition was performed in 18 patients (16.1%): eight patients with UPJ stenosis (44.4%), three with UVJ stenosis (16.7%), one with UVJ stenosis and vesicoureteral reflux (5.6%), three with vesicoureteral reflux (16.7%), and three with posterior urethral valve (16.7%).

Table 1

Characteristics of the 112 children by sex and of the total sample.

Characteristics	Male (N=78; 69.6%)		Female (N=34; 30.4%)		Total (N=112; 100.0%)	
	n	%	n	%	n	%
Color						
White	72	92.4	34	100.0	106	94.6
Black	3	3.8	0	0.0	3	2.7
Mixed	3	3.8	0	0.0	3	2.7
Delivery*						
Vaginal	15	22.7	11	45.8	26	28.9
Cesarean section	51	77.3	13	54.2	64	71.1
Gestational age (weeks)*						
Preterm (<37 weeks)	18	29.0	8	30.8	26	29.5
Full-term (≥37 week)	44	71.0	18	69.2	62	70.5
Apgar 1st min*						
0-6	8	14.5	2	10.0	10	13.3
7-10	47	85.5	18	90.0	65	86.7
Apgar 5th min*						
0-6	1	1.8	0	0.0	1	1.4
7-10	53	98.2	20	100.0	73	98.6
Birth weight (gr) ($\bar{x}$ ± SD)	3,267 ± 593		3,028 ± 754		3,192 ± 652	
Age at the 1st postnatal visit						
<1 month	12	15.4	2	5.9	14	12.5
1 month – 6 months	47	60.3	13	38.2	60	53.6
>6 months – 12 months	5	6.4	4	11.8	9	8.0
>12 months – 24 months	7	9.0	3	8.8	10	8.9
>24 months	7	9.0	12	35.3	19	17.0
Surgery						
Yes	15	19.2	3	8.8	18	16.1
No	63	80.8	31	91.2	94	83.9

* Variables with missing data.

Table 2

Classification of antenatal and postnatal urinary tract dilation (UTD) in the sample.

Urinary Tract Dilation	Male		Female		Total	
	n	%	n	%	n	%
Prenatal*						
UTD A1	5	17.2	2	20.0	7	17.9
UTD A2-3	24	82.8	8	80.0	32	82.1
Postpartum*						
UTD P1	12	23.1	5	26.3	17	23.9
UTD P2	12	23.1	7	36.8	19	26.8
UTD P3	5	9.6	1	5.3	6	8.5
No dilatation	23	44.2	6	31.6	29	40.8

* Variables with missing data.

Table 3

Etiological diagnosis by sex and sample type.

Diagnóstico final	Male (N=78; 69.6%)		Female (N=34; 30.4%)		Total (N=112; 100.0%)	
	n	%	n	%	n	%
Transient dilation	36	46.2	15	44.1	51	45.5
UPJ stenosis	16	20.5	8	23.5	24	21.4
Vesicoureteral reflux	7	9.0	5	14.7	12	10.7
UVJ stenosis	5	6.4	2	5.9	7	6.3
Multicystic kidney	4	5.1	1	2.9	5	4.5
Ureterocele	3	3.8	0	0.0	3	2.7
Posterior urethral valve	3	3.8	0	0.0	3	2.7
Renal agenesis	0	0.0	1	2.9	1	0.9
Duplication of the renal pelvis	0	0.0	1	2.9	1	0.9
Ureteral duplication	1	1.3	0	0.0	1	0.9
Ureterovesical junction (UVJ) stenosis and vesicoureteral reflux	1	1.3	0	0.0	1	0.9
Vesicoureteral reflux and ureteral duplication	1	1.3	0	0.0	1	0.9
Ectopic kidney	1	1.3	0	0.0	1	0.9
Polycystic kidney and vesicoureteral reflux	0	0.0	1	2.9	1	0.9

UPJ= ureteropelvic junction; UVJ= ureterovesical junction.

Discussion

Urinary tract dilation is an abnormality of renal development whose detection has increased with the widespread use of ultrasound (US) in routine obstetric evaluation.[4] These patients potentially benefit from routine obstetric US, as they become eligible for follow-up of their abnormalities until resolution, thus avoiding possible loss of renal function, given that 7 to 14% of children with urinary tract dilation developed infections in this system during the first year of life.[1]

The present study shows a relative frequency of 45.5% of patients with transient antenatal urinary tract dilation, a percentage lower than that expected based on the literature, which indicates a relative frequency of 70 to 80%.[2] A possible explanation for the lower frequency of transient dilation in the present study is the existence of patients still under follow-up, whose definitive evolution has not yet been documented.

In the studied sample, males predominated with 69.6% of cases, and sex was also associated with certain diagnoses such as ureterocele and posterior urethral valve, which had only male representatives in the sample and an increased prevalence, with 3 and 3 cases, respectively. In this regard, it is relevant to highlight that posterior urethral valve is a condition exclusive to males, with an approximate incidence of 1 in every 8,000 live births.[6] The importance of early diagnosis of this condition in this

subgroup of patients is notable, as they may subsequently suffer from urinary tract obstruction and consequent chronic kidney disease.[10]

Regarding the need for surgery, in the studied sample there was a predominance of transient dilation diagnoses (45.5%), and therefore surgery was not required. Follow-up of these patients is essential, given that, in the first two to three years of life, one third of patients with this diagnosis will have spontaneous resolution without the need for invasive procedures and with no major consequences in adult life. Surgical intervention occurred in 16.1% of patients, mostly due to UPJ stenosis (44.4%).

The highest prevalence of antenatal dilation, among those eligible for classification, was DTU A2–3, contrasting with the predominance of DTU P2 classification in the postnatal period and with a significant absence of dilation on postnatal US, suggesting a favorable prognosis for urinary tract dilation in most of the patients for whom data were available for this comparison. It should be noted that the absence of measurements in these classifications prevents the precise delineation of groups within the present sample, and the aforementioned information is based solely on the present records.

Another relevant aspect is the analysis of excluded patients. Loss to follow-up, in the context in question, may result from personal or social circumstances experienced during the period, with particular emphasis on the COVID-19 pandemic between 2020 and 2022, as well as the floods that affected the State of *Rio Grande do Sul* between May and August 2024. These two events may have contributed to difficulties faced by the population in attending medical appointments and undergoing examinations.

In some children, it was not possible to obtain the antenatal pelvic size, only the qualitative classification of mild, moderate, or severe dilation as described in prenatal examinations, which compromised the comparative analysis of antenatal and postnatal renal pelves. The lack of standardization in the documentation of follow-up data from the examinations performed was a methodological limitation of the study, attributed to the retrospective nature of the research and the absence of electronic medical records for more accurate documentation of patients' clinical information.

This high proportion of missing data in relevant variables of the classifications used is an important limitation of this study. As a consequence of this limitation, descriptive analyses stratified by severity are based on a smaller portion of the initial sample and compromise the interpretation of results. Therefore, the comparisons made should be interpreted with caution, due to the potential bias related to data incompleteness.

Another limitation of this study was the absence of a sampling technique, since convenience sampling of available cases during the period was used. Furthermore, some of the included patients were still undergoing diagnostic investigation at the time of study analysis, which implies different follow-up durations among individuals and heterogeneity of data. The diagnoses considered therefore reflect the most recent stage of investigation but are not equivalent in follow-up maturity, which may influence the interpretation of the results.

Although clinical outcomes such as chronic renal failure and urinary tract infection were not evaluated in this study, they present complications for which antenatal urinary tract dilation is an important risk fator,[1] and, in certain higher-risk subgroups, antimicrobial prophylaxis may be considered in the first days of life, in accordance with the care protocol adopted.[7] Finally, in this study, complications and the use of prophylaxis were not evaluated; however, the anatomical progression of dilation and the need for surgical intervention allow for a better understanding of the prevalence and initial prognosis of antenatal dilation. These limitations may serve as the focus of future studies.

The present study highlights the relevance of postnatal investigation of children with renal involvement, the role of the medical team, and the engagement of guardians in the follow-up of urinary tract dilation. These abnormalities must be properly investigated, diagnosed, and treated when necessary, so that children do not experience health consequences. The use of prophylaxis and the incidence of urinary tract infection during the follow-up period of these children were not analyzed. During the study period, changes occurred in the management and investigation guidelines for urinary tract dilation during pregnancy, with less invasive examinations and lower radiation exposure for children.

The study showed a predominance of conservative outcomes among children with antenatally detected urinary tract dilation and a low frequency of surgery at the evaluated service. Specialized follow-up allowed characterization of the main etiological diagnoses and documentation that most of the children were seen within the appropriate period (before six months of age), which may favor early diagnosis and intervention when necessary. Multicenter studies with evaluation of clinical outcomes are needed to better define the prognosis and associated complications.

Authors' contribution

Castanheira DD and Faccin E: conceptualization; data curation; formal analysis; manuscript writing, revision, and editing.

Marques DC: conceptualization; data curation; formal analysis; research; methodology; project management; supervision; manuscript writing, revision, and editing.

All authors approved the final version of the article and declare that they have no conflict of interest.

Use of artificial intelligence

Artificial intelligence tools, such as ChatGPT, were used exclusively to assist in the translation of the text into English and to support the authors with specific questions regarding spelling and grammar. All content was reviewed and validated by the authors, who assume full responsibility and authorship for the final text.

Data availability

The data used in this study are not publicly available due to ethical and privacy restrictions, but may be made available by the corresponding author upon request.

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