Orginal Article

Urological Abnormalities Associated with Anorectal Malformation in Children Presented at Kanti Childrens' Hospital

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Article History
Recived: 7 June, 2025
Accepted: 10 July, 2025
Published: 31 January, 2026

Funding Sources: None

Conflict of Interest: None

Online Access

DOI: 10.61122/jkistmc355

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Citation: Dangol E, Thapa B, Thapa Basnet A. Urological Abnormalities Associated with Anorectal Malformation in Children Presented at Kanti Childrens' Hospital. J. KIST Med. Col. 2026; 8(2)15:10-11.

Abstract

Introduction: Anorectal malformations (ARM) are common congenital defects in children that are frequently associated with other congenital anomalies, particularly urological abnormalities. These urological anomalies, which increase in frequency and severity with more complex ARM types, can lead to significant complications such as upper urinary tract deterioration if not identified and managed early.

Methods: This prospective observational study at Kanti Children's Hospital included 50 ARM patients from June 2024 to May 2025. All patients underwent baseline renal ultrasound; MCUG was done selectively for abnormal findings or symptoms. ARM was classified by Wingspread criteria and associated anomalies were documented. The study results were analyzed and compared with previously published data.

Results: Urological anomalies were detected in 44% of patients with anorectal malformations (ARM). The number of male patients with ARM was higher than females. Out of 50 patients, 23 had high-type ARM with 15 showing urological anomalies, 20 had intermediate-type with 7 anomalies, and none of the 7 low-type patients had urological anomalies. The most common urological abnormality identified was hydronephrosis (n = 13), followed by vesicoureteric reflux (VUR) (n = 5). Notably, four out of the five VUR cases were missed during the initial screening and were only diagnosed later during follow-up, often after the patient developed a urinary tract infection.

Conclusion: The high incidence of urogenital anomalies in patients with anorectal malformations highlights the need for thorough evaluation. Routine use of micturating cystourethrography (MCUG) is recommended, even when ultrasound findings are normal, to ensure early detection and timely management.

Keywords: Anorectal malformation, Urological anomalies, Micturating cystourethrography

Introduction

Anorectal malformation (ARM) is a common congenital defect observed in children.[1] ARM is frequently associated with a high rate of other congenital anomalies. It is usually linked to various systemic organ abnormalities, with urological anomalies being the most common.[2] Its presence can cause deterioration of the upper urinary tract. The overall occurrence of these related anomalies exceeds 60%.[3] Moreover, the rate of urological anomalies ranges from 20-50%.[4,5] Early identification of urological

anomalies is crucial, as it helps prevent severe damage to the upper urinary tract.[6,7]

The association of urological anomalies and ARM is due to their shared embryological development. ARM is characterized by the absence of a normally formed anus in its typical position within the perineum.[8,9] It varies from complex hindgut and urogenital organ anomalies, such as cloaca, to intricate perineal fistulas or vestibular issues fistulas.[8]

The Wingspread classification divides the ARM into high, intermediate, and low categories. Pena in 1995 classified ARMs based on specific anatomy and the child's sex. In 2005, Krickenbeck modified Pena's classification, adding more rare types variants.[10]

Patients with ARM exhibit various urological abnormalities. The occurrence of complications tends to increase with the severity of ARM,[11,12] Both structural and functional urological issues are commonly seen in affected individuals. Vesicoureteric reflux (VUR) and hydronephrosis are among the common abnormalities linked to ARM.8 Renal anomalies are found in 50-60% of patients with high or intermediate forms of ARM and 15-20% of those with low-type ARM.[12] This connection highlights the complexity of ARM and the importance of multidisciplinary care to manage diverse medical concerns.

Despite advancements in medical imaging and diagnostic techniques, debates persist regarding the optimal screening protocols for detecting associated urological anomalies. Additionally, prenatal interventions for ARM remain limited. Prenatal diagnosis of ARM is often overlooked unless associated anomalies are present, such as VACTERL association (vertebral defects, ARM, cardiac anomalies, tracheoesophageal fistula, renal anomalies and limb abnormalities). Existing recommendations advocate for comprehensive screening strategies, including ultrasonography of the urinary tract, voiding cysto-urethrography for vesicoureteral reflux detection, and imaging of the spinal cord to identify lumbosacral anomalies. However, the efficacy of these screening methods in improving treatment outcomes, especially in less complex ARM cases, remain unclear.[2]

The variation in treatment approaches for urological anomalies associated with anorectal malformations (ARM) highlights the need to explore whether these strategies differ based on the severity of ARM. This kind of study could give important information that would help create better, personalized treatment plans for each type of ARM.

Methods

A prospective, observational study done in Kanti Children's Hospital from June 2024- May 2025; where patients who had ARM presented in Kanti Children's Hospital were included. The current study aimed to study urological problems in children with anorectal malformations (ARM) treated at Kanti Children's Hospital, find out which types are most common, and see how these problems differ in the various types of ARM based on the Wingspread classification. All patients meeting the inclusion criteria were taken for the study after consent/assent. Cross table prone lateral Xray and an ultrasound of the abdomen were done during admission. ARM was categorized according to the wingspread classification. For statistical analysis, the type of ARM was dichotomized into high, intermediate and low based on definitions from the 1984 Wingspread classification. In high lesions the terminal pouch lies above the levator ani muscles, intermediate lies within and in low type, it lies below. This was determined by rectal gas shadow with the prone radiological pubococcygeal (PC) line and tip of ischium (I line). If the rectal gas shadow is above the PC line its high type; between PC line and I line is intermediate type and below I line is low type. Surgically by the distance of the terminal rectal pouch being more (high lesions) or less (low lesions) than 1 cm from the perineum. Definitive surgery was done according to the protocol of ARM. On follow up after 7 days of surgery, patients with anomalies in ultrasound are planned for micturating cystourethrogram or CT-IVU who have complex urological abnormalities in ultrasonography and MCUG. Urinary tract anomalies were defined as renal, ureteral or bladder malformations excluding the recto-vesical and recto-urethral fistula. Grading of vesicoureteric reflux was done according to international classification.

Results

During the one-year study period, 50 patients with congenital anorectal malformation (ARM) were admitted (Table 1). Of these, 26 (52%) were male and 24 (48%) were female. Urological anomalies were detected in 22 patients (44%) (Figure 1).

Out of 50 patients with anorectal malformations (ARM), 23 had the high type, of whom 15 presented with urological anomalies. Twenty patients had the intermediate type, with 7 showing urological anomalies. The remaining 7 patients had the low type, and none of these exhibited any urological anomalies. (Figure 1)

Among the 22 patients with urological anomalies, 3 were on regular follow-up after having undergone primary colostomy and were admitted for definitive surgery. Four patients were admitted for colostomy closure. Five patients had previously completed definitive surgery for ARM and presented to the surgical outpatient department with ultrasound reports indicating urological anomalies. The remaining 10 patients were newly diagnosed cases of ARM at the time of admission. The detailed distribution of urological anomalies according to the type of ARM is presented in Table 2.

Table 1: Distribution of associated urological anomalies in patients with different types of anorectal malformations.

Type of ARM	No. of ARM cases according to type (n)	Urological anomalies cases (n)	Urological anomalies cases Percentage(%)
High	23	15	30%
Intermediate	20	7	14%
Low	7	0	0
Total	50	22	44%

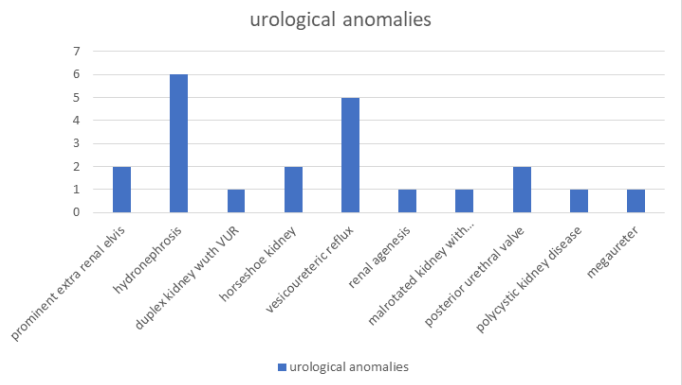

Figure 1: Depiction of various urological anomalies in anorectal malformation

Table 2: Urological abnormalities in different type of Anorectal malformations

	Hydrone-phrosis n (%)	Hydro-ure-terone-phrosis n (%)	Horseshoe kidney n(%)	Renal agenesis n (%)	polycystic kidney disease n (%)	Duplex kidney n (%)	Posterior urethral valve n (%)	Prominent extra re-nal pelvis	megaureter
High	4	2	2	1	1	1	2	1	1
Intermediate	2	3	-	-	-	1	-	1	-
Low	-	-	-	-	-	-	-	-	-

Discussion

Urological anomalies are found to be the most frequent among all the anomalies in ARM. About 40% of ARM have an associated urinary tract anomaly.[1,2] In a study done by Shenoy NS et al, 63% were male and 37% were female. Similarly, in other parts of the world, male cases were high in comparison to females, ranging from 55% to 71%.[3,4,6] In this study, male cases with 52% and female cases were 48%.

Partridge and Gough in 1961 reported 9% incidence of urologic anomalies in low ARM and 30% in high ARM.[13] Parrot reported 14% with low,21% with intermediate, and 40% with high anomalies.[7] Rich et al showed 25%, 42% and 71% associations respectively.8 Todha et al found 38.1% of low, 65.5% of intermediate and 85.7% of high ARM.[9] In this study, 14% low cases, intermediate 40% and 46% high.

Urological anomalies were found to be the most common among all the anomalies in the study conducted by Ratan et al., which showed 31% of patients were affected.[14] Similarly, in other studies, urogenital anomalies range from 26% to 60% in patients with ARM.[10–12] Urological anomalies were present in 44% of cases in this study, with 30% associated with high-type ARM, 14% with intermediate-type ARM, and none with low-type ARM.

In the present study, the most common urological anomaly was hydronephrosis, followed by vesicoureteric reflux (VUR). A total of 13 cases of hydronephrosis were identified. This finding aligns with the understanding that hydronephrosis is often secondary to underlying conditions such as VUR or bladder dysfunction, rather than being a primary abnormality. The observed incidence pattern was consistent with reports from other series.[12,15,16]

The reported incidence of VUR in ARM patients in the literature varies widely, ranging from 19% to 47.2%.[1,15,17] In the current study, the incidence of VUR was comparatively lower, which may be explained by the selective use of micturating cystourethrogram (MCUG). At this center, MCUG was performed only in patients with abnormal ultrasound findings or those presenting with urinary symptoms such as urinary tract infection (UTI). While this approach avoids unnecessary invasive testing, it inevitably results in missed cases of VUR, particularly those that are asymptomatic at presentation.

This limitation was evident in one patient who had undergone definitive ARM repair and later presented during follow-up with a new episode of UTI. Further evaluation revealed VUR, which had not been detected during the initial screening. Overall, there were five cases of VUR in this study, of which four were missed during the initial evaluation and only diagnosed on follow-up. This observation mirrors findings from Fascetti-Leon et al.[12], where a proportion of anomalies were not apparent in the neonatal period but were identified later. In his study, 88% of urological anomalies were detected through the screening protocol, while 12.9% were diagnosed only during follow-up, emphasizing that VUR can remain clinically silent in early life and manifest only under specific circumstances.

These findings show that patients with ARM need ongoing follow-up based on their risk. Although early screening can find most urological problems, some may still be missed without regular check-ups. Using MCUG only when ultrasound or symptoms suggest a problem is practical but may miss some cases. Therefore, future protocols should balance effective detection with minimizing unnecessary tests by scheduling periodic reassessments for high-risk patients, even if they show no symptoms, to ensure early identification and prevention of kidney problems.

Conclusion

Urological anomalies were found in 44% of children with anorectal malformations, most commonly in high and intermediate types. Hydronephrosis and vesicoureteric reflux were the predominant findings. Since some cases were missed on initial ultrasound, routine follow-up and selective use of MCUG are essential for early detection. Timely identification of associated anomalies in patients with anorectal malformations (ARM), particularly urological anomalies, is essential for improving long-term outcomes and quality of life.

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