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Incidence of Congenital Anomalies of Urinary Tract in Patients with Dysuria in South Maharashtra Population

Renuka S. Ahankari[1], Mahesh S. Ugale[2]

Abstract

One hundred and five patients (81 males and 24 females) with symptoms of dysuria associated with urinary tract infections, reflux of urine, urinary stasis were studied at MIMSR Medical College and YCR Hospital , Latur, from Feb 2012 to Feb 2015. These patients were from different areas of South Maharashtra. These cases were evaluated by micturating cystourethrogram (M C U) & Retrograde cystourethrography (RCG). The patients with congenital malformation of the urinary tract system were studied separately to find out the incidence of these malformations in South Maharashtra. The Congenital anomalies which we came across were - Posterior Urethral Valves, Urinary bladder diverticulum, Urethral Diveticulum, Prune belly Syndrome & Meatal Stenosis. Most of them were seen in 0-5 years of age & all were male patients. The overall incidence of Congenital anomalies of urinary system in our study is 7.4%. We also calculated incidence of individual Congenital anomaly. The results were analysed and compared with similar other studies.

Keywords: Congenital Anomalies; Urinary Tract; Dysuria; Posterior Urethral Valves, Urinary bladder diverticulum, Urethral Diveticulum, Prune belly Syndrome; Meatal Stenosis.

Introduction

Dysuria is the sensation of pain, burning, or discomfort on urination [18].

It is a representative symptom of many diseases affecting urinary system like trauma, infections, calculi, bladder neck obstruction, urethral or bladder fistula, neoplasms etc.

Congenital anomalies of the urinary system also present with dysuria as a major symptom [10].

Congenital malformations of the urinary tract system comprise diversity of abnormalities. This wide range of anomalies results from multiplicity of factors that interact to influence urinary tract development in sequential and an orderly manner. Abnormal maturation or inappropriate timing of these factors at the critical points in development can produce any number of deviations in the development of kidneys, ureters, bladder and urethra [17].

To understand the anomalies of the urinary system, let's take a quick review of normal development of urinary system.

Development of Urinary System

The urinary and genital systems develop from the intermediate mesoderm and subdivisions of cloaca.

Its development starts at 5th week of intra uterine life & it is completed by 37th week [9, 20]. The following diagram illustrates development of Urinary system.

The Kidneys

The collecting part of kidneys is derived from ureteric bud and excretory part from the metaneprhic blastema.

Author's Affiliation: [1]Assistant professor, Department of Anatomy, Shrimati Kahibai Navale Medical College & General Hospital Narhe, Pune, Maharashtra, India. [2]Professor, Department of Anatomy, MIMSR Medical College & YCR Hospital, Latur, Maharashtra, India.

Corresponding Author: Renuka S. Ahankari, Assistant Professor, Department of Anatomy, Shrimati Kahibai Navale Medical College & General Hospital, off westerly bypass, Narhe, Pune, Maharashtra-411041, India.
E-mail: adgaonkarrenuka36@gmail.com

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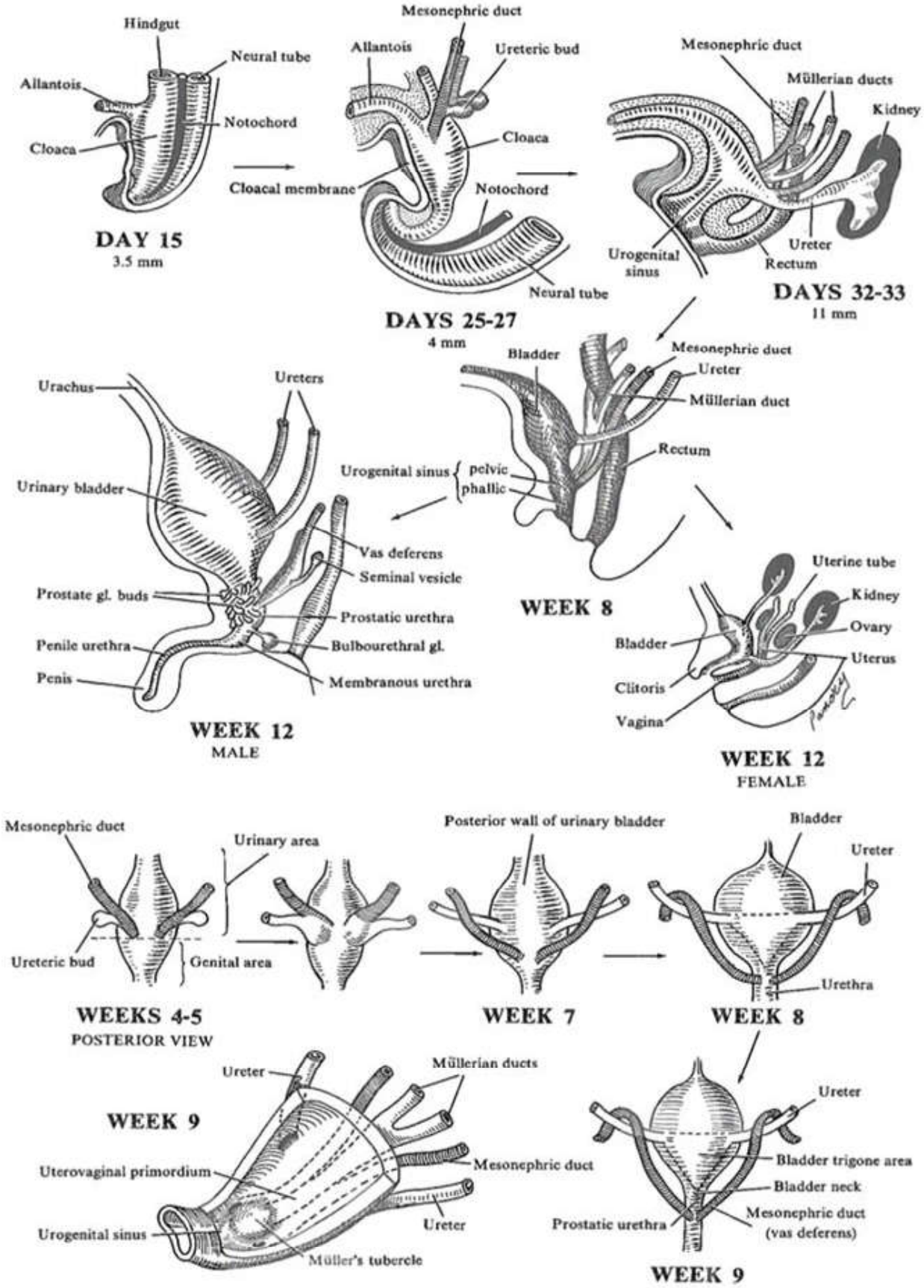
Hindgut
Neural tube
Allantois
Notochord
Cloaca
DAY 15
3.5 mm
Mesonephric duct
Allantois
Ureteric bud
Cloaca
Cloacal membrane
Notochord
Neural tube
DAYS 25-27
4 mm
Mesonephric duct
Müllerian ducts
Kidney
Urogenital sinus
Ureter
Rectum
DAYS 32-33
11 mm
Urachus
Ureters
Urinary bladder
Vas deferens
Seminal vesicle
Prostate gl. buds
Prostatic urethra
Penile urethra
Bulbourethral gl.
Penis
Membranous urethra
WEEK 12
MALE
Bladder
Mesonephric duct
Ureter
Müllerian duct
Rectum
Urogenital sinus
pelvic
phallic
WEEK 8
Uterine tube
Kidney
Ovary
Bladder
Uterus
Clitoris
Vagina
WEEK 12
FEMALE
Mesonephric duct
Urinary area
Ureteric bud
Genital area
WEEKS 4-5
POSTERIOR VIEW
Posterior wall of urinary bladder
WEEK 7
Bladder
Ureter
Urethra
WEEK 8
Ureter
Müllerian ducts
WEEK 9
Uterovaginal primordium
Mesonephric duct
Urogenital sinus
Ureter
Müller's tubercle
Ureter
Bladder trigone area
Bladder neck
Prostatic urethra
Mesonephric duct
(vas deferens)
WEEK 9

The Ureters

The ureters are derived from the part of the ureteric bud which lies between the pelvis of the kidney & the vesico-urethral canal.

The Urinary Bladder

The epithelium of the urinary bladder develops from the cranial part of the vesicourethral canal (endoderm). The epithelium of the trigone develops from the absorbed mesonephric ducts (mesoderm). The muscular and serous walls of the organ are derived from splanchnopleuric mesoderm.

The Female Urethra

Most of the female urethra develops from caudal narrow part of the vesico- urethral canal.

A small terminal part of the urethra develops from pelvic part of definitive urogenital sinus. Phallic part of definitive urogenital sinus forms vestibule of vagina in to which the urethra opens.

The Male Urethra

1. *Prostatic Part*: Above the openings of ejaculatory ducts- develops from the narrow caudal part of vesico urethral canal. Below the openings of ejaculatory ducts- develops from the upper pat of definitive urogenital sinus.
2. *Membranous Part*: It lies in the deep perineal pouch & develops from the upper part of the definitive urogenital sinus.
3. *Spongy Part:* It lies partly in the bulb of penis & partly in the shaft of penis. Both these parts are derived from phallic part of definitive urogenital sinus except a small part at the tip of penis which is derived from ectoderm.

Congenital Anomalies of Urinary System Associated with Dysuria

The knowledge of congenital urinary tract anomalies is extremely essential to anatomists as well as clinicians as it may contribute to end-stage renal disease. The complications in these patients are due to urinary stasis which happens by 2 processes: either obstruction or reflux and these may lead to pyelonephritis or stone formation & progressive end stage renal disease. A significant proportion of these patients will have persistent abnormal anatomical and physiological characteristics of the urinary tract, requiring more attention, more evaluation and may lead to reconstructive surgery to preserve renal function [17].

The congenital anomalies of the urinary tract associated with symptom of dysuria are- Congenital meatal stenosis, Urethral diverticulum, Posterior urethral valves, Congenital bladder neck obstruction, Weakness of uretero-trigonal muscle, Ureteral anomalies like duplication, ectopia , congenital non-meatal stenosis, and Prune Belly Syndrome. [2,3,10,11,17].

Here, we are describing those congenital anomalies which we have came across in our study.

• *Posterior Urethral Valves (PUV)*

It is a congenital defect in males that results in obstruction of the bladder due to extra tissue that projects into the urethra. This excess tissue blocks urine from flowing freely from the bladder to the outside of the body leading to back pressure on the bladder which may enlarge considerably & / or develop a very thick muscle wall. This in turn can lead to further back pressure up to the ureters resulting in collection of excess fluid in the kidneys- a condition known as hydronephrosis. This blockage, if not corrected, can cause problems in all the organs in the urinary system including the kidneys, ureters, urethra and bladder.

Depending on the extent of blockage, the organs can swell, causing damage to the tissues and cells within those organ [4, 6, 8].

• *Urinarybladder Diverticulum*

A congenital bladder diverticulum is the out pouching of bladder mucosa which herniates through the wall of bladder. They may be solitary or multiple and usually diagnosed in early life [11,12,16].

Urethral Diverticulum

The urethra develops a weak spot that forms a small outpouching or herniation on the side — called urethral diverticulum [13,14,15].

• ***Meatal Stenosis (Urethral Stricture)***

It is a congenital anomaly in which the opening of the urethra becomes abnormally narrow [13,19,20].

• *Prune Belly Syndrome {Abdominal Muscle Deficiency Syndrome}*

Prune belly syndrome is a congenital disorder of the urinary system, characterized by a triad of

symptoms –a partial or complete lack of abdominal wall muscles with wrinkles of skin covering the abdomen, Cryptorchidism (undescended testicles) in males and Urinary tract abnormality such as unusually large ureters, distended bladder, accumulation and backflow of urine from the bladder to the ureters and the kidneys

It is a rare, genetic defect affecting about 1 in 40,000 births. About 97% of those affected are male. The syndrome is named for the mass of wrinkled skin that is often (but not always) present on the abdomen of those with the disorder (3, 5, 11).

Methodology

The patients referred for dysuria from the departments of surgery and paediatrics were investigated in Department of Radiology, MIMSR Medical college & YCR Hospital in last three years. Their routine blood & urine examination were also carried out before investigating them by procedures like micturating cystourethrogram (MCU) & Retrograde cystourethrography (RGU).

In some patients, however combination of both M C U & R G U was utilised.

The contrast medium used was Conray 280 (meglumine iothalamate 60% containing equivalent of 280 mg iodine in each ml). It was diluted with equal quantity of distilled water. Patients were asked to empty the bladder before the procedure and local parts were cleaned. For male urethra 1% Xylocaine jelly was used for local anaesthesia before introducing catheter or canula.

Observations

Our observations are tabulated below. Owing to more complicated development, incidence of congenital anomalies is more common in males than the females [20].

In our study we have found all the congenital anomalies in male patients only.

We have also calculated incidence of individual congenital anomaly as tabulated in tables.

Congenital urinary tract anomalies are known to cause obstruction to the normal passage of urine as well as reflux of urine in a reverse direction. Hence we have also analysed the percentage of patients with vesico- urethral reflux (VUR) associated with congenital malformation of the urinary system.

Discussion

Dysuria, which accounts for 5 to 15% of the patients with urinary tract symptoms [17,18] can result due to congenital anomaly or can be due to acquired conditions like trauma, infection etc.

We aimed to study the incidence of congenital anomalies of urinary tract in patients complaining of dysuria in MIMSR Medical College and YCR Hospital, Latur over a period of 3 years i.e. from Feb 2012 to Feb 2015. The patients were from different areas of South Maharashtra. They were diagnosed based on clinical symptoms & procedures like micturating cystourethrogram (MCU) and retrograde cysto urethrography (RCG). The incidence of the individual congenital anomalies in patients with dysuria in different age groups as found in our study is tabulated below. We found a markedly higher incidence of congenital urinary tract anomalies in younger age group that indicates a higher morbidity and mortality.

Sa'ad H and et al studied incidence of congenital anomalies in patients with recurrent urinary tract infection. They have calculated the incidence according to age; which is tabulated below. They have classified the congenital anomalies in upper and lower urinary tract anomalies in contrast to our study where we have given incidence of individual anomaly. In our study the upper urinary tract was involved less commonly as compared to lower urinary tract.

Urinary tract infection in patients with congenital urinary tract anomalies may develop either from obstruction or reflux. Vesico-Urethral Reflux (VUR) is the retrograde flow of urine from the bladder to the upper urinary tract. It can be primary or secondary. In primary VUR the ureterovesical junction is in adequately closed due to some intrinsic factor.

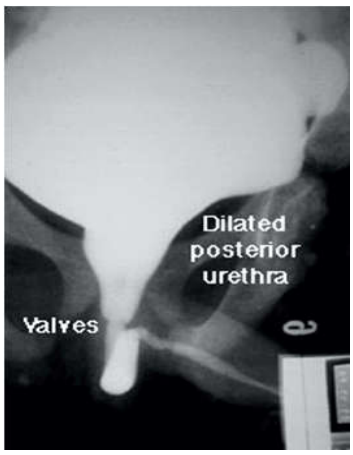

Fig. 1: MCU Image showing Posterior urethral valves

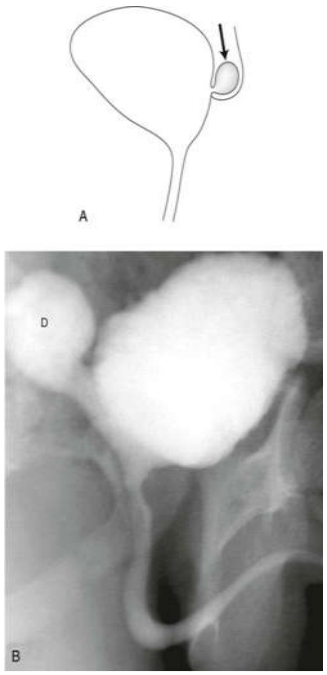

Fig. 2: MCU Image showing Urinary bladder diverticulum

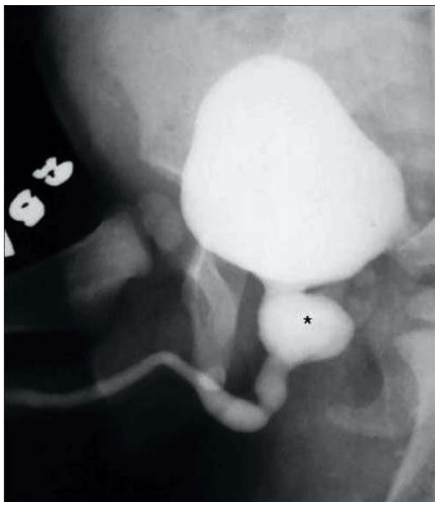

Fig. 3: MCU Image showing Urethral Diverticulum

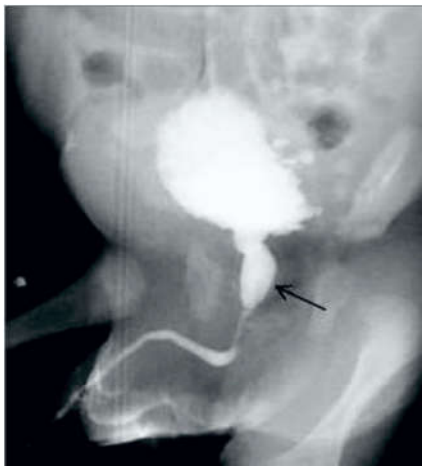

Fig. 4: MCU Image showing Meatal Stenosis

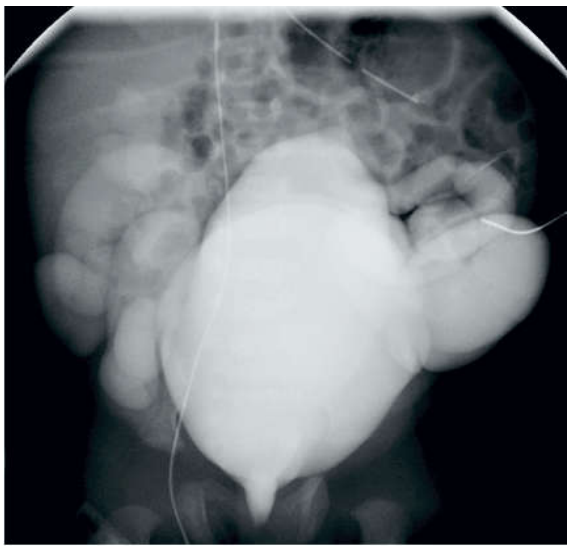

Fig. 5: MCU Image showing Prune Belly Syndrome

Secondary VUR is commonly due to anatomical bladder outflow obstruction resulting due to anomalies like PUV & Urethral Stricture [11].

In our study the VUR was mostly of secondary type and was seen in 2 patients with urinary bladder diverticulum, 1 patient each of posterior urethral valve and Prune Belly Syndrome.

Comparisons of our study with other similar type studies are as follows:

1. *Posterior Urethral Valve:* Various studies done by different researchers [1,4,6,8] suggests that PUV occur in 1 in every 7,000–8,000 live births and like our study, they found majority of cases occuring in the neonatal period. In our study the incidence of PUV is 1.2% .
2. *Bladder Diverticulum*: Urinary bladder diverticula are more common in males than females. They later manifest as stone formation and infection

Table 1: Overall Incidence of congenital urinary tract (UT) anomalies in patients with Dysuria In our study

Total No. of cases with dysuria	Dysuria associated with Congenital UT anomalies	Overall Incidence of congenital U T anomalies
81	6	7.4

Table 2: Incidence of Specific congenital Anomaly

Sr. No.	Clinical Diagnosis	No. of Cases	Incidence
1	Posterior urethral valves (PUV)	1	1.2
2	Urinary bladder diverticulum (U B D)	1	1.2
3	Urethral diverticulum (UD)	2	2.4
4	Meatal stenosis (MST)	1	1.2
5	Prune belly syndrome (PBS)	1	1.2

Table 3: Incidence of VUR Associated with congenital Anomalies

Diagnosis	No. of Cases	Percentage
U B D	2	33
P U V	1	16.6
	1	16.6
P B S	1	16.6
	1	16.6
Total	4	

Table 4: Congenital Urinary Tract anomalies according to age distribution

Age Groups	No. of Cases with associated UT anomaly
0-5	PUV 1, B D 1 , PBS 1
5-10	B D 1, U D 1, MST 1

Posterior Urethral Valve - PUV Bladder Diverticulum - BD Urethral Diverticulm - UD
Prune Belly Syndrome PB Meatal stenosis - MST

Table 5: Congenital Urinary Tract anomalies according to age distribution accdg to Sa'ad H and et al

Age Groups	No. of Cases	Upper UT anomalies	Lower UT anomalies	Total
0-10	3	7	0	10
11-20	9	1	0	10
21-30	18	5	1	24
31-40	8	7	0	15
Total	55	23	3	81

predisposing to malignancy. The incidence of it is found to be 1.7 % [3,11,12 16] .We found 2 cases of bladder diverticulum one in a 2 year boy and another in a 5 year boy; both associated with vesicourethral reflux,

3. *Urethral Diverticulum:* It is more common in females due to less supported urethra. In males the various studies indicate its incidence in the range of 1-3%, which coincides with our findings also. [13,14,15,16]. However, age of presentation of Urethral Diverticulum in our study was late i.e. at 6 years ; which is comparatively is rare.
4. *Meatal Stenosis*: Various studies done indicate overall incidence of 8-10 % and common age of presentation is 3-12 years. In our study we found a single case of meatal stenosis in a boy of age 9 [2,13,18,19].
5. *Prune Belly Syndrome*: It's a rare congenital anomaly seen mostly in male infants with an incidence of 1in 30,000-40,000 births. 4% of cases are found associated with Twin pregnancies [5,7,10].

We found a male neonate with this syndrome showing vesicourethral reflux.

Conclusion

Early identification of congenital urinary tract anomalies among patients complaining of dysuria is of extreme importance in order to preserve the renal function as much as possible and to prevent further progressive renal damage [17].

The overall incidence of Congenital anomalies of urinary system in our study is 7.4% where as maximum incidence seen was that of Urethral Diverticulum 2.4%.The patients were diagnosed based on clinical symptoms & Micturating Cystourethrogram and Retrograde cystourethrography (RGU). Also we found a strong association of vesicourethral reflex along with four out of six patients.

The studies on congenital anomalies of urinary tract to find out their incidence can help to diagnose the population at risk for UTI which includes: newborn particularly premature, pre-puberty girls, young boys, and elderly males and elderly females [11].

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