

Original article

Congenital uronephropathy pattern in children

Husein Alatas, Natalina Soesilawati, Bambang Madiyono

Department of Child Health, Medical School, University of Indonesia, Cipto Mangunkusumo Hospital, Jakarta

ABSTRACT To obtain the basic data of congenital uronephropathy pattern and the affecting factors in children, we conducted a cross-sectional study at the Department of Child Health Cipto Mangunkusumo (CM) Hospital Jakarta from 1995 to 1999 and 9 teaching hospitals throughout Indonesia. During the study period 134 patients were obtained, 116 patients from the CM Hospital and 18 patients from other teaching hospitals. Most patients (48.8%) were below 1 year of age; male were affected more than female (2.4:1). The disorder was classified into two groups, i.e., congenital nephropathy and uropathy. There were 10 children with nephropathy, i.e., 4 with unilateral renal hypoplasia, 3 with polycystic kidney, and 3 with renal agenesis. In the uropathy group, 43 were with hypospadias, 22 with primary reflux vesicoureter, 18 with neurogenic bladder, and 17 with ureteropelvic junction obstruction. The complications found were urinary tract infection (71.2%), chronic renal failure (15.7%), hypertension (3.7%), and acute renal failure (1.5%). Consanguinity, familial disorders, maternal diseases, x-ray exposure and abortion efforts were found in a small proportion of patients. History of drug or herbs use in the first trimester of pregnancy was found in a large proportion of patients, mostly took analgesics (especially acetaminophen). In conclusion, uropathy disorders were much more common than congenital nephropathy. The most common complication was urinary tract infection, followed by chronic renal failure, hypertension, and acute renal failure. [**Paediatr Indones 2001;41:241-246**].

Keywords: *Congenital uronephropathy, urinary tract infection, acute renal failure*

CONGENITAL URONEPHROPATHY (CU) IS ONE OF THE important causes of morbidity and mortality in children with renal disease. It is believed that more than one-third of terminal renal failure in children is caused by this disorder.¹ The disorder is classified into two groups, i.e. congenital nephropathy and congenital uropathy, each one consists of various disorders.¹ The etiology and pathogenesis of this disorder are not completely known. Hereditary and familial factors, maternal age, use of drugs or herbs, maternal diseases in pregnancy, exposure to x-ray, as well as efforts to terminate pregnancy are suspected to give contribution to the development of this disorder.^{2,3} The clinical manifestations of congenital uronephropathy vary according to the type of the disorders, ranging from no symptoms at all to frank renal failure.¹

The purpose of this study was to collect basic data of congenital uronephropathy and the affecting factors in children that can be used for the management of the disorder and further study.

Methods

This cross-sectional study was done by reviewing data from medical records of the Department of Child Health CM Hospital Jakarta between 1995 to 1999 and from 9 teaching hospitals outside Jakarta in 1999. Patients with congenital uronephropathy were divided into three groups, i.e.

1. Outpatients and inpatients in the Department of Child Health CM Hospital between January 1, 1999 to December 31, 1999;
2. Outpatients and inpatients in teaching hospitals outside Jakarta between January 1, 1999 to December 31, 1999;

Correspondence: Husein Alatas, M.D., Department of Child Health, Medical School, University of Indonesia, Cipto Mangunkusumo Hospital, Jakarta.

3. Outpatients and inpatients in the Department of Child Health CM Hospital obtained from medical records in 1995 to 1998.

Results

There were 88 patients obtained from the Department of Child Health CM Hospital between 1995 to 1998. Another 28 patients (4 inpatients and 24 outpatients) were obtained from the Department of Child Health CM Hospital, and 18 from other teaching hospitals during the period from January 1 to December 31 1999. The total number of patients was 134 (116 from Jakarta, 4 patients each from Bandung and Surabaya, 3 from Makassar, 2 patients each from Semarang, Yogyakarta, and Padang, and 1 from Medan).

The proportion of congenital uronephropathy outpatients to the total nephrology outpatients in the Department of Child Health CM Hospital in 1999 was 24/100 (24.0%), and to the total nephrology inpatients was 4/89 (4.5%). The proportion of congenital uronephropathy patients to the total outpatients in 1999 was 24/8966 (0.3%), and to the total inpatients was 4/1169 (0.3%), while in the other teaching hospital were as followed: Bandung 4/90 (4.4%), Semarang 2/61 (3.3%), Yogyakarta 2/61 (3.3%), Padang 2/366 (5.5%), and Medan 1/23 (4.3%).

Patients' age ranged from 0 to 18 years. Sixty-five patients (49%) were below 1 year, 5 of which

were detected in the prenatal period, 1-5 years 39 patients (29%) and above 5 years 30 patients (22%).

Among the congenital nephropathy group unilateral renal dysplasia was the most commonly found (4 patients), followed by polycystic kidney and renal agenesis, each with 3 patients. All polycystic kidney patients were found outside CM Hospital.

In the uropathy group hypospadias was the most frequently found (43 patients), followed by primary vesicoureteral reflux (VUR) 22, neurogenic bladder 18, ureteropelvic junction (UPJ) obstruction 17, ureter/pelvic duplication 11, and ureterovesical junction (UVJ) obstruction 9 patients (Table 1).

The manifestations of CU varied and in one patient it could be found more than 1 symptom. The most common symptom was fever 46 (18.0%), followed by genital disorders 43 (16.7%), polakisuria 26 (10.1%), dysuria 24 (9.3%), straining in voiding 17 (6.6%), and enlarged abdomen 17 (6.6%).

Anemia was the most frequent disorder found, i.e. in 50 out of 81 patients, 17 of which were suffering from chronic renal failure (CRF). The total CRF patients was 21. From urine examination, leukocyturia and proteinuria were found most frequently, i.e., 46 and 47, consecutively. Hematuria was only found in 32 patients.

In this study, CU complications noted were acute renal failure (ARF), urinary tract infection (UTI), and CRF. The largest total number was UTI, i.e. with 52 from 73 patients (Table 3).

TABLE 1. DISTRIBUTION OF TYPES OF CONGENITAL BY LOCATION

Types of congenital uropathy	CMH 95-98	CMH 1999	Outside CMH 1999	N (%)
Congenital ureter disorders				72(48,0%)
UPJ obstruction	7	7	3	17 (11.3 %)
UVJ obstruction	6	1	2	9 (6.0%)
Pelvic/ureter duplication	7	2	2	11 (7.3%)
Primary RVU (grade 1-5)	16	5	1	22 (14.6%)
Secondary RVU (grade 1-5)	5	5	1	11 (7.3%)
Unilateral ureter kinking	2	0	0	2 (1.3%)
Congenital bladder disorders				30 (20.0%)
Neurogenic bladder	11	6	1	18 (12.0%)
Ureterocele	3	0	3	6 (4.0%)
Bladder extrophy	0	0	3	3 (2.0%)
Bladder diverticula	2	0	1	3 (2.0%)
Congenital urethra disorders				48 (32.0%)
Posterior urethral valve	2	1	0	3 (2.0%)
Urogenital sinus	2	0	0	2 (1.3%)
Hypospadias	34	9	0	43 (28.7%)
Total	97	36	17	150 (100.0%)

Note: Type of disorder could be more than one in one patient

TABLE 2. CLINICAL MANIFESTATION OF 134 PATIENTS WITH CONGENITAL URONEPHROPATHY

Clinical manifestation	Nephropathy	Uropathy	N (%)
Common symptom			50 (19.5%)
Fever	1	45	46 (18.0%)
Nausea, vomiting	1	3	4 (1.6%)
Impaired micturition			125 (48.6%)
Polakisuria	1	25	26 (10.1%)
Dysuria	-	24	24 (9.3%)
Straining in urination	-	17	17 (6.6%)
Night urination/nocturia	-	11	11 (4.3%)
Clouded urine	1	13	14 (5.4%)
Dribbling urine	1	11	12 (4.7%)
Oliguria	2	6	8 (3.1%)
Bloody/red urine	1	3	4 (1.6%)
Urgency	-	5	5 (2.0%)
Foul-smell urine	-	4	4 (1.6%)
Genital disorders:			44 (17.1%)
External genital abnormality	-	43	43 (16.7%)
A small penis	-	1	1 (0.4%)
Others			38 (14.8%)
Enlarged abdomen	3	14	17 (6.6%)
Low back pain	-	6	6 (2.3%)
Edema	2	6	8 (3.1%)
Suprapubic pain	-	2	2(0.8%)
No symptoms			5 (2.0%)
Total	13	244	257 (100.0%)

Note: symptom could be more than one in one patient

TABLE 3. COMPLICATIONS OF CONGENITAL URONEPHROPATHY

	Nephropathy	Uropathy	Total
Acute renal failure	1/10	1/124	2/134
Urinary tract infection	3/7	49/66	52/73
Hypertension	2/10	3/124	5/134
Chronic renal failure	1/10	20/124	21/134

Attempt to find the risk factors for the occurrence of CU resulted in negative findings. Consanguinity, familial factors, disease during pregnancy, x-ray exposure, abortion efforts were only found in a small proportion of CU.

History of taking drugs and herbs during the first trimester of pregnancy reviewed. One mother might take more than 1 kind of drug. The greatest total number of drugs taken was analgesics.

Discussion

The proportion of CU outpatients to total nephrology outpatients in the Department of Child Health CM Hospital in 1999 was 24/100 (24.0%), larger than proportion of inpatients (4/89 = 4.5%) because not all CU patients needed hospitalization. The proportion of CU inpatients outside CM Hospital in 1999 to total

nephrology inpatients in data collected ranged between 3.3-5.5%. The proportion of CU outpatients in CM Hospital in 1999 to total outpatients was 24/8966 (0.3%) or 2.7/1000 patients. Thus, we assumed there were 2-3 CU patients among every 1000 new patients who came to the outpatients clinics of the Department of Child Health, CM Hospital.

Most patients in this study were below 1 year (48.5%), 5 patients were detected in the prenatal periods, however the proportion of the two other age groups i.e. 1-5 years and above 5 years were still relatively high (29.1% and 22.4%, respectively). This might happen because of the few clinical signs appeared, resulting in delayed detection of this disorder, and not all pregnant women had their fetus examined with ultrasound. Along with the more widespread use of prenatal ultrasound, total CU patients diagnosed before birth was larger.¹

CU was more common in male (71.0%) with a ratio of 2.4: 1. The possible explanation was that hypospadias was the most common disorder found in this study (43 patients).

The total number of congenital uropathy disorders was much larger than congenital nephropathy, and based on diagnosis, hypospadias was the

most common disorder found i.e. 43 patients, followed by primary RVU 22, neurogenic bladder 18, UPJ obstruction 17, ureter/pelvic duplication 11, and UVJ obstruction 9 consecutively. In accordance with the literature the incidence of hypospadias was high, i.e. 1 every 300 male children.⁵ Besides, hypospadias can be seen directly, without supporting examination, so that the parents took the child earlier for medical assistance. Primary RVU was found in 10 males and 9 females. Previous study in Jakarta showed that from 20 RVU patients, 11 were males and 9 were females.⁶ Scott found equal number of boys and girls with high-grade reflux.⁷ In the European branch of the International Reflux Study, females only slightly outnumbered males.⁸ The occurrence of reflux was higher in the newborn boys and girls, probably as a consequence of higher voiding pressure;⁹ however, this ratio reverses after the first few months of life, when the larger incidence of Otis in girls resulted in more girls than boys being evaluated.¹⁰

The most frequent clinical manifestation was fever, followed by genital disorders, polakisuria, dysuria, and straining in micturition, respectively. Fever was the major clinical manifestation. It may be due to the high frequency of UTI found in this study. These symptoms were also found in UTI.

Anemia was relatively frequent in the Department of Child Health CM Hospital as well as other teaching hospitals. From 81 available data, 50 patients were anemic. This might be caused by chronic renal failure or iron deficiency anemia. The result of the study showed that from 21 chronic renal failure patients, 17 were anemic (81%). Anemia was one of the complications of chronic renal failure.¹¹

Complications of CU were acute renal failure, UTI, hypertension, and chronic renal failure. From the available data, UTI was found most frequently, followed by CRF, hypertension, and acute renal failure. Renal failure was seldom found unless the disorder involved both kidneys or obstruction was found on contra lateral kidney.^{12,13} According to the literature, complication in the form of acute renal failure can be caused by bilateral renal agenesis, bilateral dysplasia multicystic kidney, autosomal recessive polycystic kidney disease (AR-PKR), posterior urethral valve (PUV), urethra diverticulum's, UPJ obstruction, and neurogenic bladder; and the most frequent cause was PUV.^{14,15} In this study, acute renal

failure was only found in 2 patients i.e. one patient with UPJ obstruction and one patient with polycystic kidney disease.

UTI was found in 52 patients (71.2%). Fever was the most frequent clinical symptom found in this study. From 46 patients with fever, 33 were suffering from UTI (71.7%).

Hypertension in this study was found in 5 patients, 2 from nephropathy group i.e. unilateral renal hypoplasia, and 3 from uropathy group i.e. bilateral HUP obstruction, neurogenic bladder, and secondary RVU. Hypertension was reported found in unilateral renal hypoplasia, renal dysplasia, polycystic renal disease, and obstructive uropathy.¹⁶⁻¹⁸

The majority of patients (84.3%) did not progress to CRF. Nephropathy that was potential to progression to CRF were hypoplasia, renal dysplasia, polycystic kidney, and juvenile nephrophtysis while from uropathy group was obstructive uropathy.¹⁹ Chronic renal failure happened in CU disorders commonly occurred in children under 5 years old.¹⁹

Consanguinity, familial disorders, history of renal disease in family, history of maternal disease during the first trimester of pregnancy, history of exposure to x-ray, and history of abortion efforts in this study were only found in a small proportion of patients. History of taking drugs and herbs during the first trimester of pregnancy was found in the majority of patient i.e. 30 of 58 (51.7%) patients. The most abundant patients took analgesic, 14 of which was acetaminophen. According to the literature, acetaminophen increased the risk of occurrence of congenital disorders.²⁰ But because the number of patients in our data was relatively small, we could not conclude that acetaminophen was the cause of congenital disorders. However, precaution must be taken in considering risk and benefit before taking acetaminophen, especially in the first trimester of pregnancy. Other drugs that were reported suspected in causing CU were antiepileptic drugs, cocaine, chlorambucil, and ACE inhibitors.^{21,22}

The effect of radiation after atomic bombs explosion in Hiroshima and Nagasaki as well as Chernobyl tragedy and the effect of magnetic field (electric blanket) were reported to result in increasing occurrence of congenital disorders.²³⁻²⁵ In this study, only 2 CU patients had ever exposed to x-ray so that

no conclusion could be made whether the occurrence of CU was caused by x-ray. The greatest number of mothers whose children had CU in this study was in the age range of 25-35 years. This was not in accordance with the previous study reported that the greatest number of congenital anomaly was found in mothers' age above 35 years old.^{4,26}

In conclusion, this study suggested that the proportion of CU outpatients to nephrology outpatients in the Department of Child Health CM Hospital was relatively high (24.0%). Uropathy was far more common than nephropathy. The complication most commonly detected was UTI, followed by CRF, hypertension, and ARF. In order to detect CU earlier, we strongly recommend prenatal USG examinations for all pregnant women for the sake of their fetus health.

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