# Kidney Disease Profile of Syrian Refugee Children

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**Keywords.** children, kidney disease, Syrian refugees

**Introduction.** Although preventative nephrology is the effective management of childhood kidney diseases, it is hard to provide it in this undesirable conditions. In this study, we aimed to document the kidney disease profile of Syrian refugee children admitted to our hospital.

**Materials and Methods.** One hundred and thirty Syrian refugee children were admitted to the Pediatric Nephrology Department of the University of Gaziantep from September 2012 to January 2015. Demographic data, history, symptoms, physical examination findings, laboratory investigations, diagnosis, disease outcome, and therapeutic procedures such as peritoneal dialysis and hemodialysis were obtained from patient files.

**Results.** Of the 130 admitted children, 74 were girls (59.6%). The average age was 6.97 ± 4.2 years (range, 1 month to 17 years). Congenital abnormalities of the kidney and urinary tract were found in 34 children (26.2%). Other morbidities were chronic kidney disease in 30 (23.1%), nephrotic syndrome in 24 (18.5%), urolithiasis in 9 (6.9%), acute kidney injury in 4 (3.1%), glomerulonephritis in 5 (3.8%), enuresis in 12 (9.2%), and others in 12 (9.2%).

**Conclusions.** Congenital abnormalities of the kidney and urinary tract and chronic kidney disease were highly prevalent in Syrian refugee children. Although free health care have been provided to all of these children, the continuation of political crisis and instability would increase the number of admissions and affect the quality of life of those children in a different environment from the home country.

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## INTRODUCTION

Almost 4 years have passed since the political crisis and instability began in Syria. It has cost thousands of lives, while injured and displaced many of them. According to the Disaster Emergency and Management Agency of the Goverment of Turkey, roughly 500 000 Syrians live in and outside the camps and in provinces in Turkey.[1] Basic needs such as shelter, food, and health care, and also education, social activities, and employment opportunities are provided by the Turkish government.

Doctors are now trying to provide health care services to this large population having no previous medical records, socially and psychologically affected, with language barrier. Thus, an audit of kidney diseases in refugee children may provide data for taking attention to affected children both in our environment and other places. Although preventative nephrology is the effective management of childhood kidney diseases, it is really hard to provide it in this undesirable

situation. In this study, we aimed to document the kidney disease profile of Syrian refugee children admitted to our hospital.

## MATERIALS AND METHODS

### Study Center and Population

The study was carried out at the Pediatric Nephrology unit of Gaziantep University, which is a tertiary hospital in the area providing pediatric nephrology care to children. Our university is located south-east of Turkey, which has a border to Syria. It is apparent that the patient population is not homogeneous and substantial proportion of the patient population has low socio-economic status. For these patients, health care is free, provided by the Turkish government.

### Data Collection

We evaluated 130 children (between the age of 1 month to 17 years) admitted to our hospital from September 2012 to January 2015, through patient files, retrospectively. All patients were Syrian refugee children. This study included the demographic data, history, physical examination, weight Z-score, height Z-score (by the World Health Organisation software, January 2011 anthropometric calculator), laboratory investigations, diagnosis, disease outcome and all applied procedures, such as peritoneal dialysis or hemodialysis. The investigations mostly were complete blood count, erytrocyte sedimentation rate, urinalysis, urinary protein estimation, urine culture, and blood chemistry. Further investigations were carried out if needed, such as renal ultrasonography, intravenous urography, micturating cystourethrography, and renal biopsy. Chronic kidney disease (CKD) and nephrotic syndrome (NS) were defined as on the Kidney Disease Outcomes Qualitative Initiative and the International Study of Kidney Disease in Children guideline,[2] and acute kidney injury (AKI) was defined on the pRIFLE criteria (risk, injury, failure, loss, end-stage), respectively. Stage 4 and stage 5 of CKD were included to the CKD group. Early stages of CKD were noted in the primary renal pathologies such as urolithiasis, NS, and congenital anomalies of the kidney and urinary tract (CAKUT).

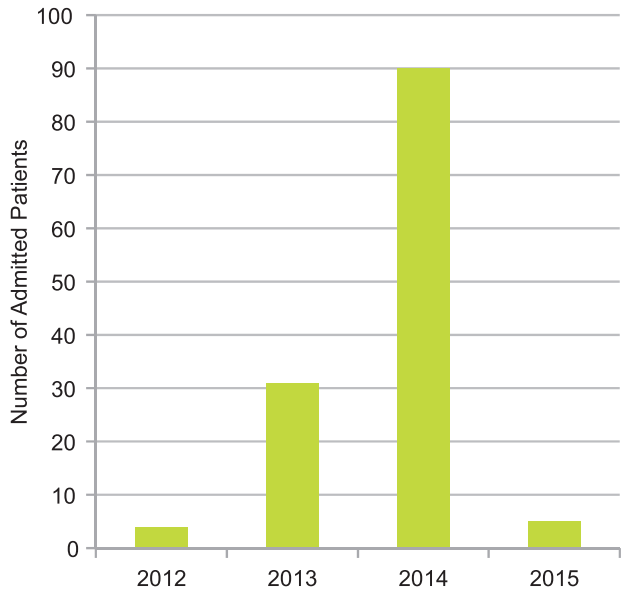
### Statistical Analysis

Data was analyzed using the SPSS software (Statistical Package for the Social Sciences, version 17.0, SPSS Inc, Chicago, IL, USA). Continuonus data were presented as mean or median, as appropriate, while categorical data were presented as percentages.

## RESULTS

One hundred and thirty children were admitted to our hospital between September 2012 and January 2015, and 74 of the patients were girls (59.6%). The average age was 6.97 ± 4.2 years (range, 1 month to 17 years). The Figure shows a gradual rise from 2012 to 2014 in pediatric renal admissions from 3% to 69%. Since only the 1st month of 2015 was included in the study, data from this year was a small percentage (4%).

The spectrum of the kidney diseases is shown in Table 1. The majority of the patients were




Pediatric renal admissions of Syrian refugee children between 2012 to 2015.

**Table 1.** Spectrum of Pediatric Kidney Disease Among 130 Syrian Refugee Children

| Disorders | Number of Patients (%) |
|---|---|
| Nephrotic syndrome | 24 (18.5) |
| Congenital anomalies of the kidney and urinary tract | 34 (26.2) |
| Urolithiasis | 9 (6.9) |
| Chronic kidney disease | 30 (23.1) |
| Acute kidney injury | 4 (3.1) |
| Glomerulonephritis | 5 (3.8) |
| Enuresis | 12 (9.2) |
| Others | 12 (9.2) |

CAKUT and CKD. Of the 34 cases of CAKUT, 12 had bladder abnormalities, while the others were vesico-ureteral reflux (VUR) in 6, ureteropelvic junction obstruction (UPJO) in 6, unilateral renal agenesis in 5, posterior urethral valve (PUV) in 2, and multicystic dysplastic kidney in 3 (Table 2). Detailed information of children with neurogenic bladder and VUR are shown in Tables 3 and 4, respectively.

Of the 6 UPJO patients, 1 was operated in Syria and his estimated GFR was 102 mL/min/1.73 $m^2$ and he had scar formation in the left kidney. Two of the patients had right UPJO (anteroposterior diameter, 10 mm to 11 mm) and 3 had left UPJO, all of whom had a normal GFR, with no other urinary malformation or scar formation in the kidneys.

All of the children with left renal agenesis had a normal right kidney, a normal GFR, and no scar formation in the right kidney. Three multicystic dysplastic kidney patients also had a normal GFR. Two of the patients with posterior urethral valve underwent cystoscopic valve resection in our hospital. One had a normal GFR, while the other had low GFR (83 mL/min/1.73 $m^2$).

**Table 2.** Etiology and Characteristics of Congenital Anomalies of the Kidney and Urinary Tract in Syrian Refugee Children

| Etiology | Number of Patients | Weight Z-score | Height Z-score |
|---|---|---|---|
| Neurogenic bladder | 12 | -2.46 | -1.88 |
| Vesico-ureterial reflux | 6 | -0.52 | -0.18 |
| Ureteropelvic junction obstruction | 6 | -0.24 | -0.18 |
| Renal agenesis | 5 | -1.03 | -1.68 |
| Posterior urethral valve | 2 | -2.20 | -1.47 |
| Multicystic dysplastic kidney | 3 | +0.51 | -0.21 |

**Table 3.** Detailed Information of Children With Neurogenic Bladder

| Patient | Sex | Age | Consanguinity | Etiology | Radiologic Finding | Glomerular Filtration Rate, mL/min/1.73 $m^2$ |
|---|---|---|---|---|---|---|
| 1 | Female | 12 years | No | Spina bifida | Bladder trabeculation | 140 |
| 2 | Female | 6 years | Yes | Spina bifida | Bilateral hydroureteronephrosis | 95 |
| 3 | Female | 8 years | Yes | Spina bifida | Bilateral hydroureteronephrosis | 32 |
| 4 | Female | 9.5 years | Yes | Spina bifida | Bilateral hydroureteronephrosis | 90 |
| 5 | Female | 6 years | No | Spina bifida | Bilateral hydroureteronephrosis | 55 |
| 6 | Female | 8 years | Yes | Spina bifida | Right duplicated collecting system with right-sided grade 4 vesico-ureterial reflux | 94 |
| 7 | Female | 8 months | Yes | Anal atresia | Left sided renal pelvis anteroposterior diameter of 9 mm | 140 |
| 8 | Female | 9 months | Yes | Anal atresia | Left sided anteroposterior diameter of 9 mm, right sided anteroposterior diameter of 8 mm | 92 |
| 9 | Female | 4 months | No | Spina bifida | Bladder trabeculation | 130 |
| 10 | Female | 5 months | Yes | Spina bifida | Right sided anteroposterior diameter of 8 mm | 142 |
| 11 | Male | 3 years | Yes | Spina bifida | Bilateral hydroureteronephrosis | 89 |
| 12 | Male | 2 years | No | Spina bifida | Bilateral hydroureteronephrosis | 94 |

**Table 4.** Detailed Information of Children With Vesico-Ureteric Reflux

| Patient | Sex | Age | Consanguinity | Radiologic Finding | Glomerular Filtration Rate, mL/min/1.73 $m^2$ |
|---|---|---|---|---|---|
| 1 | Female | 8 years | No | Right duplicated collecting system with right-sided grade 4 vesico-ureterial reflux | 180 |
| 2 | Female | 7.5 years | Yes | Left-sided grade 4 vesico-ureterial reflux | 176 |
| 3 | Male | 2.5 years | Yes | Bilateral grade 5 vesico-ureterial reflux | 159 |
| 4 | Female | 4 years | Yes | Right-sided grade 4 vesico-ureterial reflux | 170 |
| 5 | Female | 5 years | No | Right-sided grade 3 vesico-ureterial reflux | 165 |
| 6 | Female | 8 years | Yes | Right duplicated collecting system with grade 4 vesico-ureterial reflux, left-sided grade 4 vesico-ureterial reflux | 94 |

Twenty-four of the 130 children had NS, and consanguinity was common among them. Detailed information of the children with NS are shown in Table 5. Only 1 patient progressed to CKD, because of focal segmental sclerosis. She had dysmorphic findings, and her 2 sisters and a brother died because of NS and CKD. Further genetic evaluation of her was ongoing.

There were 4 patients with AKI. Etiologies were as follows: metabolic acidosis and dehydration associated metabolic disease, hypernatremic dehydration, tubulointerstitial nephritis, and sepsis related AKI. There were 12 patients with other etiologies that included isolated proteinuria, hematuria, hypertension, and renal tubulopathy. One of these patients had kidney transplantation in Egypt. Eight children had urolithiasis. Detailed information of those children are shown in Table 6.

Overall, 43 patients had CKD, 30 of whom were at stages 4 and 5, while 3 had stage 3 CKD (1 NS and 2 neurogenic bladders), 3 had stage 2 CKD (1 PUV, 1 urolithiasis, and 1 neurogenic bladder). Seven patients had stage 1 CKD (5 neurogenic bladders, 1 PUV, and 1 VUR). Of the 30 cases of CKD, neurogenic bladder (n = 11) and unknown causes (n = 9) were the most common causes; the others were cystic renal disease (n = 4), VUR (n = 2), Joubert syndrome (n = 1), Senior-Løken syndrome (n = 1), amiloidosis (n = 1), and NS (n = 1).

Since 18 of 30 CKD patients were end-stage renal disease (ESRD) at the time of admission, dialysis programme was started. Seven children (5.3%) were

**Table 5.** Detailed Information of Nephrotic Syndrome Patients

| Characteristic | Value |
|---|---|
| Number of patients | 24 |
| Sex | |
| Femlae | 10 |
| Male | 14 |
| Presence of parental consanguinity | 16 |
| Weight Z-score | +0.21 (-2.48 to +2.88) |
| Height Z-score | -0.76 (-5.10 to +0.86) |
| Hypertension | |
| Prehypertensive | 2 |
| Stage1 | 3 |
| Stage 2 | 4 |
| Ultrasonography | Normal for all patients |

**Table 6.** Detailed Information of Children With Urolithiasis

| Patient | Sex | Age | Consanguinity | Ultrasonography | Etiology | Therapy | Follow-up |
|---|---|---|---|---|---|---|---|
| 1 | Male | 6 months | No | Bilateral 4- to 5-mm stone | Not found | Hydration | No |
| 2 | Male | 7.5 years | Yes | Right upper 10-mm stone | Hypocitraturia | K-cystrate | Yes |
| 3 | Male | 7.5 years | Yes | Midpole right kidney 9-mm stone | Hypocytraturia | K-cystrate | Yes |
| 4 | Male | 6 months | Yes | Bilateral 4- to 5-mm stone | Metabolic disease | K-cystrate and eligible dietary | No |
| 5 | Female | 5 years | No | Bilateral 4- to 5-mm stone | Hypocitraturia | K-cystrate | No |
| 6 | Female | 7 years | No | Multiple urolithiasis | Not found | K-cystrate | No |
| 7 | Female | 7 years | No | Right midpole 4- to 5-mm stone | Not found | Hydration | No |
| 8 | Female | 2.5 years | No | Right 10-mm inferior pole stone | Not known* | Hydration | No |
| 9 | Female | 1 years | Yes | Right 4- to 5-mm stone | Not found | Hydration | No |

*Patient had a glomerular filtration rate of 72 mL/min/1.73 $m^2$. She could not be evaluated completely because she did not refer to our hospital again.

**Table 7.** Detailed Information of Children With Stage 4 and 5 Chronic Kidney Disease

| Etiology | Number of Patient | Consanguinity | Radiologic Finding | Weight Z-score | Height Z-score |
|---|---|---|---|---|---|
| Cystic renal disease | 4 | 4 | Bilateral cystic kidneys | -1.97 | -3.01 |
| Vesico-ureterial reflux | 2 | 1 | Atrophic Kidneys | -2.60 | -3.23 |
| Nephrotic syndrome | 1 | 1 | Normal | -2.48 | -4.23 |
| Neurogenic bladder* | 11 | 9 | ... | -1.41 | -2.23 |
| Unknown† | 9 | 7 | ... | -1.95 | -2.72 |
| Amiloidosis | 1 | 1 | Atrophic kidneys | -3.88 | -5.59 |
| Joubert syndrome | 1 | 1 | Small, scarred, echogenic kidneys | +0.08 | -1.86 |
| Senior-Løken syndrome | 1 | 1 | Small, scarred, echogenic kidneys | +0.04 | -2.20 |

*Two patients with neurogenic bladder had Hinman syndrome, 3 had surgery for posterior urethral valve, and 6 had other surgeries (5 for spina bifida and 1 for anal atresia).
†The Cause of cronic kideny disease was unknown in 9 of whom 5 had atrophic kidneys on ultrasonography. The other 4 children were in 2 families, brothers and sisters. Ultrasonographic findings showed loss of corticomedullary differantion in all.

on peritoneal dialysis, while 11 (8.4%) were on hemodialysis. Because of uncontrolled peritonitis, dialysis modality changed to hemodialysis in 1 patient. In the ESRD group, only 8 patients had regular follow-up visits.

## DISCUSSION

Previous reports on the overall prevelance of pediatric kidney disease from Asian-African countries are scarce. The findings of this study demonstrate the increasing prevalence of kidney diseases in our environment, because of the admission of refugee children to our clinic has been increased due to ongoing war. The year 2011 was the first year of interwar in Syria, and the number of the applicants for getting medical service continues to increase day by day. Even, prevalance almost doubled over the study duration for the year of 2015.

Unfortunately, this war has been mostly affecting the children. The natural result of this event, most of chronically ill children have been admitted to the nearest safe health care services. Our team had been working hard for years to provide the most effective treatment modalities for those children. The data regarding the kidney disease profile of children in the Middle-East are limited. This study would help to share our knowledge and experiences with our colleagues in all over the world.

In recent data from Midwestern Nigeria, Michael and colleagues found that urinary tract infection was the most common cause for kidney disease.[3] Nephrotic syndrome was the 2nd and acute glomerulonephritis was the 3rd morbidity encountered. They concluded that their study had similar to results reported in their region. Ladapo and coworkers reported 320 patients with a high mortality rate. In this study NS, AKI, and nephroblastoma were the most common causes.[4] They concluded that the study results was similar to a wide variation in disease-spesific prevalance between geographic regions. The AKI and CKD groups had very high mortality rates. Another study from Saudi Arabia revealed that CAKUT and neurogenic bladder were the most common causes for CKD.[6]

We only could find 1 study from Syria.[6] Saed reported a 1-year single center experience with 55 CKD patients. He divided the patients into 2 groups. There were 31 patients with obstructive nephropaty and 24 patients were in the nonobstructive nephropaty group.[6] Neurogenic bladder was the most common cause for CKD in the study, accounting for 27% of all cases and 48% of the cases with obstructive nephropaty. Nonobstructive causes were found in 44% of all cases; renal hypoplasia and chronic glomerulonephritis were the two most common causes.[6] The comparison of available data in literature is shown in Table 8.

In our study, CAKUT, CKD, and NS were the

**Table 8.** Comparison of Kidney Disease Profiles in Asian Countries

| | Studies on Kidney Profile | | | | |
|---|---|---|---|---|---|
| **Characteristic** | **Lapado et al[4]** | **Michael et al[3]** | **Kari et al[5]** | **Saeed[6]** | **Current Study** |
| Study Population | Sub-Saharan Africa | Nigeria | Saudi Arabia | Syria | Syria |
| Nephrotic syndrome | 73 (22.8) | 61 (31.3) | 9 (13.6) | ... | 24 (18.5) |
| Congenital anomalies of the kidney and urinary tract | 56 (17.5) | 10 (5.8) | 33 (50.0) | ... | 34 (26.2) |
| Wilms tumor | 71 (22.2) | ... | ... | ... | ... |
| Glomerulonephritis | 32 (10.0) | 50 (25.6) | ... | ... | 5 (3.8) |
| Urinary tract infection | 10 (3.1) | 82 (32.8) | ... | ... | ... |
| Acute kidney injury | 64 (20.0) | 7 (4.1) | ... | ... | 4 (3.1) |
| Chronic kidney disease | 14 (4.2) | 24 (12.3) | ... | 55 | 30 (23.1) |
| Enurezis | ... | ... | ... | ... | 12 (9.2) |
| Urolithiasis | ... | | ... | ... | 9 (6.9) |
| Nephroblastom | ... | 17 (16.8) | ... | ... | ... |
| Other | ... | 4 (3.6) | ... | ... | 12 (9.2) |
| Neurogenic bladder | ... | ... | 13 (19.6) | ... | ... |
| Cortical necrosis | ... | ... | 1 (1.5) | ... | ... |
| Hereditary conditions | ... | ... | 8 (12) | ... | ... |
| Obstuctive nephropathy | ... | ... | ... | 31 (56) | ... |
| Non-obstructive nephropahty | ... | ... | ... | 24 (44) | ... |

most common causes. The findings of our study demonstrated the high prevalence of CKD in refugee children. The etiology of CKD in almost half of the patients was neurogenic bladder or unknown. In our study, the unknown causes of CKD were high (30%). We attributed thoseto insufficient medical records; thus, ESRD was already present at the time of first presentation in 60% of all cases. This late detection could be explained by late referral to health care centers, or coming from another country with difficult conditions because of the ongoing war, and the low socio-economic status.

The Syrian study noted that parental consanguinity was high (53%).[6] This huge percentage can explain the wide prevalance of CKD in this series, such as neurogenic bladder, reflux nephropathy, and hereditary nephritis. We observed that consanguinity was more common but unfortunately we are not able to compare its prevalance because of incomplete data. Prenatal history could not be remembered definitely by the parents.

Female patients were predominant in all groups with CKD. In the Syrian study, 62% of patients were males.[6] However, in ours, 63% were females. However, it is hard to compare our findings because of the heterogeneity of groups and possibility of selected patients' admissions to our clinic.

Eighteen children with ESRD were on peritoneal dialysis (7 patients) or hemodialysis (11 patients). The preference of hemodialysis was common, probably because of unsuitable living conditions. Unfortunately, only 8 patients were being visited regularly in spite of all free medical supports. We observed that a few parents accepted the disease as a fate and refused the treatment options.

## CONCLUSIONS

The Syrian refugee crisis in Turkey required a fast and efficient comprehensive rescue strategy because of borders to Syria. According to the United Nations, Turkey is one of the most refugee-accepting countries in the world, and our city is one of the biggest centers for Syrian refugees to get health care. Although payments are provided by the government, the patients and families do not admit to hospital regularly. We usually observe that they are admittied to hospital mostly in emergent situations. Sometimes, it becomes difficult to understand and solve the problems of those patients. It is remarkable that the rate of CKD among the refugee children is high. Unfortunately, this may also show that they are usually coming to hospital when the disease in the advance stages. The importance of medical records should be remembered again, while struggling with a lot of problems of chronically ill children without any medical records and information.

## CONFLICT OF INTEREST

None declared.

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