Clinical and Epidemiology Characteristics of Urinary Tract Infections in Childhood

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SUMMARY
Urinary tract infection (UTI) is one of the most common infections in children, and usually it appears in early childhood. The aim of this study was to find out the incidence and distribution of urinary tract infections in childhood, and to analyze clinical presentation of urinary tract infections in children. In the retrospective study were included 164 children, of both genders, who were treated in Primary Health Centre. Medical history were analyzed from all children who have presence of bacteria in urinary sediment. Urinary tract infection was found in 7,74% (164/2118) children, 11,26% (115/1021) of girls and 4,47% (49/1097) of boys. The biggest frequency was found in age group 3-6 years were UTI was found in 9,80% (74/755) of all children. Some of non-specific symptoms were found in 73,18% (120/164) children, and specific symptoms for UTI were found in 35,98% (59/164) children. The most common symptom was fever, which was found in 54,9% (90/164) children. UTI is common bacterial infection causing illness in children. It may be difficult to recognize UTI in children because the presenting symptoms and/or signs are non-specific, particularly in younger children.

Key words: urinary tract infection, children, fever.

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1. INTRODUCTION
Urinary tract infection (UTI) is one of the most common childhood bacterial infections, after upper respiratory tract and middle ear infections (1). It is hard to recognize them because of non-specific symptoms, but clinical experiences based on experimental research suggest that early diagnosis of first UTI, timely antibiotic treatment and image evaluation can prevent renal damage (2, 3).

The true incidence of urinary tract infections in children is difficult to estimate. At least 8% of girls and 2% of boys are estimated to have at least one episode of UTI in childhood. The biggest incidence is in first two years of the life when real bacteriuria is present in 5% of febrile children (4). Male children are more susceptible to UTI in the first two or three months of life; later on, girls are proportionally more affected (5).

UTI occurs in a minimum of 2.1% of girls and 2.2% of boys before the age of 2 years. A population-based study suggested that 11.3% of girls and 3.6% of boys will have had a UTI by the age of 16 years (6). Lower levels were noted in children of African-American descent (7, 8). One study noted a cyclical pattern in incidence over two consecutive years with June the most common and December the least common month for childhood UTI (9).

UTI show high level of recurrence especially in children who had their first episode of UTI in early childhood. Recurrent UTI occurs in 30%-50% of children. Important predisposing factors include Vesicoureteric reflux (VUR), urinary tract obstruction, voiding dysfunction and constipation. There are two ways of appearing UTI: ascending contamination and secondary to a haematogenous source. Except for the neonatal period ascending contamination of the urinary tract found in the intestinal flora is the most frequent mechanism of urinary tract infection (10). It is combination of bacterial virulence, and host factors that are closely interrelated, which lead to the development of a UTI (11).

Different type of microorganisms can be causative microorganisms of UTI. Enterobacteria are the most common organisms isolated from uncomplicated UTI. Gram negative microorganisms are isolated in 90% and Gram positive in 10% of UTI in children. The most common isolated pathogen of UTI is Escherichia coli.

Diagnosis of UTI is based on medical history, physical examination, laboratory tests and imaging evaluation which include cystogram and sonogram of the kidneys and bladder, and renal scintigraphy. The clinical presen-
tation of UTI in childhood are non-specific and varies of the age, sex, existing anomalies of urinary tract, localization of infection, type of causative microorganisms and recurrences of these infections. Symptoms and signs of UTI are mostly non-specific or absent in young children, suggesting on UTI or be more likely as in sepsis. Symptoms can be specific or non-specific for UTI.

Specific symptoms suggesting for UTI are: dysuria, frequency voiding, enuresis after successful toilet training, haematuria, squatting, abdominal or suprapubic pain; systemic (non-specific) signs and symptoms are: fever, vomiting, diarrhoea, back pain and other (12). Neonates and small children don’t have specific symptoms which are suggesting for UTI. The most common symptoms in this age group are: loss of weight, trouble in feeding, jaundice, vomiting, diarrhoea, abdominal colic, with or without temperature (13). Small children have also often offensive urine (14). Suprapubic or back pain, dysuria, frequency voiding, dysfunctional voiding, enuresis are more common symptoms in children age after 3-5 years old (15). Although, the symptoms are non-specific especially in neonates and small children age 2 years old, every temperature should be treated as possible UTI and make urinary testing and take urine specimen for urine culture (UK). From the other children with positive anamnesis, dysuria, with or without temperature, with positive urinalysis (deep-stick screen test-nitrile, or leucocytes by microscopy) it is necessary to take urine specimen for UK and start with an antibiotic treatment (16).

Physical examination can show temperature, irritability, dehydration, hypotension or hypertension, abdominal or suprapubic touch pain, and in children with progressive nephropathy, recurrent infections or with pathology on genitourinary tract, can result in disorders of growing. Recurrent infections are more asymptomatic and prevalence study shown that it is more often new infection with a new different type of causative microorganism then consequences of non-adequate treatment of previous infection.

The goals of this study were to:
- Determine frequency and distribution of UTI in children age group 0-6 years old,
- Analyse clinical characteristics of UTI in childhood.

2. PATIENTS AND METHODS

The research was conducted at the Department of Pediatrics in Primary Health Centre in Lukavac. With the retrospective study was obtained all children of both genders (2118) who are in period from 01.01.2007. to 31.12.2007. went to a doctor for any reasons. It was analyzed medical history from the children who had presence of bacteria in urine, them 164.

From medical records were analyzed all data about the symptoms and signs of urinary tract infections. It were analyzed specific symptoms which are suggesting for UTI: dysuria, frequent voiding, enuresis, squatting, haematuria, abdominal and suprapubic pain; and non-specific symptoms as temperature, vomiting, diarrhoea, jaundice, loss of weight, back pain and other, according to gender and age.

Statistical comparison of data was performed using Chi-square test and Odds ratio with 95% confidence interval (Arcus Quickstat Biomedical for Windows). Using Chi-square test, the differences between the groups were considered significant when P<0.05.

3. RESULTS

UTI is found in 7,74% (164/2118) of children, 11,26% (115/1021) of girls and 4,47% (49/1097) of boys. The biggest frequency was found in age group 3-6 years, were UTI was found in 9,80% (74/755) of all children. The next was age group 1-3 years old with 8,39% (84), and in age group 1 month to 1 year UTI was found in 1,76% (6) children. UTI was not found in children age under 1 month (Graph 1).

Even that was not found that frequency of appearance of UTI depends of gender, the chance of appearance of UTI is bigger in girls then in boys: 
in age group of 1 month to 1 year the chance of appearance of UTI is 1.18 times (95%CI: 0.1-8.69) bigger in girls than in boys; in age group of 1-3 years 1.4 times (95%CI: 0.7-2.7); and in age group of 3-6 years is 1.45 times (95%CI: 0.7-3.1) bigger chance for appearance of UTI in girls than boys.

Recurrent infections in research period of one year find in 18.9% (31) of children, in 21.7% (25) of girls and 12.2% (6) of boys. The biggest frequency of recurrent infections was found in age group 1-3 years old. Chance of appearance recurrent UTI were bigger in girls than in boys in all age group (Graph 2).

Some of the symptoms were found in 87.20% (143/164) children with UTI, in 86.09% (99/115) of girls and 89.80% (44/49) of boys. Non-specific symptoms were found in 73.17% (120/164) of children; in 73.04% (84/115) of girls and in 73.45% (36/49) of boys. Specific symptoms for UTI were found only in 35.98% (59/164) children; in 37.39% (43/115) of girls and in 32.65% (16/49) of boys.

Even that was not found that frequency of appearance of symptoms in children with UTI depends of gender, they were different between girls and boys. In age group of 1 month to 1 year the chance of appearance of symptoms is bigger 1.85 times (95%CI: 0.18-93.3) in girls than in boys but without statistic significance $\chi^2=0.003$ ($P=0.95$); in age group of 1-3 years $\chi^2=1.15$ ($P=0.28$) and 1.58 times bigger in boys than in girls. In age group of 3-6 years old $\chi^2=0.77$ ($P=0.28$), and 1.47 times bigger in girls than in boys (95%CI: 0.72-3.24).

The most common symptom was temperature, which was found in 54.9% (90/164) of all children with UTI, after that comes vomiting in 22.6% (37/164), abdominal colic in 18.9% (31/164), frequent voiding in 7.3% (12/164), diarhoea also in 7.3% (12/164), loss of appetite in 7.3% (12/164), dysuria in 5.5% (9/164) children.

4. DISCUSSION

The majority of the conducted studies were of infants and children treated in secondary care centres and do not represent the majority of infants and children who present with a UTI in primary care.

In this study urinary tract infection is find in 7.74% (164/2118) of children age 0-6 years old who were treated in Primary Health Centre in Lukavac. A similar study conducted in Sweden reported the cumulative incidence of UTI in 8.4% girls and 1.7 boys up to the age of 7 years (17). Doyley and Nelligan were found UTI in 7% of children in age 2-10 years (18).

In this study UTI was found in 11.26% (115/1021) of girls and in 4.47% (49/1097) of boys. The biggest frequency was found in age group 3-6 years, were UTI was found in 9.80% (74/755) of all children. The next was age group 1-3 years with 8.39% (84/1001), and on the end was age group 1 month to 1 year with 1.76% (6/336). In age group less than 1 month there was not found urinary tract infection in children who were treated in Primary Health Centre.

American Academy of Paediatrics (AAP) in hospital treated children under the age of one year find the prevalence of UTI in 6.5% of girls and in 3.35% of boys that is higher then in this study (19). This can be explained by the facts that small children in presence of infection show very fast the signs of serious illness and require hospital treatment without initial examination in Primary Health Centre what is resulting in less incidence. The same situation is in age group under 1 month where was not found UTI against 13.6% hospital treated children age <8 weeks which was found by Lin et al. (20). Even that was not found that frequency of appearance of UTI depends of gender, the chance of appearance of UTI is bigger in girls then in boys.

UTI show a high prevalence of recurrences. It is difficult to be sure about rates of recurrence in children. Every next recurrent infection show less symptoms then the previous infection what is makes more problems in diagnostic UTI in childhood. Girls are more prone to recurrence and those with recurrent UTI have more episodes than boys. In research period of one year recurrent infections were found in 18.9% (31) of children, in 21.7% (25) of girls and 12.2% (6) of boys. Girls had recurrent infections for once in 18.3%, and 3.5% of girls had two or more recurrent infections in research period of one year. In boys 10.2% of them had one time recurrent infection and 2% had two or more times in this period. In this study the biggest frequency of recurrent infections was found in age group 1-3 years old, and in all age groups prevalence of recurrent UTI was bigger in girls than in boys, same as show data from the literature.

Panaretto et al. found recurrent UTI in 11.7% preschool children, 6.89% of them had one time recurrent infection and 4.83% of them had two or more
recurrences what is less then in this study-18,95% (21). In age up to 10 years Jodal find recurrent infections in 32% of girls and 23% of boys; prevalence of recurrences two or more times in follow up period of one year was bigger in girls than in boys 8% against 1% (22). A small study in the USA also found that girls were more prone to multiple recurrences of UTI, what is also shown in this study (23).

It was not found that the chance of appearance of symptoms depends of gender. The most common symptom was temperature, which was found in 54,9% (90/164) of all children with UTI, after that comes vomiting in 22,6% (37/164), abdominal colic in 18,9% (31/164), frequent voiding in 7,3% (12/164), diarrhoea also in 7,3% (12/164), loss of appetite 6,1% (10/164), dysuria in 5,5% (9/164) children.

A case series study conducted in Australia described the clinical features of 305 children younger than 5 years who presented consecutively at an emergency department with first-time symptomatic UTI. The most commonly reported symptom were fever (80%), an axillary’s temperature higher than 37,5 C (60%), irritability (52%), anorexia (49%), malaise (44%), vomiting (42%) and diarrhoea (21%). Less common symptoms in fewer than 20% of children were dysuria, offensive urine, abdominal pain, frequency and haematuria (24). A case series study from the USA reported symptoms and signs from 100 children age 5 days to 8 months who were hospitalised for first known UTI. Fever was the most common symptom (63%) and irritability was reported in over half of the children (55%). Other symptom included refused feeds (38%), vomiting (36%), and diarrhoea (31%). Less common symptoms were abdominal distension and jaundice, which were reported in 8% and 7% of the children, respectively (25).

5. CONCLUSION

UTI is common bacterial infection causing illness in children. It may be difficult to recognise UTI in children because the presenting symptoms and/or signs are non-specific, particularly in younger children. Urine collection and interpretation of urine tests in children are not easy and therefore it may not always be possible to unequivocally confirm the diagnosis.

The aim of confirm diagnosis of UTI and long-term management is to include antibiotic treatment and to reduce the risk of further UTIs and any renal damage that might occur as a result (19). Because of that it is necessary to find out the safe clinical way to identify those children with UTI who are at risk to develop renal damage. The timely diagnosis and adequate management of UTI in children can prevent appearance of serious complications and consequences in later life time.

REFERENCES