Tikrit Journal of Pure Science 21 (3) 2016 *ISSN: 1813 – 1662 (Print)*
E-ISSN: 2415 – 1726 (On Line)

The Relationship Between Urinary Tract Infection And Hyperuricemia Among Children In Tikrit Teaching Hospital

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Abstract
The current study represents an observational, cross-sectional study by using a simple random sampling technique which included one hundred children patients with UTI from the age of 4-14 years old in Tikrit Teaching Hospital from the first of March 2014 to the end of May 2014 to find the relationship between UTI and Hyperuricemia in children. The study demonstrates that the prevalence of UTI was common in females (64%) than males (36%) with 2:1 ratio. Also high prevalence of UTI was common in rural area (78%) than urban area (22%) of the total cases, and UTI was common in the patients with low socio-economic state (69%). Prevalence of hyperuricemia among patients with UTI was (27%) of the total cases. The study concluded that the prevalence of UTI was high among children in Tikrit Teaching Hospital and there is a significant association between UTI and Hyperuricemia .

Key wards: Urinary tract infection, hyperuricemia.

Introduction:
Urinary tract infection (UTI) is one of the he most common pediatric infections. even en more worrying is the increasing prevalence of UTI in developing countries. UTI in childhood is a well-recognized problem all over the world. It distresses the child, concerns the parents, and may cause permanent kidney damage. Urinary tract infection (UTI) is one of the most common pediatric infections. Urinary tract infections (UTIs) occur in 1-3% of girls and 1% of boys. In girls, the first UTI usually occurs by the age of 5 years old. In boys, most UTIs occur during the 1st year of life; UTIs are much more common in uncircumcised boys, especially in the 1st year of life.[1] Clinical presentation of UTI in children may be nonspecific and the appropriateness of certain diagnostic tests remains controversial.[2]

The UTIs are caused mainly by colonic bacteria, such as *Escherichia coli*, followed by *Klebsiella* and *Proteus*. However, any organism that gains access to the urinary tract system may cause infection, including fungi (Candida species) and viruses. In some instances, UTI results in recognition of an important underlying structural abnormality of the urinary tract.[2]

When UTI is diagnosed in a child, an attempt should be made to identify any risk factors for the UTI .[3]

Uric acid is the final product of purine metabolism in human beings.[2]

The blood levels of uric acid are a function of the balance between the breakdown of purines and the rate of uric acid excretion. Uric acid normally dissolves in the blood, processes through the kidney, and leaves the body in the urine. If the body makes extra uric acid, or if the kidneys cannot clear enough of it, then uric acid levels in the blood will become too high, a condition known as hyperuricemia. Hyperuricemia, although clinically defective elimination accounts for most cases of hyperuricemia. Hyperuricemia may occur because of decreased excretion (under excretors), increased production (over producers), or a combination of these two mechanisms. [3,4]

The aim of this study was to decrease the morbidity among patients with UTI by early detection of serum uric acid.

Patients and Methods:
The current work represented an observational cross-section study which was conducted during the period extending from the first of March 2014 to the end of May 2014. A simple random sampling technique had been used to collect a (100) patients (36 males and 64females) from different locations in Tikrit province Patients with the age of 4-14 years old had been included in the sample without congenital anomalies or medical condition that affect serum uric acid level or abnormal renal function test, history of chronic drug use, hypertension, hyperglycemia, obesity and Patients with albuminuria or abnormal PH of urine. All the patients should have UTI at the time of data collection. There were (22) patients from urban area and (78) patients from rural area. The questionnaire was developed to collect all the data relevant to socio-demographic factors.

The study includes two components: interviewer administration of questionnaire and anthropometric measurement. Prior to interview, the purpose of data collection was explained and contest was obtained.

Weight ,blood pressure, random blood sugar, general urine and urine culture and sensitivity, serum uric acid, ESR, and renal function test and renal ultrasound were done to all patients, The statistical analysis was done with the use of SPSS software, version 20.0.

Results
The total sample studied in this cohart was (100) patients admitted to Tikrit Teaching Hospital. Of the total 22% from urban areas and 78% from rural areas; 36% were males and 46% were females .

Table (1) shows that the most common type of urine crystal found in the urine samples was Uric Acid crystals which representing (35%) of total cases with

UTI, which represented (33.3%) of total male samples and (35.9%) of total female samples.

Table (1): Distribution of the cases according to sex and type of urine crystals.

Sex	Type of Urine Crystals									
	Uric Acid		Ca. Oxalate		Triple Phosphate		None		Total	
	Number (No.)	%	Number (No.)	%	Number (No.)	%	Number (No.)	%	Number (No.)	%
Male	12	33.3%	9	25%	6	16.7%	9	25%	36	36 %
Female	23	35.9%	13	20.4%	7	10.9%	21	32.8%	64	64 %
Total	35	35%	22	22%	13	13%	30	30%	100	100%

X^2= 1.32, *P* value = 0.00<0.05 , df =3 (significant) .

Table (2) shows that (27%) of the total samples had high serum uric level (hyperuricemia) representing (22.2%) of total male samples and (29.7%) of total female sample.

Table (2): Distribution of the cases according to sex and serum uric acid

Sex	Serum Uric Acid							
	< 3 mg / dl		3 - 5 mg / dl		> 5 mg / dl		Total	
	No.	%	No.	%	No.	%	No.	%
Male	7	19.5%	21	58.3%	8	22.2%	36	36%
Female	6	9.4%	39	60.9%	19	29.7%	64	64%
Total	13	13%	60	60%	27	27%	100	100%

X^2=2.29, *P* value = 0.00<0.05 , df =2 (significant) .

Table(3) shows that the most common microorganism that found in urine culture in patients with hyperuricemia was *Escherichia coli* which represented (63%) of total patients with hyperuricemia .

Table (3): Distribution of the cases according to serum uric acid and urine culture

Serum Uric Acid	Urine Culture													
	Escherichia coli		*Staphylococci aureus*		*Proteus Mirabilis*		*Pseudomonas aerogenoza*		*Enterobacter*		*Klebsiella pneumoniae*		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
<3 mg/dl	5	38.4 %	3	23.1 %	2	15.4 %	2	15.4 %	1	7.7 %	0	0 %	13	13 %
3-5 mg/dl	21	35 %	17	28.3 %	8	13.3 %	7	11.7 %	4	6.7 %	3	5 %	60	60 %
>5 mg/dl	17	63 %	7	25.9 %	3	11.1 %	0	0 %	0	0 %	0	0 %	27	27 %
Total	43	43 %	27	27 %	13	13 %	9	9 %	5	5 %	3	3 %	100	100 %

X^2=11.08, *P* value = 0.00<0.05 , df =10 (significant)

Table (4) shows that all patients with hyperuricemia (100%) had uric acid crystals in urine samples .

Table (4): Distribution of the cases according to the serum uric acid level and urine crystals

Serum Uric Acid	Type of Urine Crystals									
	Uric Acid		Ca. Oxalate		Triple Phosphate		None		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
<3 mg/dl	0	0%	4	30.8%	9	69.2%	0	0%	13	13%
3-5 mg/dl	8	13.3%	18	30%	4	6.7%	30	50%	60	60%
>5 mg/dl	27	100%	0	0%	0	0%	0	0%	27	27%
Total	35	35%	22	22%	13	13%	30	30%	100	100%

X^2=110.3, *P* value = 0.00<0.05 , df =6 (significant) .

Table (5) shows that (33%) of total cases had +ve joint pain in which (77.8%) of patients with hyperuricemia had +ve joint pain .

Table (5): Distribution of the cases according to serum uric acid level and joint pain

Serum Uric Acid	Joint Pain					
	+ve		-ve		Total	
	No.	%	No.	%	No.	%
< 3 mg/dl	0	0%	13	100%	13	13%
3 - 5 mg/dl	12	20%	48	80%	60	60%
> 5 mg/dl	21	77.8%	6	22.2%	27	27%
Total	33	33%	67	67%	100	100%

X^2= 35.4 , *P* value = 0.00<0.05 , df =2 (significant) .

Table (6) shows that (77.8%) of patients with hyperuricemia had high ESR .

Table (6): Distribution of the cases according to serum uric acid and ESR .

Serum Uric Acid	ESR					
	Normal <10mg/dl		High>10mg/dl		Total	
	No.	%	No.	%	No.	%
< 3 mg/dl	13	100%	0	0%	13	13%
3 - 5 mg/dl	53	88.3%	7	11.7%	60	60%
> 5 mg/dl	6	22.2%	21	77.8%	27	27%
Total	72	72%	28	28%	100	100%

X^2= 46.1, *P* value = 0.00<0.05 , df =2 (significant) .

Discussion

The present study was the first study carried out in Tikrit University College of Medicine and Tikrit city to assess the prevalence of UTI and its relation to hyperuricemia among children in Tikrit Teaching Hospital in Tikrit province. Therefore, the methods and results developed would be useful as basic information in further studies among this age group .

In this study, the most common micro-organism isolated from urine samples was *Escherichia coli* which represented (43%) of total samples, followed by *Staphyllococci aureus* (27%) and *Proteus* (13%). By comparison with study by Enrico *et al* in Milano - Italy[5] who reported that *Escherichia coli* was isolated from (67.6%) of total cases of UTI, while *Staphyllococci aureus* from (13.8%) and *Klebseilla pneumoniae* from (8.8%) of the total cases. *Escherichia coli* is still the commonest microorganism recovered in patients with UTI. This due to the fact in general that gram negative endotoxin decrease ureteral peristalsis. In addition the *Escherichia coli* has pili and adherence allow bacteria to bind to and colonize urinary tract epithelium. Furthermore motile bacteria (like *Escherichia coli*) can ascend through the urethra against urinary flow by which it infect urinary tract frequently. In patients with hyperuricemia, *Escherichia coli* isolated from (63%) while *Staphyllococci aureus* isolated from (25.9%) of the total patients with hyperuricemia. [5]

The study shows that (70%) of total samples had urine crystals while (30%) had no urine crystals. (35%) of urine samples had Uric Acid crystals and (22%) had Ca. Oxalate crystals and (13%) had Triple phosphate. In comparison with study by El Nasser *et al* in Sinia-Egypt done on 1918 patients with UTI were found only (29%) had urine crystals and Ca. Oxalate crystals more common (15.6%), while Uric acid crystals (12.6%) and only (1%) for Triple Phosphate crystals.

Also we reported that all patients with hyperuricemia had uric acid crystals (100%).

In children, urine crystals remains a significant problem with serious consequences. The types of crystals formed depend mainly on the urine composition, which in turn, reflects the type of diet consumed. In the pediatric population, nutritional and metabolic causes of tubular re-absorption can contribute to crystals formation which may lead later to stone formation. Besides chronic infection, metabolic disorders and urinary stasis, other conditions can represent a risk factor for stone development; for instance, dietary habits and drinking water intake, as well as water composition, may play a role in the induction or development of urinary calculi.[6]

The current study shows that (28%) of total patients had high ESR which represented (25%) of total male samples and (29.7%) of total female samples. Among them, (77.8%) of patients with hyperuricemia had high ESR. This Result agreed with Tagoe in USA, who reported that (70%) of patients with hyperuricemia had high ESR which is helpful in diagnosis of hyperuricemia.[7].

In the current study, we found that only (27%) of the total samples had high serum uric level (hyperuricemia), and the prevalence was high among female samples (29.7%) than male samples (22.2%). This result agreed with study in Japan done by Nagai A. et al with 119 samples which found that Thirty-six patients (30.3%) showed hyperuricemia. But he found Hyperuricemia was more common in male patients (36.8%) than in female patients (21.6%).[8]

In the current study, revealed that (77.8%) of patient with Huperuricemia had +ve joint pain which is the commonest presentation of Hyperuricemia that may be progress to arthritis. The most common sites of arthritis are large joints, such as the knee, wrist, elbow, or ankle. Although arthritis is commonly monoarticular, polyarticular acute flares are not rare, and many different joints may be involved simultaneously or in rapid succession. Multiple joints in the same limb often are involved, as when inflammation begins in the great toe and then progresses to involve the midfoot and ankle.

Conclusions

The Prevalence of hyperuricemia among patients with UTI was (27%) of the total cases. The prevalence of Uric Acid crystals in urine was high in patients with UTI (35%), while Ca. Oxalate crystals had (22%) and Triple Phosphate crystals had (13%)of total cases . All patients with hyperuricemia had Uric Acid crystals in urine (100%). Among the patients with hyperuricemia, (77.8%) had high ESR. Joint pain was most common sign and symptom of hyperuricemia (78.8%) .

Aknowledgment: To all the patients that were participate in the study.

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العلاقة بين التهاب المسالك البولية وفرط حامض اليوريك في الدم بين الاطفال في مستشفى تكريت التعليمي

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الملخص

تمثل الدراسة الحالية إجراء دراسة مقطعية باستخدام تقنية أخذ العينات العشوائية البسيطة والتي شملت 100 مريض يعانون من التهاب المجاري البولية من سن 4 سنوات إلى سن 14 سنة .لقد أجريت الدراسة في مستشفى تكريت التعليمي من الأول من اذار /2014 في نهاية شهر ايار/ 2014 لتقييم مدى انتشار التهاب المسالك البولية وإيجاد العلاقة بين التهاب المجاري البولية وفرط حمض يوريك في الدم عند الأطفال.

وتوضح هذه الدراسة أن انتشار التهاب المجاري البولية كان شائعا بين الإناث بنسبة (64٪) اكثر من الذكور (36٪) وبنسبة 1:2 . كما ان نسبة عالية من معدل انتشار التهاب المجاري البولية كان شائعا في المناطق الريفية (78٪) بنسبة اكثر من المناطق الحضرية (22٪) من مجموع الحالات، وكما ان التهاب المجاري البولية كان اكثر شيوعا بين المرضى الذين يعانون من حالة اجتماعية واقتصادية منخفضة بنسبة (69٪) .وكان انتشار فرط حمض يوريك في الدم بين المرضى الذين يعانون من التهاب المجاري البولية (27٪) من مجموع الحالات.

وخلصت الدراسة إلى أن معدل انتشار التهاب المجاري البولية كان مرتفعا بين الأطفال في مستشفى تكريت التعليمي، وهناك ارتباط كبير بين التهاب المجاري البولية وفرط حمض اليوريك في الدم.