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PREDICTORS OF URINARY TRACT INFECTION AMONG CHILDREN WITH FEBRILE CONVULSION IN ATERTIARY HOSPITAL IN AFRICA

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Abstract

Background: Febrile convulsion (FC) in resource poor setting is usually attributed to malaria. With the decline in malaria prevalence due to interventional programmes, it is pertinent to recognize other causes of FC such as urinary tract infection. Additionally urinary tract infection is associated with deleterious consequences if untreated or poorly treated. This study was therefore conducted to confirm predictors of UTI among children with FC in University of Ilorin Teaching Hospital, Ilorin, north central Nigeria.

Materials and Methods: One hundred and forty five children with FC were recruited over an 18 month period. Demographic and clinical details were obtained using a standardized hquestionnaire. Samples for urine dipstick, microscopy, culture and sensitivity were obtained. Sensitivity, specificity, positive and negative predictive values for the clinical features and laboratory investigations were calculated.

Results: Fifteen (10.3%) of the children recruited had urinary tract infection. Complex febrile convulsion was a significant finding among children with positive culture results. Complex FC and pyuria had the highest sensitivity while pyuria showed a high positive predictive value.

Conclusion and Recommendation: Predictors of UTI among children with FC were complex febrile convulsion and pyuria. Empirical treatment could be commenced among children with either or a combination of complex febrile convulsion and pyuria in resource poor settings while culture results are been expected.

Keywords: Febrile convulsion, Urinary tract infection, Pyuria.

Introduction

Febrile convulsion (FC) and Urinary tract infection (UTI) are two common paediatric morbidities[1]. Urinary tract infection however remains under-diagnosed especially in poor resource countries[2]. This could be attributed to variability in its presentation, poor laboratory support and the endemicity of malaria especially in Sub-Saharan Africa. Hypertension and renal failure are possible sequelae that may follow untreated and poorly treated UTI[3].

Malaria and UTI commonly present with fever[4]. Treatment of aetiology of FC is important in its management. In malaria endemic region of the world, treatment of malaria is usually prioritized without recourse to laboratory findings. Missing diagnosis of UTI in such instances may lead to unforeseen complications such as end stage renal disease[5]. An Iranian study further reported that the incidence of UTI among FC is higher compared to those in other febrile patients without convulsion making it apt to study the possible predictors of UTI in this group of patients[6].

The objective of the study was to determine the predictive factors for UTI among children with FC in a resource poor country like Nigeria.

Materials and Method

A prospective study involving children aged 6 months to 5 years who presented with FC was carried out at the University of Ilorin teaching Hospital, Ilorin, Kwara state, Nigeria. Sample size for the study was 145 derived using the Kish and Leslie formula[7].

Ethical approval for the study was obtained from the hospital research and ethics committee. Consent was obtained from their parent / guardian. Children who had antibiotic medications two weeks prior to presentation and those who have congenital anomalies of the urinary tract (CAKUT) that predisposes to UTI were excluded. Consecutive children with febrile convulsion were recruited from January 2010 to June 2011 at the emergency unit of the hospital till sample size was attained.

Demographic and clinical data were obtained with the aid of a structured questionnaire. All the recruited children had urine samples collected for urine dipstick and a sterile method for collecting urine sample for microscopy, culture and sensitivity. Parents/ caregivers of subjects were provided with two properly labeled uncontaminated universal bottles. They were instructed on how to collect mid-stream urine and for those we had challenges with collecting mid-stream urine a transurethral catheter method was used under aseptic condition. One hundred and eleven samples were collected via clean catch method while the remaining thirty four was via sterile transurethral catheterization following which catheter was removed.

Urine dipstick was done using multistix 10SG by Bayer diagnostic. For the purpose of this study the following definitions were adhered to:

Significant proteinuria refers to 1+ or more protein in urine dipstick.

Significant haematuria refers to 1+ or more blood in urine dipstick.

Pyuria refers to presence of >5 white blood cells per high power field on microscopic examination of spun urine sediment.

Urinary tract infection is pure growth of an acknowledged uropathogen in the urinary tract seen as 10^5 per ml of organism in mid stream urine.

Febrile convulsion is convulsion occurring in a febrile child aged between 6 months and 5 years arising from sources other than intracranial or other central nervous system causes.

Simple FC is characterized by one episode in 24 hours usually generalized and does not last more than 15 minutes.

Complex FC is characterized by convulsion extending beyond 15 minutes, with more than 1 episode in 24 hours and may have focal expression.

Urine sample collected for culture was tested within 2 hours of collection. In case this was not possible sample was stored in refrigerator and tested within 4 hours of storage. A yield of multiple organisms was considered as a contaminant and discarded. Sensitivity of positive culture was done within the next 24 hours.

Statistical analysis was done using SPSS version 16. Frequency distribution tables and cross tabulation of variables, graphs and charts were generated to report descriptive statistics. Categorical variables were compared using the Chi-square test, while the continous variable were analyzed using the student's t-test. Yates correction or fishers exact test were utilized as appropriate. The level of significance was established at *p*-value of <0.05. The sensitivity, specificity, positive and negative predictive values for clinical features and laboratory findings for the subjects with positive culture was calculated.

Results

Ninety six of the 145 subjects recruited were males and 49 were females. They were divided into five groups based on age grouping (Table I). Fifteen (10.3%) had positive significant isolates. Positive culture was highest (five) among the 12 – 24 months age group, though this finding was not significant (Table II). Urinary tract infection was more prevalent among the lower and middle socio-economic class group though it was not statistically significant (Table II). Organisms isolated were *Escherischia coli* in 7 (46.7%), *klebsiella spp* in 5 (33.3%) and *Staphylococcus aureus* in 3 (20.0%). Malaria parasitaemia was seen in 52 (35.9%) of the studied population, though none of the children with FC had malaria and UTI co-infection.

Table I: **Age distribution of the study population**

	Total	Gender		χ^2	*P*
		Male n(%)	Female n(%)		
Age (months)					
< 12	26 (17.9)	16 (61.5)	10 (38.5)	0.309	0.579
12 -< 24	45 (31.0)	32 (71.1)	13 (28.9)	0.701	0.521
24 – 36	35 (24.1)	25 (71.4)	10 (28.6)	0.426	0.514
36 - <48	19 (13.1)	10 (52.6)	9 (47.4)	1.801	0.180
48 -60	20 (13.9)	13 (65.0)	7 (35.0)	0.015	0.902
Total	145 (100.0)	96 (66.2)	49 (33.8)		

Table II: Prevalence of UTI according to socio-demographic characteristics in the study population

	Total	**UTI** n (%)	**No UTI** n(%)	χ^2	p^*
Age group (months)					
< 12	26 (17.9)	3 (11.5)	23 (88.5)	0.392	0.763
12 -<24	45 (31.1)	5 (11.1)	40 (88.9)	0.041	0.998
24 - <36	35 (24.1)	3 (8.6)	32 (91.4)	0.156	0.975
36 - <48	19 (13.1)	2 (10.5)	17 (89.5)	0.001	0.998
48 - < 60	20 (13.8)	2 (10.0)	18 (90.0)	0.002	0.998
Total	145(100.0)	15 (10.3)	130 (89.7)		
Gender					
Males	96	12 (12.5)	84 (87.5)		
Females	49	3 (6.1)	46 (93.9)	1.179	0.433
Total	145	15 (10.3)	130 (89.7)		
Social class					
Upper	21 (14.5)	3 (2.1)	18 (12.4)	0.411	0.747
Middle	56 (38.6)	6 (4.1)	50 (34.5)	0.013	0.998
Lower	68 (46.9)	6 (4.1)	62 (42.8)	0.320	0.572
Total	145 (100.0)	15 (10.3)	130 (89.7)		

Common symptoms seen among those subjects with UTI were vomiting, diarrhea, abdominal pain, and painful micturition. All were not significantly present when compared with children without UTI. Complex febrile convulsion however was seen significantly among patients with UTI ($p<0.05$) (Table III).

Table III: The type of febrile convulsion among the subjects with UTI and without UTI

Convulsion	**UTI**	**No UTI**	χ^2	***P***
Type of convulsion				
Simple	4	75		
Complex	11	55	5.220	**0.022***
Nature				
Generalized	13	109		
Focal	2	21	0.080	0.835

*= Significant *p*value

Physical examination findings among those subjects with UTI were tachypea, various levels of dehydration and hepatomegaly. Though they were not significantly present when compared to the subjects without UTI. The isolates had higher sensitivity to flouro-quinolones (Ofloxacin and Ciprofloxacin) when compared with other tested antibiotics.

Table IV: Clinical features as predictors of UTI in the population

Symptoms	**Sensitivity**	**Specificity**	**PPV**	**NPV**
Vomiting	26.6	80.8	13.7	90.5
Diarrhea	6.7	88.5	6.3	89.1
Abdominal Pain	6.7	98.5	33.3	90.1
Dysuria	6.7	98.5	33.0	90.1
Focal Convulsion	13.3	83.3	8.7	89.3
Complex "	73.3	57.7	16.7	94.9
Simple "	26.7	42.3	5.1	83.3

Complex febrile convulsion showed high sensitivity among the symptoms and physical signs elicited among the UTI positive group (Table IV). While pyuria showed 60.2% sensitivity and positive predictive value of 90.0% (Table V).

Table V: Laboratory indices as predictors of UTI in the population

Urine Indices	Sensitivity	Specificity	PPV	NPV
Proteinuria	13.3	91.5	15.4	90.2
Nitrite	33.3	97.7	62.5	92.7
Haematuria	15.4	96.9	50.0	90.6
Pyuria	60.2	99.2	90.0	95.6

Discussion

Urinary tract infection has been reported in 1-3% of the general paediatric population[8]. Our study indicates a higher prevalence among children with FC (10.3%) compared to the general population. Though there is a dearth of similar studies in Nigeria but compared to studies done in the western world for UTI among children with FC, prevalence varies from 0.7% to 10.0%[9-12].

The reason why prevalence of UTI is more in children with FC compared to the general population is not clear, though there are some tangential correlations why children with FC may have a higher prevalence of UTI. There are report showing that higher prevalence of FC are seen in children with decreased duration of breast feeding[13] and those with decreased level of trace elements such as zinc and selenium[14]. Decreased duration of breast feeding and low levels of trace elements are associated with increased predisposition to infections[13-14].

Fever, vomiting, diarrhea, painful micturition and abdominal pain were commonly seen among the patients with positive culture in the studied population. These symptoms did not reveal any significance when compared with children without UTI (Table IV). Similarly their sensitivity was low. Most of these symptoms are related to the gastro-intestinal tract. Symptoms of the gastro-intestinal system are commonly seen among children with FC as reported in an Indian study[15], this was attributed to the peculiarity of the age group that suffers FC were this symptom predominate.

Complex febrile convulsion was a significant finding among patients with UTI with p value <0.05. This was in tandem with the findings of Gael and Teach in Australia[11]. Similarly, complex FC showed a high sensitivity of 73.3% (table IV) indicating that it is a strong predictor of UTI in the population.

Five of the subject with UTI had positive leucocyte and nitrite in urine dipstick, this was a significant in the studied population. Wammanda and Ewa reported in a previous study that they are good predictors of positive urine isolates[16]. In regards to sensitivity and prediction they had low values (table V). Contrary to this, pyuria was not only a significant finding among those with UTI in the studied population it also had a relatively high sensitivity as well as a high positive predictive value. This makes it a strong predictor of UTI in the population.

Escherichia coli were the most common agent seen among patients with positive isolates. It has been documented to be the most common cause of UTI in the paediatric age group[17]. This has been attributed to mannose resistant type II fimbrae some strains of this organism possess that makes it easy for them to colonize the urinary tract[18].

Flouroquinolones (ciprofloxacin and ofloxacin) had the best sensitivity amongst antibiotics that had their disc assessed. Though there are concerns about irreversible damage to cartilage in weight bearing joints in animal studies as a plausible side effect of this group of antibiotics[19]. Recent studies however have dispelled this, thereby making it an option in the paediatric population[19].

Limitations

This study is limited by our inability to carry out radiologic and uro-dynamic studies to rule out possible underlying condition that might have predisposed the patients to UTI.

Conclusions and recommendations

Urinary tract infection can cause FC. Common aetiologic agents are Escherichia coli, Klebsiella *spp* and Staphylococcal aureus. Predictors of UTI in this population from our study include history of complex febrile convulsion and pyuria on urine microscopy.

We therefore recommend that a urine dipstick should be done in all febrile children especially those with febrile convulsion. Empirical antibiotic treatment should be offered in those with either or a combination of complex febrile convulsion and pyuria where some laboratory support is available. However, further investigations are recommended in localities with adequate laboratory facilities.

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