Prevalence Of Enterohaemorrhagic Eschericia Coli 0157:H7 Causing Severe Urinary Tract Infection In Abeokuta, Nigeria

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ABSTRACT: Increasing renal debility among various age groups in recent past has shifted public attention on the prevalence of renal diseases caused by enterohaemorrhagic eschericia coli serotype 0157:H7 (EHEC 0157:H7) in Abeokuta, Nigeria as a result of consumption of unproperly cooked meal especially of bovine source. This study spanned through a period of 23 months between February 2006 to November 2007 with total urine sample of 1205 from various age group including known UTI patients and related diseases (988) and Non-UTI patient 217 which serves as control group. All the urine samples were investigated for EHEC 0157:H7. E.coli serotype accounted for 372(46.4%) of all the isolates like Pseudomonas aeruginosa 74(9.2), Staphlococcus albus 122(15.2), Proteus mirabilis 51(6.4%), klebsiella specie 147(18.3%), staphylococcus aureus 36(4.5%).Age group 41-50 male shows highest prevalence of 1/3(33%) , while female age group 6-10 having 1/11(9.0%), 11-20(6.7%). 21-30, 6/8(7.5%), 41-50 ½(8.3%), suggesting that female were more predisposed to UTI and its related diseases. Incidence of E.coli0157:H7 in chronic PID and gynaecological condition having 1/9(11.1%) inferred that E.coli0157:H7 could as well be responsible to this disease condition and foetal debilities. Most of the isolates were verocyto-toxin producers with 112 out of 223(5.4%) in severe UTI and all produce type-1 and 2 verocytotoxin and likewise in chronic PID and gyaenecology conditions. This study shows a very high prevalence of E.coli0157:H7 in this area which could be a major aetiological cause of renal diseases. Attention should be more paid to undiagnosed hemolytic colitis and hemolytic uremic syndrome caused as a result of severe UTI in developing countries with aggressive strategic public health campaign in preventing secondary transmission .The study is statistically significant ($p<0.05$). [The Journal of American Science. 2008; 4(2):4-9].

Keyword: enterohemorrhagic *Escherichia coli0157:H7, UTI, Verocytotoxin, chronic PID*

INTRODUCTION

Increasing renal debility in young adult and elderly from complication of urinary tract infection in recent years has shifted public attention on the prevalence of the illness and its declining effective therapeutic management. Ecshericial coli is accounted for the majority of urinary tract infection in young adult and pregnant women, but other Gram negative rods of different genera such as Proteus spp,

Enterobacter aerogene, Pseudomonas aeruginosa and Enterococci spp can also be the cause, particularly in hospitalized patients or those with predisposing condition such as bladder catherization or diabetes (3,5). The symptoms and signs always include urinary frequency, dysuria, haematuria and pyuria but none is absolutely specific for E.coli infection. Flank pain is associated with upper urinary tract infection while it was reported that nephropathogenic E.coli typically produce hemolysin(5). Enterohaemorrhagic E.coli causing hemolytic colitis (HC), a severe form of diarrhea; has been associated with hemolytic uremic syndrome (HUS) which progress in some patients to renal failure (1,14). Hemolytic uremic syndrome is life threatening condition especially among children and elderly. The death rate associated with HUS was reported to be 3-5% in USA (1,6).

Of the E.coli serotype that produces verocytotoxin , 0157:H7 is the most com- mon cause of HUS illness or severe thro-mbotic thrombocytopenic purpura wh-ich affect all ages(1,5). Increasing acute renal failure reported as a result of UTI prevalence in this part of the country motivated this investigation . High consu-mption of roasted beef locally known as "suya" and particularly pasteurized milk, youghurt etc were common vehicle of E.coli 0157:H7 transmission (1,2,19). Their low infection dose, unusual acid tolerance and their apparent special association with ruminant that are used for food could as well serve as a major point of contraction (1,14).

This study, therefore examine a two years prospective investigation to determine the prevalence of severe UTI caused by enterohaemorrahagic E.coli0157:H7 in Abeokuta, Nigeria.

MATERIALS AND METHODS

Sample collection: 988 suspected urine samples were collected from Federal Medical Center, Sacred Heart Hospital and General Hospital, all in Abeokuta township. These hospitals were among the largest hospital in south-western Nigeria (one of the geo-political zone in Nigeria). These urine samples were among those submitted to the hospital laboratory for routine culture and sensitivity. 217 urine samples were collected as control from subjects that have not had episode of UTI in the past previous 6 weeks but were visiting the hospital for other reason other than UTI.

Bacteriological procedure: Specimen were cultured on Blood Agar and MacConkey agar; and incubated at 37c for 24hrs aerobically. Each colonial characteristic like colony size, consistency, shape, pigmentation and lactose fermentation on MacConkey were noted in addition to Gram stain reaction. Isolates were identified to specie by standard biochemical methods according to the protocol of Cowan and Steel(7,8). Colonial morphology that conformed to E.coli identity (7), was further tested for E.coli 0157:H7 by sub-culturing the colony onto Sorbitol MacConkey Agar(9) for sorbitol fermentation . Non-sorbitol fermenting organism were further tested for verocytotoxin production i.e shiga–like toxin.

Detection of verocytotxin: virulent factor exhibited by the E.coli 0157:H7 were identified using Reversed Passive Latex Agglutination VTEC-RPLA test kit produced by OXOID TD960

Statistical analysis: All data were analysed by chi-square test for statistical comparison between the group and a p-value <0.05 was considered significant.

RESULT:

Table 1 shows the pattern and distribution of some pathogens, UTI E.coli isolates of 372 (46.4%),having highest frequency with Klebsiella oxytoca 147 (18.3%) then Staphylococcus albus 22 (15.2%),Pseudomonas aeruginosa 74 (9.2%),Proteus mirabilis 51 (6.4%) and Staphylococcus aureus 36 (4.5%).Chronic pelvic inflammatory disease (PID) which its aetiological source could be traced to E.coli having 21(39.6%) then Staphylococcus albus 20 (37.8%) and Streptococcus pyogene 12 (22.6%), all were isolated in association with severe cystitis. Gynaecological conditions which include preterm labour, intra-uterine foetal distress and miscarriage in association with pylonephritis and severe cystitis shows an increase of E.coli 93 (69.9%),Staphylococcus albus 22 (16.5%) and Pseudomonas aeruginosa 18

(13.5%).Non-Eschericia coli 0157:H7 urine samples which serve as control group shown no E.coli isolates but increase Proteus mirabilis 151 (69.7%), Klebsiella oxytoca 52 (24.0%), Pseudomonas aeruginosa 8(3.7%) while Staphylococcus albus and staphylococcus aureus have equal occurrence of 3 (1.4%) but no Streptococcus pyogene was isolated. Pattern and distribution of bacteria pathogen isolated from severe UTI (Table 1), Chronic PID associated with cystitis and Gynaecological conditions associated with pyelonephritis and cystitis. Non-E. coli 0157:H7 infected control group.

A very high incidence (Table 2)of E. coli 1/3(33%) was found in male of age group 41-50.Recurrent occurrence of E. coli 0157:H7 in 1/11(16.7%) in female age group 6-10, 11-20, 21-30, 41-50, 61-70 respectively. Chronic PID associated with cystitis in female subjects shows 1/9(11.1%) and 1/3(33.3%) in age group 31-40 and 41-50 respectively that were of reproductive age group. Gyneacological conditions with severe pyelonephritis and cystitis show 1/9(11.1%) in 21-30 age group.

Verocytotoxin vt was detected from 12 e.coli 0157:h7 in 223(5.4%) serotypes isolated from UTI (Table 3).VT-1 from 2 of 12(33.3%), VT-2 from 6 of 12 (50%) and VT-1&2 in 4 of 12 (33.3%) isolates. In Chronic PID associated with severe cystitis, 2 out of 24(8.3%) while VT-1 from 2 of 2(100%), nil from VT-2 and VT-1&2 respectively. Gyneacological conditions show VT-1 1 out of 16 (6.3%) and nil from 1(0%) for VT-1 and VT-2 respectively but 100% for VT-1&2 isolates.

Table 1: Pattern and distribution of bacteria pathogens.

Isolate	UTI	Chronic PID	Gyneacological Condition	Non-E.coli 0157:H7
	No(%)	No(%)	No(%)	No(%)
E.coli	372(46.4)	21(39.6)	93(69.9)	0(0)
Pseudomonas aeruginosa	74(9.2)	0(0)	18(13.5)	8(3.7)
Staphylococcus albus	122(15.2)	20(37.8)	22(16.5)	3(61.3)
Proteus mirabilis	51(6.4)	0(0)	0(0)	151(69.7)
Streptococcus pyogene	0(0)	12(22.6)	0)0)	0(0)
Klebsiella oxytoca	147(18.3)	0(0)	0(0)	52(24.0)
Staphylococcuc aureus	36(4.5)	0(0)	0(0)	3(1.4)
Total	802(66.6)	53(4.4)	133(11.0)	217(18.0)

Table 2: Distribution of E.coli0157:H7 in various disease conditions according to age group

Age group	UTI		Chronic PID	Gyneacological conditions
	male	female	female	female
	n* (%)	n* (%)	n*(%)	n* (%)
0-5	0/2(0)	0/7(0)	nil	nil
6-10	0/6(0)	1/11(9.1)	nil	nil
11-20	0/3(0)	1/15(6.7)	nil	nil
21-30	1/10(10)	6/80(7.5)	0/7(0)	1/9(11.1)
31-40	0/3(0)	0/41(0)	1/9(11.1)	0/7(0)
41-50	1/3(33)	1/12(8.3)	1/3(33.3)	nil
51-60	0/3(0)	0/0(0)	0/3(0)	nil
61-70	0/0(0)	1/15(16.7)	0/2(0)	nil
71-above	0/2(0)	0/11(0)	nil	nil
Total	2/31(6.5)	10/192(5.2)	2/24(8.3)	1/16(6.3)

n=number showing positive as numerator and total no of specimen as denominator*

Table 3: Prevalence of verocytotoxin producers among E.coli 0157:h7 isolates by Reverse Passive Latex Agglutination(RPLA-OXOID TD 960)

Disease condition And no of samples	E.coli0157:h7 n* (%)	VT-1 n* (%)	VT-2 n* (%)	VT-1&2 n* (%)
UTI(223)	12/223(5.4)	2/12(16.7)	6/12(50)	4/12(33.3)
Chronic PID(24)	2/24(8.3)	2/2(100)	0/2(0)	0/2(0)
Gynaecological(16)	1/16(6.3)	0/1(0)	0/1(0)	1/1(100)

DISCUSSION

This study confirms E.coli 0157:H7 as one of the major cause of severe UTI in Abeokuta affecting various age groups. From this study, enteroheamorrhagic E. coli 0157:H7 was isolated in chronic PID affecting most reproductive age group and gyneacologica conditions associated with severe cystitis and pyelonephritis. Findings from this study indicate a very high prevalence of E.coli 0157:H7 among 41-50 male (33%) suffering severe UTI. Its prevalence spread across various female age groups. This suggest that female mostly adult were more predisposed to this infection.

Reproductive age group female subjects of 31-40 and 41-50 having chronic PID associated with cystitis have prevalence rate of 11.1% and 33.3% respectively. Gyneacological conditions which include preterm labour, intra-uterine foetal distress and miscarriage show prevalence rate of 11.1% only in 21-30 age group.

Studies have shown that VTEC strain is commonly isolated in haemolytic colitis and heamolytic uremic syndrome belonging to serogroup 0157 and they posses flagella antigen H7 while VT-2 toxin is common to both (1,13,20).Following this assertion ,VTEC is on the incresase in UTI subjects with 16.7%, while chronic PID of 100% VT-1 suggest an absolute prevalence and also gynaecological condition given an inference of 100% VT-1&2. Then if, VT-1 and VT—1&2 could give such an increasing prevalence, then many of these patients could as well be suffering from undiagnosed life threatening haemorrhagic colitis (HC) and haemolytic uremic syndrome(HUS)(1). Very scanty documentation of E.coli 0157:H7 prevalence in UTI and other renal related diseases could not be obtained. Comparation of data was not possible from other part of the country due to poor documentation.

Symptomatic and asymptomatic persons were assumed to transmit E.coli0157:H7 to susceptible individuals in the same manner since we have no data to prove otherwise (11,14).The prevalence rate from the study is statistically significant $p>0.003$.

PUBLIC HEALTH IMPLICATION

With the evidence of E.coli0157:H7 appearance, thousands of people are at risk locally as a result of secondary transmission through contact with feacal materials of infected cattle or cow products and poor hygiene (11). Intensive public health strategies in prevention of E.coli0157:H7 transmission could include public media campaign targeting a high risk group such as children, elderly and immunocompromised individuals (11,15,16). Considering the potential public health benefit to be gained by these actions and low cost of associated with its implementation, these strategies would be relevant in prevention of hemolytic colitis and hemolytic uremic syndrome outbreak and other highly infectious pathogenic organisms (11,17).

CONCLUSION

E. coli 0157:H7 is the major cause of HUS illness that affect all ages (17). From this study, renal diseases associated with severe UTI were majorly caused by E.coli0157:H7 and also chronic PID, miscarriages and preterm labour could be linked with severe cystitis and pyelonephritis. Physicians and other health professional should pay more attention on any infection caused by E.coli serotype 0157:H7 in UTI and other related diseases. Public health campaign should be intensify to grassroot in preventing secondary transmission in order to curb its outbreak (12). Adequate personal hygiene and proper cooking of food material especially of bovine origin should be more emphasized (S18)

Received:
4/12/2008

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