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Original Research Article

Nexus of urinary tract infection prevalence of the causal organism and predisposing factors in Kanyakine Hospital, Meru, Kenya

Irene Muthee[1]*, Eliphas Gitonga[1], Joseph Musau[2]

[1]Department of Population, Reproductive Health and Community Resource Management, Kenyatta University, Nairobi, Kenya
[2]Department of Pharmacology and Clinical Pharmacy, Kenyatta University, Nairobi, Kenya

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***Correspondence:**
Irene Muthee,
E-mail: irene2012muthee@yahoo.com

ABSTRACT

Background: Globally, urinary tract infection (UTI) is most common during pregnancy, prevalence and incidences being higher than in non-pregnant and elderly women. Inadequate data and information deter UTI prevention and management.
Methods: The study targeted UTI positive gravid women seeking antenatal services at Kanyakine hospital. The study assessed history of UTI, lifestyle and hygiene factors. Laboratory test and analysis were conducted on urine specimen collected from 135 randomly sampled study subjects. A semi-structured questionnaire was administered to the sampled subjects and their urine tested to detect presence of microorganisms. The results were analysed using established quantitative methods.
Results: Most (47%) of the respondents were *Escherichia coli* infected while *Staphylococcus aureus* was detected in 20%. of respondents. Increased rate of sexual intercourse was linked to detection of *Escherichia coli* in 47.6%, *Klebsiella pneumoniae* in 40% and yeast (*Candida*) in 47.4%. Wearing non-cotton undergarment was attributed to detection of *E. coli* in 68.3%, yeast (63.2%) and *Klebsiella pneumoniae* (60%) of the respondents. Reduced frequency of changing undergarment led to detection of high pathogen levels. The mode of wiping and type of toilet significantly influenced infection ($p<0.05$).
Conclusions: Hygiene factors that increases chances of E. coli infection remains among the most significant cause of UTI in gravid mothers. This study recommends integration of an elaborate awareness creation on UTI prevention measures at the early stages of pregnancy and further studies to determine the national UTI burden to device mitigation strategies.

Keywords: Predisposing factors, Prevalence, Causal organism

INTRODUCTION

Globally, urinary tract infection (UTI) in pregnancy is one of the prevalent health problems. It is the commonest infection during pregnancy. The prevalence and incidences being high in gravid women compared to other groups of people including men, children, youths, non-pregnant women and the elderly women. Studies have shown that UTI is one of the frequent bacterial infections.[1,2] The disease is common and expensive to manage owing to vulnerability of pregnant women to infections. Annually UTI infects about 150 million people imposing substantial financial burdens to the society.[3,4] The rate of developing UTI in gravid women is four times higher than non-gravid.[5,6] *Escherichia coli* is one of the most predominant UTI causing pathogen.[7]

Data on UTI patients' condition is scanty in Kenyan rural health facilities like Kanyakine hospital. Recent observational studies from developing countries indicate poor investigation of risk factors attributes to UTI during pregnancy.[8] Existing studies in Kenya indicate that UTI rate during pregnancy in many hospitals is between 10% and 19%. Routine investigations are not done for mothers and they are treated symptomatically in many hospitals.[9,10] UTI causes low birth weight (LBW), pyelonephritis and maternal morbidity which can be preventable through appropriate screening and treatment programmes.[11] There are a number of pathogens associated with UTI during pregnancy.[3] Medical reports indicate 17.9% and 13.0 % of pregnant women with UTI is caused by symptomatic and asymptomatic bacteriuria respectively.[12] *E. coli* is attributable to about 80-85% of community acquired infections.[13] *Staphylococcus saprophyticus* attributes 5-10% of incidences. Viral and fungal organisms also cause UTI but are not common. Other organisms associated with UTIs include *Pseudomonae*, *Klebsiella pneumoniae*, *Enterobacterial* and *Proteus.*[14] *E. coli* cause acute asymptomatic infections while others like proteus species and *Klebsiella* cause acute cystitis and pyelonephritis. Host factors such as age and diabetes increase vulnerability. Gram positive organisms such as *Enterococcus faecalis* and *Staphylococcus saprophyticus* contribute 5% to 15% of UTIs.[15]

Physiological and anatomical changes occurring during pregnancy contribute to increased incidence of urinary tract infections.[16] Three clinical types of UTIs are notable including asymptomatic bacteriuria (ASB) pyelonephritis and cystitis resulting to obstetric complications.[17] ASB is persistent presence of bacteria in the lower urinary tract but no symptoms of the diseases. Cystitis is the infection of the lower urinary tract while pyelonephritis is the infection of the upper urinary tract; both are symptomatic.[12]

This study focused on the relationship between three broad categories of predisposing factors which includes history of UTI, lifestyle and hygiene and the prevalence of UTI causal organisms. In developing world women are more affected in their reproductive.[18] However, in the region UTI predisposing factors have not been adequately researched despite increasing incidences.[19] Sexual intercourse, history, hygiene and young age are among UTIs predisposing factors.[3] In developing economies routine urine cultures are not often done for antenatal mothers in hospitals. Treatment relies on out dated empiric guidelines.[20] Therefore, updating knowledge on linkage between predisposing factors and causative organisms will ultimately contribute to prevention and management of gravid women UTI burden in Kenya.

METHODS

Study design and setting

Cross sectional design was applied to achieve the objectives of this study while qualitative and quantitative methods were employed. The study population was pregnant women seeking antenatal services at Kanyakine hospital Meru County between 31 August 2020 and 30 November 2020. The pregnant women who attended the clinic during the period were 938 aged between 15 and 49 years. This study used simple random sampling. Random numbers were assigned to participants in ANC of the 200 positive cases until a sample size of 135 was reached. Participants' urine specimen was collected and preserved in a cool box for culture and isolation. This design facilitates collection of large amounts of data in a short period of time. In addition, it does not manipulate variables and open way for subsequent studies. Therefore, it can be used to look for clues that guide further studies. However, the design has a few weaknesses such as non-response biases that may result into non-representation of the population.[21]

Research instruments and procedure

Semi-structured questionnaires consisting of the socio-demographic and obstetric profile, historical, lifestyle, hygiene factors and other relevant information for the study was used to collect data. Among the variables were historic factors, lifestyle factors, and prevalence of UTI pathogens. Historic factors assessed included whether the individual had suffered UTI before, frequency of previous UTI incidences and whether the patient's family had a history of UTI. Regarding lifestyle factors, the study assessed the level of sexual activity, urogenital hygiene and voiding self-control factors. Further on the prevalence of UTI pathogens, the researcher determined the distribution by the prevalence of known UTI pathogens such as *E. coli*, *Staphylococcus*, *Klebsiella*, and yeast. Women's perception of the causes of UTI and awareness about female genital mutilation (FGM) were studied as intervening factors to the observed prevalence of UTI among gravid mothers. The measurements were based on responses from the participants on practices perceived to cause variation to a specific risk factor. Microbes were identified through a further urine test, culture and microscopy from prior identified UTI positive study subjects. In addition, UTI prevalence was measured based on a laboratory test by use of urine reagent dipstick testing method, a rapid test yielding instant results. Positive predictive lab test results qualified the individual for participation in the subsequent sessions of this study.

Collection of urine samples

Participants were explained on the urine sample collection process which entailed the following five steps: washing hands thoroughly with soap and water followed by drying; separation of labial with one hand; cleaning the area around the urinary opening with water in backward direction then drying thoroughly; separating the labia void the first 20 to 30 ml in the toilet and then collecting a sample of the remaining urine into a sterile universal bottle; closing the cap of the urine bottle immediately

while avoiding hand contact with either the edge of the bottle or inner side of the bottle cap; and then the urine sample bottles were labelled with the client's name, number, and date, and then placed in the ice box immediately for eventual analysis and culture.

Detection, isolation and identification of UTI causing organisms

After testing positive by use of dipstick urine test for UTI; 135 participants were randomly sampled from a total of 200 positive cases. Data were obtained from the 135 randomly sampled pregnant women who had signed the consent form. A questionnaire was administered.

Further, determination of UTI causal organisms was expedited through isolation and identification of specific microbes in mid-stream urine clean-catch through culture using cystein lactose electrolyte deficient (CLED) media in agar plates for 24 to 48 hours. After, gram staining, biochemical tests and microscopic examination followed and results were recorded.

Data analysis

The collected data was initially transferred into the Microsoft excel spread sheet for descriptive statistics analysis. The data was then exported to statistical package for the social sciences (SPSS) software version 22.0. In SPSS the data was subjected to basic descriptive statistics and expressed as means. Cross tabulation to understand the correlation between different variables.

Descriptive statistics of frequency and percentages were used for demographic characteristics. Differences in the distribution of awareness and knowledge responses among the participants based on their demographics were evaluated using both Chi-square exact test (when expected counts are less than 5 in a cell) to test for the significant association. Differences were considered statistically significant when $p \leq 0.05$. The results were also summarized in graphs, tables and figures.

Inclusion criteria

Pregnant women receiving antenatal services at Kanyakine hospital, UTI positive and consenting to participate in the study between August 2020 and November 2020 by duly completing the participants' consent form were included.

Exclusion criteria

Pregnant women who had other conditions such as diabetes mellitus, chronic renal disease, women taking immunosuppressant medications, inflammatory bowel disease (IBD), mentally unwell, critically ill, malignancy and rheumatic disease, those taking antibiotics or a less than seven days from the last antibiotic dose.

Ethical approval

Ethical clearance was issued by the Kenyatta University Ethics Review Committee (KUERC) and a research permit to conduct the study was obtained from the National Commission for Science, Technology and Innovation (NACOSTI) of the Government of Kenya.

Researcher's safety

During data collection safety measures were complied with including maintenance of social distance, wearing face masks and gloves, and use of sanitizer during interaction with the participants, handling of specimens and questionnaires. Health messages on hygiene and appropriate treatment were given to the participants.

RESULTS

All the participants were aged between 15 and 49 years and 62% had attained at least secondary school level of education. The distribution of education level for participants indicates that half (50%) attained secondary education, 35% primary education, 12% reported that they have attained post-secondary education while 3% said they have no formal education. Most of the respondents were not formally employed in that 48.1% were unemployed and 41.5% were self-employed. Further analysis indicated that a majority 63% of the respondents' families earned Ksh. 10,000–30,000 monthly. On marital status, 71.9% of the pregnant mothers were married whereas none was widowed. The majority of participants were young mothers, 44.4% and 30.4% were in their first and second pregnancies respectively. In both cases, the pregnancies were of a gestation age below 24 weeks (Table 1).

Each pathogen was analysed against the historical factors under study. Of the respondents who tested positive for *E. coli* caused infections, majority (84.1%) had suffered from UTI before. Similar trends were recorded for all the pathogens in this study. Larger proportions of respondents in the *E. coli*, yeast (*Candida)* and *Klebsiella* categories indicated that their prior UTI infections occurred before conception (60.3%, 57.9%, 40% and 50% respectively). Majority of the *E. coli* and *Candida* infected participants indicated that they suffered UTI infections once per trimester while *Klebsiella* strain was rare. UTI cases caused by *E. coli* (60.3%), and *Candida* (52.6%) were from families where urinary tract infections had occurred (Table 2).

Regarding lifestyle factors, the study found out that the risk of UTI increased with increase in frequency sexual intercourse in a week. 47.6% of patients infected with *E. coli* had sexual intercourse three times per week. Similarly, 47.4% of yeast and 40% of *Klebsiella pneumonia* infected respondents had more than three sexual intercourse encounters per week. Results from patients who wear non-cotton undergarment indicated that 68.3% were *E. coli* infected, 60% *Klebsiella pneumoniae* and 63.2% were

yeast infected. Further, the environment was enhanced by reduced frequency of change of undergarment. Results indicated that proportions of patients that changed their undergarments once per day 63.6% were infected by *E. coli* and 71% by *Klebsiella*.

Table 1: Demographic characteristics and Chi^2/Fishers exact.

Variable and category	Percentage (%)	P value
Age in years (n=135)		
15-24	48.1	<0.001
25-35	46.7	
36-49	5.2	
Highest level of education (n=135)		
Not gone to school	3.0	<0.001
Primary	34.8	
Secondary	50.4	
Post-secondary	11.9	
Marital status (n=135)		
Married	71.9	<0.001
Single	24.4	
Divorced	0.7	
Separated	3.0	
Parity (n=135)		
0+0	44.4	<0.001
1+0	30.4	
2+0	14.8	
3+0	5.9	
1+1	2.2	
0+1	0.7	
5+0	0.7	
No answer	0.7	
Gestation period (n=135)		
<16	3.0	<0.001
16-24	31.1	
25-32	50.4	
33-40	13.3	
Don't know	2.2	
Monthly family incomes (n=135)		
<10,000	0.0	<0.001
10,000-30,000	63.0	
30,000-50,000	22.2	
50,000-70,000	13.3	
70,000-90,000	0.0	
90,000-100,000	0.7	
100,000-120,000	0.0	
>120,000	0.7	
Employment status		
Non-employed	48.1	<0.001
Self-employed	41.5	
Formally employed	10.4	

The Fisher's test is a two-sided test. The results of Fisher's Exact test showed a very highly significant (p<0.001)

Findings on genital hygiene indicated that despite the underlying UTI causes, majority of *Klebsiella pneumonia* cases (100%), *E. coli* (89%) and yeast (94.7%) wiped after defecation. Respondents (93.7%) with *E. coli* wiped from Back to front while 94.7% of yeast infected wiped front to back. Wash of genitals before and after sexual intercourse showed relatively average effects on the spread of UTI causing pathogens. Further analysis on respondents voiding practices indicated that 65% of *E. coli* infected gravid mothers voluntarily delayed voiding. Similarly, 80% of *Klebsiella pneumonia* patients delayed voiding. On the contrary, gravid mothers with yeast (63%), *Staphylococcus aureus* (70%) and *Klebsiella* (50%) did not delay voiding. While majority of the respondents (63%) held the opinion that FGM predisposes pregnant mothers to UTI, most of the *E. coli* (89%) cases *Klebsiella pneumonia* (80%) cases and yeast (95%) cases had not undergone genital mutilation (Table 3).

Using cross tabulation and Chi-square tests, results indicated that *E. coli* were the most dominant of all the other pathogens across all categories. Pregnant mothers (41.2%) who engaged in sexual intercourse once per week tested positive for *E. coli* followed closely by 35.3% for *Staphylococcus aureus*. While the trend for *E. coli* seemed to increase with increase in number of sexual intercourses per week, however, beyond three times per week, the number of *E. coli* cases dropped to 30.6% (Figure 1).

Other pathogens also displayed unpredictable trend except for yeast infected cases that increased with increase in frequency of sexual intercourse per week, whereby no case was detected for those who had sexual intercourse once per week but 19.4% cases were detected for those who had sexual intercourse more than three times per week. The differences observed were not significant at 95% confidence interval (p value=0.05) since a Chi-square test indicated a p value of 0.6. Additionally, *E. coli* was more prevalent (52.4%) in pregnant mothers who used to wear non-cotton undergarment compared to their counterparts using cotton material undergarments (38.5%) (Table 4).

In depth analysis to check whether the differences were affected by rate of changing the undergarment showed a similar trend as in material type. *E. coli* positive cases was most prevalent (45.8%) followed by staphylococcus (22.5%) and yeast 12.5%. Inter-category differences observed considering material of undergarment and number of times undergarment was changed were not statistically significant since their Pearson Chi-square test p values 0.4 and 0.768 were greater that p value of 0.05 accepted at 95% confidence interval. Other assessment was performed on genital hygiene during defecation, washing genitals before and after sexual intercourse (Table 5). Findings indicated that there was statistically significant difference (p value=0.001) for UTI pathogen trends observed between pregnant mothers who wiped back-to-front and front–to-back.

Staphylococcus aureus cases were more prevalent (38.8%) in pregnant mothers who wiped front-to-back compared to 1.5% for those who wiped back-to-front. Front-to-back

mode of wiping after defecation recorded higher prevalence rates for other pathogens but *E. coli* cases were at 86.8% for back-to-front against 6% for front-to-back. Washing genitals before sex and after sex indicated p values 0.236 and 0.234 respectively. As such, the two factors did not cause significant differences on observed prevalence rates for UTI pathogens between those who washed and those that did not. Toilet types were identified as a UTI predisposal factor for pregnant mothers (Table 6). The observed differences were statistically significant since the obtained p value of 0.006 is less than 95% confidence interval p value of 0.05.

Table 2: Relationship between identified pathogens and historical risk factors.

Historical factors	*E. coli*		*Klebsiella pneumoniae*		*Klebsiella*		*Staphylococcus aureus*		Yeast	
	N	%	N	%	N	%	N	%	N	%
Ever suffered from UTI										
Yes	53	84.1	4	80.0	4	50.0	16	59.3	15	78.9
No	10	15.9	1	20.0	4	50.0	11	40.7	4	21.1
Total	63	100.0	5	100.0	8	100.0	27	100.0	19	100.0
When suffered UTI										
During this pregnancy	17	27.0	2	40.0	0	0.0	7	25.9	4	21.1
Before conception	38	60.3	2	40.0	4	50.0	9	33.3	11	57.9
Don't know	8	12.7	1	20.0	4	50.0	11	40.7	4	21.1
Total	63	100.0	5	100.0	8	100.0	27	100.0	19	100.0
UTI frequency										
Thro' out	4	6.3	0	0.0	0	0.0	2	7.4	0	0.0
Twice/trimester	15	23.8	1	20.0	0	0.0	2	7.4	4	21.1
Once/trimester	24	38.1	1	20.0	0	0.0	4	14.8	8	42.1
Twice/gestation	8	12.7	2	40.0	5	62.5	8	29.6	2	10.5
Do not know	12	19.0	1	20.0	3	37.5	11	40.7	5	26.3
Total	63	100.0	5	100.0	8	100.0	27	100.0	19	100.0
Family UTI history										
Yes	38	60.3	1	20.0	2	25.0	8	29.6	10	52.6
No	25	39.7	4	80.0	6	75.0	19	70.4	9	47.4
Total	63	100.0	5	100.0	8	100.0	27	100.0	19	100.0

Table 3: Relationship between identified pathogens and lifestyle risk factors.

Lifestyle factors	*E. coli*		*Klebsiella pneumoniae*		*Klebsiella*		*Staphylococcus aureus*		Yeast	
	N	%	N	%	N	%	N	%	N	%
Number of times engaged in sexual intercourse per week										
Once only	7	11.1	1	20.0	2	25.0	6	22.2	0	0.0
Twice	13	20.6	1	20.0	2	25.0	3	11.1	3	15.8
Three times	30	47.6	1	20.0	1	12.5	8	29.6	9	47.4
More than three times	11	17.5	2	40.0	3	37.5	9	33.3	7	36.8
Total	63	100.0	5	100.0	8	100.0	27	100.0	19	100.0
Material of undergarment										
Cotton	20	31.7	2	40.0	5	62.5	13	50.0	7	36.8
Non cotton	43	68.3	3	60.0	3	37.5	13	50.0	12	63.2
Total	63	100.0	5	100.0	8	100.0	26	100.0	19	100.0
Change of undergarment in a day										
Once	35	63.6	2	50.0	5	71.4	2	7.4	8	53.3
Twice	19	34.5	2	50.0	2	28.6	2	7.4	6	40.0
Thrice	1	1.8	0	0.0	0	0.0	4	14.8	1	6.7
Total	63	100.0	4	100.0	7	100.0	27	100.0	15	100.0
Wipe after defecation										
Yes	56	88.9	5	100.0	2	25.0	8	29.6	18	94.7
No	7	11.1	0	0.0	6	75.0	19	70.4	1	5.3
Total	63	100.0	5	100.0	8	100.0	27	100.0	19	100.0

Continued.

Lifestyle factors	*E. coli*		*Klebsiella pneumoniae*		*Klebsiella*		*Staphylococcus aureus*		Yeast	
	N	%	N	%	N	%	N	%	N	%
How do you wipe										
Front to back	4	6.3	3	60.0	6	75.0	24	88.9	18	94.7
Back to front	59	93.7	2	40.0	2	25.0	3	11.1	1	5.3
Total	63	100.0	5	100.0	8	100.0	27	100.0	19	100.0
Wash genitals before sex										
Yes	35	55.6	2	40.0	5	62.5	22	81.5	12	63.2
No	28	44.4	3	60.0	3	37.5	5	18.5	7	36.8
Total	63	100.0	5	100.0	8	100.0	27	100.0	19	100.0
Wash genitals after sex										
Yes	26	41.3	3	60.0	5	62.5	17	63.0	8	42.1
No	37	58.7	2	40.0	3	37.5	10	37.0	11	57.9
Total	63	100.0	5	100.0	8	100.0	27	100.0	19	100.0

Table 4: Relationship between material of undergarment and pathogen prevalence.

UTI pathogen	Material of undergarment	
	Cotton (%)	Non cotton (%)
E. coli	38.5	52.4
Staphylococcus aureus	25	15.9
Yeast	13.5	14.6
Klebsiella	9.6	3.7
No growth obtained	9.6	9.8
Klebsiella pneumonia	3.8	3.7

Table 5: Mode of wiping after defecation.

UTI Pathogens	Front to back (%)	Back to front (%)
Staphylococcus aureus	38.8	1.5
Yeast	22.4	5.9
No growth obtained	17.9	1.5
Klebsiella	10.4	1.5
E. coli	6	86.8
Klebsiella pneumonia	4.5	2.9

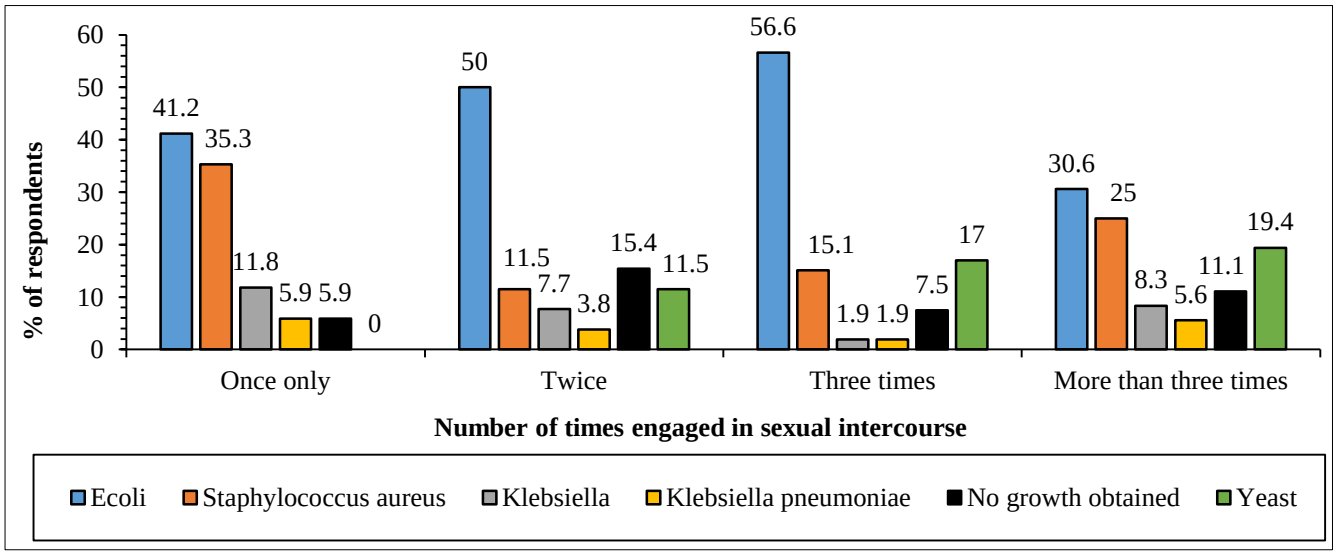

Figure 1: Relationship between numbers of times a pregnant woman engaged into sex per week and UTI causal agents detected.

Table 6: Different causal agent against toilet types.

UTI pathogens	Types of latrines			
	Sit on (low pressure flashing) type	Squatting type (high pressure flashing - Asian type)	Pit latrine	Open defecation
E. coli	60	44.4	46.7	0
Klebsiella	20	11.1	5	0
No growth obtained	20	11.1	9.2	0
Klebsiella pneumonia	0	0	3.3	100
Staphylococcus aureus	0	11.1	21.7	0
Yeast	0	22.2	14.2	0

DISCUSSION

Knowledge on risk factors contributing to the spread of UTI helps physicians to tailor prophylactic strategies to effectively minimize chances of recurrence.[22] In this regard, several risk factors were assessed and broadly categorized into the history of UTI, frequency of sexual intercourse per week, voiding practices and genital hygiene.

E. coli was the most predominant UTI pathogen followed by *Staphylococcus* strain. The majority (84.1%) of the respondents who tested positive for *E. coli* caused infections had suffered from UTI before. Similar trends were recorded for all the pathogens in this study. This would be attributed to resistance of gram-negative prophylaxis such as *E. coli*. A previous study conducted in Kenya indicated that *E. coli* obtained in Kenya are more resistant to antibiotic treatments compared to similar strains obtained in developed countries like Japan.[23]

The increased sexual activity (three and more times per week) had effect on the occurrence of UTI. These findings are consistent with a study conducted in Egypt.[24] Women having sexual intercourse three times or more per week was predictive to UTI.[8,25] A previous study had associated having sexual intercourse more than twice per week with increased UTI incidences.[26] Moreover, repeated friction of vaginal introitus and subsequent massaging of the urethra cause trauma to the urethral meatus facilitating uropathogen entry.[25] These findings also concur with other studies that the mechanical action nature of sexual intercourse expedites entry of *E. coli* strains into the urethra and bladder. Intercourse also alters the dominant vagina normal lactobacillus flora facilitating colonization of *E. coli*.[27]

Results indicated that 52.6% of the respondents did not void after intercourse. Women who do not void post-coitus were most likely to be UTI positive as compared to those who void after intercourse.[25,28] Voiding practices by the respondents indicated that 65% of *E. coli* infected gravid mothers voluntarily delayed voiding. Similarly, 80% of *Klebsiella pneumonia* patients delayed voiding. Contrary to, yeast (63%) cases, *Staphylococcus aureus* (70%) cases and *Klebsiella* (50%) cases who did not delay voiding.

Wiping anterior to posterior reduces the risk of UTI. *E. coli* is a common organism in the perineum and unhygienic practices such as wiping back to the front increases the risk of infection.[29] It is easily caused by bacteria emanating from the digestive tract that is capable to translocate to the urethra orifice to cause infection.[18] Washing genitals before sex and after sex indicated p values 0.236 and 0.234 respectively. As such, the two factors did not cause significant differences in observed prevalence rates for UTI pathogens between the two categories. Type of toilet was identified as a predisposal factor for pregnant mothers with UTI. The observed differences were statistically significant ($p<0.05$) whereby 88.9% of the respondents used pit latrines. This is contrary to findings that UTI enter the body through toilet seats.[30] Kanyakine hospital is a rural facility that serves people from low-income rural communities whose common type of toilet is pit latrine. Most households use pit latrines in rural residents of Meru County.[31]

Limitations

Being self-sponsored the study was fully dependant on family resources, as such scarcity of funds restricts the researcher. Hence, the reason for using the hospital facilities rather than field surveys for administrating research instruments and specimen test analysis, therefore, cutting down the cost.

Delimitation

This study targeted all gravid women seeking **a**ntenatal services at Kanyakine sub-county hospital Meru, in consideration that they are prone to community UTIs due to risk factors exposure.

CONCLUSION

E. coli was the most predominant UTI causal organism. Increased sexual activity was linked to increased prevalence of *E. coli, Klebsiella pneumonia* and *Candida*. Use of non-cotton material of undergarment and reduced frequency of changing undergarment favoured occurrence of *E. coli* and, *Klebsiella pneumoniae* and candida. Undergarment material and frequency of changing undergarment significantly contributed to UTI occurrence ($p<0.05$). Other urogenital related practices such as wiping

back-to-front and delayed voiding resulted into increased *E. coli* prevalence. Similarly, *Klebsiella pneumonia* patients delayed voiding. Significance test on the effects of the various risk factors on prevalence of UTI indicated that the associations were not statistically significant ($p>0.05$). Mode of wiping and type of toilet significantly influenced UTI prevalence among pregnant mothers under study ($p<0.05$). Therefore, stakeholders including relevant Government departments need to design guidelines for requiring mothers in the reproductive age to attend awareness training on the causes of UTI during their 1st trimester of their first pregnancy. This will enhance awareness and inform the mothers' lifestyle in a bid to manage all risk factors in a manner not to encourage UTI pathogens establishment.

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