Predictive Factors for Community-Acquired Urinary Tract Infection in the Rural Communities of Enugu State, Nigeria.

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Abstract
Urinary tract infection is a serious public health challenge that affects men and women, old and young, both in the community and hospital settings, causing cystitis and pyelonephritis, with associated complications. Factors that predispose individuals to UTI are gender, age, sex, marital status, and environmental factors. This study was designed to determine the predictive factors for community acquired urinary tract infection in Enugu State rural communities.In a cross-sectional study, a well-structured questionnaire was used to collect datafrom 780 respondents, to investigate their socio-demographic characteristics, symptoms of UTIs, knowledge, practices, and treatment on UTIs. Data collected were analyzed by bivariate analysis, using Q-square, and multivariate analysis using logistic regression model. Results show that the respondents have poor knowledge of UTI, and that respondents without formal education and those with FSLCE were 1.43 times less likely to have good knowledge of UTI than those with SSCE and above. Also, male respondents were 1.73 less likely to have good knowledge of UTI compared to female respondents. Age category and pregnancy predicted UTI, and respondents who were 40 years and below were 1.72 times less likely to have UTI compared to those above 40 years. Also, respondents who were pregnant women were 1.77 times more likely to have UTI compared to those who were not pregnant. The level of knowledge in this study is generally poor and level of education is directly proportional to good knowledge of UTI. Age category and marital status were factors associated with UTI.
Key Words: Community-acquired UTI, respondents, knowledge, predictor, questionnaire.

I.   Introduction

Globally, urinary tract infections (UTIs) have remained serious public health challenge. It primarily affects the urinary system, but subsequently, spread pass the urinary system, into the blood circulation, causing cystitis and pyelonephritis, withs associated complications, including kidney damage, septicemia, or death. In 2019, report indicates that more than 404.6 million (95% UI 359.4-446.5) individuals had UTIs globally and nearly 236,786 people (198,433-259,034) died of UTIs, contributing to 5.2 million (4.5-5.7) disability-adjusted life-years (Zeng *et. al*., 2022). In the United States, UTIs result in an estimated 7 million office visits, 1 million emergency department visits, and over 100000 hospitalizations with an associated annual cost of $1.6 billion (Foxman *et. al.,* 2002). UTIs can occur both in the community and hospital settings, affecting both men and women at all ages.

However, there are limited data on the true impact of UTIs in the community settings, as most studies have focused on health care related infections and associated risk factors. Moreover, these studies have largely been based on information from medical records. Thus, information on possible risk factors not regularly noted in those records is sparse (Søraas*et al*., 2013). However, few studies addressed the topic and the results have varied with regard to the setting. For instance, Magliano and colleagues, identified female gender and age as factors of CA-UTI (Magliano*et. al*., 2012), while others identified, age, female sex and marital status as factors associated with CA-UTIs (Kabugo *et. al*., 2016). Furthermore, rural background, inadequate water intake, and unsatisfactory toilet habits were found to be strong predictors of UTI (Vyas *et.al*., 2015).The findings of this study will give informed decisions in formulating policies and epidemiological interventions necessary to check UTIs and associated challenges.

Study area and period
Respondents for this study were raised from rural communities within the three senatorial zones of Enugu State, and the study was conducted in Enugu State University of Science and Technology Teaching Hospital.

Study population

Rural dwellers fromthe selected communities in Enugu state, who were within the ages of 10 to 70, and who were not in their menstrual period (for women), were recruited in this study. Also recruited, were those, who represented at least three of the symptoms of UTIs in their questionnaire, whereas those who did not meet up with these criteria, and who did not give their consent for participation in the study were excluded.

Sample size

This population-based, cross-sectional survey was conducted between February 2021 and, June, 2021 in Enugu state, Nigeria. A random sample of males and females aged 10-70 years residing in the selected communities within the three senatorial districts of Enugu state were selected. Simple random sampling technique was used to select three communities from the three senatorial zones in Enugu state, who participated in the study.

Ethical approval

Ethical Clearance: The ethical clearance for this study was sought from Enugu State University of Science and Technology Teaching Hospital (ESUT TH).

Research details were made known to the participants and their informed consent in the form of signature or thumbprint were obtained.

Data collection method

A well-structured questionnaire was used as the instrument for data collection as self or interviewer administered for the literate or illiterate respondents respectively. The questions were pre-tested on randomly selected outpatients, in ESUT Teaching Hospital, who came from rural communities within Enugu state, and who were not part of the study. This helped in testing respondents' comprehensibility of the questions and areas of ambiguity were identified and modified before we commenced the actual work.The questionnaire comprised of 20 questions, which investigated the following areas: socio-demographiccharacteristics ofthe participants, symptoms of UTIs, and the participant's knowledge, practices, and treatment on UTIs.

Analysis of data.

Data were analyzed using statistical package for Social Sciences (SPSS) version 25 (Norusis, 1990). Frequency and contingency table were used to show the distribution of data. Bivariate analysis was done using Q-square test, to determine the association between socio-demographic variables and knowledge of UTI. Multivariate analysis was done using logistic regression model, do determine predictors of UTI. The level of significance $p = 0.05$, set at 95% confidence interval.

II.   Results

Table 1 showing the socio-demographic characteristics of the participants

Variable	Sub-category	Frequency	Percent
Age	10-20	42	5.4
	21-30	200	25.6
	31-40	199	25.5
	41-50	104	13.3
	51-60	114	14.6
	61-70	121	15.5
Sex	Male	172	22.1
	Female	608	77.9
Marital status	Married	648	83.1
	Single	132	16.9
Academic qualification	None	108	13.8
	FSLCE	153	19.6
	SSEC/GCE	247	31.7
	HND/BSc	246	31.5

	MSc	24	3.1
	PhD	2	0.3
Religion	Christian	778	99.7
	Islam	2	0.3
Occupation	None	51	6.5
	Student	111	14.2
	Farmer	88	11.3
	Trading	376	48.2
	Civil servant	152	19.5
	Clergy	2	0.3

From the table above, the highest age representation in this study was 21-30 years (25.6%), followed by 31-40 years (25.5%), whereas the least represented age was 10-20 years (5.4%). There were more females (77.9%) than males (22.1%), and more married (83.1%) than singles (16.9%). The highest academic qualification recorded was SSCE/GCE(31.7%), whereas the least was PhD (0.3%). There were more Christians (99.7%) than Muslims (0.3%), and the highest occupation recorded was trading (48.2%), whereas clergy was the least (0.3%).

Table 2 showing symptoms of urinary tract infections

Variable	Sub-category	Frequency	Percent
Do you feel pains on your lower abdomen, flanks, or urethra during or after urinating	Yes	264	33.8
	No	516	66.2
How many times do you typically urinate from waking in the morning until sleeping at night	1 -2times	73	9.4
	2 – 3times	159	20.4
	3 – 4times	186	23.8
	4 – 5times	154	19.7
	5 times and above	208	26.7
How many times do you typically urinate from sleeping at night until waking in the morning	1-2 times	250	32.1
	2-3 times	204	26.2
	3 -4 times	173	22.2
	4 - 5 times	93	11.9
	5 times and above	60	7.7
Do you experience a sudden desire to urinate, which is difficult to hold	Yes	213	27.3
	No	567	72.7
Do you experience leakage of urine after you have finished urinating	Yes	120	15.4
	No	660	84.6
Is there blood in your urine (not menstrual blood)	Yes	52	6.7
	No	728	93.3
Do you have discharge from the vagina (female)/urethra (male)	Yes	278	35.6
	No	502	64.4
Does your urine smell badly (offensive odor) while urinating	Yes	128	16.4
	No	652	83.6
Does your urine have dark colour	Yes	65	8.3
	No	715	91.7
Do you feel ill	Yes	369	47.3
	No	411	52.7

The most prevalent symptom recorded in this table was feeling ill (47.2%), followed by vaginal or urethral discharge (35.6%), whereas the least represented was bloody urine (6.7%).

Table 3 showing predisposing factors to urinary tract infections

Variable	Sub-category	Frequency	Percent
Do you have or have you had any of the following (Diabetes)	Yes	67	8.6
	No	713	91.4
Urinary catheter	Yes	35	4.5
	No	745	95.5
Are you pregnant	Yes	180	23.1
	No	600	76.9

From the table above, the most represented predisposing factor of UTI was pregnancy (23.1%), whereas the least was catheterization (4.5%).

Table 4 showing respondents knowledge on UTI in relation to transmission, treatment, pathology, and prevention.

Question Item	Variable	Sub-category	Frequency	Percent
How can you get UTI	Through sexual intercourse	YES	514	65.9
		NO	266	34.1
	From toilet	Yes	368	47.2
		No	412	52.8
	It comes naturally	Yes	88	11.3
		No	692	88.7
	Through spiritual	Yes	65	8.3
		No	715	91.7
Which of the following is the best treatment for urinary tract infection	Use of antibiotics	Yes	476	61.0
		No	304	39.0
	Use of root and herbs	Yes	147	18.8
		No	633	81.2
	Prayers and fasting	Yes	120	15.4
		No	660	84.6
Can UTI lead to sterility in women and orlow libido/erectile dysfunction in men		Yes	402	51.5
		No	378	48.5
Which of the following is way of preventing UTI	Use of condom	Yes	332	42.6
		No	448	57.4
	Washing private parts with medicated soap and water	Yes	144	18.5
		No	636	81.5
	Washing private parts with hot water	Yes	125	16.0
		No	655	84.0

Table 5: Factor associated with Knowledge of UTI

Variables	Sub-category	Good knowledge	Poor knowledge	χ2	p value
Age Category	40 and below	192(43.5)	249(56.5)		
	Above 40	117(34.5)	222(65.5)	6.25	**0.012**
Academic qualification	none, FSLCE	86(33.0)	175(67.0)	7.285	**0.008**
	SSCE, HND, BSC, MSC, PHD	223(43.0)	296(57.0)		
Occupation	none, student, farmer	110(44.0)	140(56.0)		
	Others	199(37.5)	331(62.5)	2.957	0.099
Sex	Male	80(46.5)	92(53.5)		
	Female	229(37.7)	379(62.3)	4.387	**0.042**
Marital status	Married	255(39.4)	393(50.6)		
	Single	54(40.9)	78(59.1)	0.111	0.770

Age category, education less than secondary education (FSLCE and No education) and sex were the significant factors associated with knowledge of UTI.

Table 6: Predictors of good knowledge

Variable	Sub-category	AOR	P value	Lower CI	Upper CI
Age (yrs.)	40 and below Above 40	0.731	0.012	0.518	1.032
Academicqual	FSLCE and below SSCE and above	**0.695**	**<0.001**	**0.487**	**0.990**
Occupation	None, students, farmers, traders, civil servants and clergy	0.849	0.099	0.619	1.165
Sex	Male female	**0.577**	**0.042**	**0.401**	**0.829**
Marital status	Single Married	NA	0.770	NA	NA

NA means that the variable was not used for multivariate analysis because the p was >0.2.

The predictors of good knowledge were academic qualification and sex. Respondents without any formal knowledge and those with FSLCE were 1.43 times less likely to have good knowledge of UTI than those with more than SSCE and above. Male respondents were 1.73 less likely to have good knowledge of UTI compared to female respondents

Table 7: Factor associated with UTI

Variables	Sub-category	UTI	NO UTI	χ2	p value
Age Category	40 and below	373(84.6)	68(15.4)	3.994	**0.048**
	Above 40	268(79.1)	71(20.9)		
Academic qualification	None, FSLCE	211(80.8)	50(19.2)	0.478	0.489
	SSCE, HND, BSC, MSC, PHD	430(82.9)	89(17.1)		
Occupation	None, student, farmer	333(82.0)	73(19.0)	0.015	0.926
	Others	308(82.4)	66(17.6)		
Sex	Male	139(80.8)	33(19.2)	0.281	0.575
	Female	502(82.6)	106(17.4)		
Marital status	Married	521(80.4)	127(19.6)	8.268	**0.004**
	Single	120(90.9)	12(9.1)		
Are you pregnant	Yes	141(78.3)	39(21.7)	2.364	0.148
	No	500(83.3)	100(16.7)		
Diabetic or not	Yes	59(88.1)	8(11.9)	1.731	0.242
	No	582(81.6)	131(18.4)		
Duration before collecting urine	adequate duration	333(82.0)	73(18.0)	0.015	0.926
	Inadequate duration	308(82.4)	66(17.6)		

Age and marital status were the significant factors associated with UTI

Table 8: Predictors of UTI

Variable	Sub-category	AOR	P value	Lower CI	Upper CI
Age Category	40 and below Above 40	**0.581**	**0.036**	**0.359**	**0.964**
Academic qualification		NA	NA	NA	NA
Occupation		NA	NA	NA	NA
Sex		NA	NA	NA	**NA**
Marital status	Married Single	1.691	0.143	0.838	3.416
Pregnancy	Yes No	**1.769**	**0.048**	**1.006**	**3.111**
Diabetes		NA	NA	NA	NA
Duration before collecting urine		NA	NA	NA	NA

 AOR means Adjusted Odds Ratio. NA means not available for multivariate analysis because the p value from bivariate analysis was more than the 0.2 cut off point.

Age and pregnancy predicted UTI. Respondents who were 40 years and below were 1.72 times less likely to have UTI compared to those above 40 years. Also, respondents who were pregnant women were 1.77 times more likely to have UTI compared to those who were not pregnant.

III.   Discussion

From the table 1, the socio-demographic characteristics of the participants indicate that there were more of youths than elderly in this study, with more females than males, and more married than singles, with the highest percentage of them (31.7%), possessing SSCE/GCE as their highest academic qualification. They were mostly traders (48.2%), and 99% of them were Christians.

From table 2, the most prevalent symptom recorded in this study was feeling ill (47.2%), which is in conformity with a report finding (Sabih and Leslie, 2022). This was followed by vaginal or urethral discharge (35.6%), whereas the least represented symptom was bloody urine (6.7%).

From table 3, respondents' knowledge, as a predictor of UTI was assessed from their responses on questions pertaining knowledge of UTI, in relation to transmission, treatment, pathology/consequence, and prevention. Their responses show that the respondents have poor knowledge of UTI. When asked about transmission of UTI, up to 34.1% do not know that UTI can be acquired through sexual intercourse. On the same question, 47.2% are not aware that UTI can be acquired through use of toilet. Surprisingly, a reasonable percentage, 8.3% believes that UTI can come though spiritual means.

In terms of treatment, 39% of the respondents do not agree that UTI can be treated using antibiotics, instead, they are of the opinion that roots and herbs are the best treatment for UTI. Furthermore, 15.4% believe that prayers and fasting are the best treatment option for UTI.

When asked if UTI can lead to low libido/erectile dysfunction in men and sterility in women, almost half of the number of participants (48.5%) disagreed. This response, which further, stressed the poor knowledge of the respondents on UTI, is in disagreement with research findings (Wiseand Shteynshlyuger, 2008).

Surprisingly, more than half (57.4%) of the respondents believe that the use of condom during intercourse cannot prevent UTI, as well, 18.5% and 16% are of the opinion that washing vagina with medicated soap and with hot water respectively can prevent UTI

A look at the level of information the participants have on UTI, suggests the possibility of a high prevalence of UTIs in this community. This is because, those of them, who do not have the infection, have strong pre-disposition to it, whereas the infected ones, have very little knowledge of the use of antibiotics for treatment. Furthermore, the use of hot water and, or medicated soap on the vagina, as curative measures will go a long way in worsening the bad situation. One of the major reasons why people who get UTI seek treatment options is for its pathological consequences, ranging from neurologic pathology and either erectile dysfunction, orgasm dysfunction, ejaculatory dysfunction, lower urinary tract symptoms, and fertility issues, as reported (Altaweel and Seyam, 2019). As a result of gap in knowledge, the desire for treatment of any form of UTI among these respondents, is most likely to be a second priority, thus a reason for expected high prevalence.

A crosstabulation of respondent's demographics with knowledge of UTI, indicate that age category, level of education, and sex were the significant factors associated with knowledge of UTI, as reported (Medina and Castillo-Pino, 2019).

Upon multivariate analysis, it was identified that academic qualification and sex were the predictors of good knowledge of UTI. Here, respondents without formal education and those with FSLCE were 1.43 times less likely to have good knowledge of UTI than those with SSCE and above. Also, male respondents were 1.73 less likely to have good knowledge of UTI compared to female respondents. Thus, we therefore report that more educated respondents and female respondents have better knowledge of UTI. This agrees with research findings and reported (Lund, 2017).

The results of a cross tabulation between respondent's demographics and pre-disposing factors of UTI, indicate that only age category and marital status were the significant factors associated with UTI.

A multivariate analysis of these factors associated with UTI, indicate that, age category and pregnancy predicted UTI. Respondents who were 40 years and below were 1.72 times less likely to have UTI compared to those above 40 years. Also, respondents who were pregnant women were 1.77 times more likely to have UTI compared to those who were not pregnant

IV.   Conclusion

The level of knowledge in this study is generally poor, with academic qualification and sex identified as the predictors of good knowledge. Level of education is directly proportional to good knowledge of UTI, with females having better knowledge than males. Age category and marital status were the significant factors associated with UTI, with younger people less like to have good knowledge of UTI, than older ones, and pregnant women more likely to have UTI than non-pregnant ones.

V.   Recommendation

To bridge the gap in knowledge of UTI, which informs wrong believe, perception, and practices,immediate public health intervention in the form of health education and awareness campaign, should

be administered to therural dwellers in the affected communities, and they should be encourage towards formal education, with special attention paid toyounger people and pregnant women.

Compliance with ethical standards
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Disclosure of conflict of interest
The authors declare that they have no conflicts of interest.

Data Availability
All the data supporting the conclusion of the study are included in the paper.

Statement of informed consent
Informed consent was obtained from all individual participants included in the study.

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