Prevalence and Associated Factors of Urinary Tract Infections among Diabetic Patients: A Study at Kiryandongo Hospital, Uganda

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ABSTRACT

Urinary tract infections (UTIs) pose a significant health concern, especially among individuals with diabetes mellitus. This study aimed to evaluate the prevalence and associated factors of UTIs among diabetic patients attending Kiryandongo Hospital in Uganda. A descriptive cross-sectional study design was employed, and data were collected using structured questionnaires. A total of 86 diabetic patients participated, with the majority being aged ≥50 years, married, and residing in rural areas. The prevalence of UTI among the studied patients was 14.0%. Age, sex, area of residence, duration of diabetes, history of UTI, and history of catheterization were identified as significant predictors of UTI. Females, older individuals, those with a longer duration of diabetes, and a history of UTI or catheterization were at higher risk of UTIs. These findings underscore the importance of screening and early treatment of UTIs in diabetic patients to mitigate associated complications and improve health outcomes. Public health interventions aimed at UTI prevention and management should be prioritized among diabetic populations. Keywords: Urinary Tract Infections; Diabetes Mellitus; Prevalence; Associated Factors; Uganda
Keywords: Urinary Tract Infections; Diabetes Mellitus; Patients, Glucose

INTRODUCTION

Globally, it is estimated that about 150 million individuals are affected by urinary tract infections (UTIs) annually, with a significant number of those affected being diabetics [1–3]. The 2016 WHO report has shown that there is a marked increase in the number of people affected by diabetes, and this trend is scheduled to grow in geometric proportions in the next couple of decades [4]. In Africa, there is a gross change in people's lifestyles, tending more toward a westernized form of living. This has resulted in many cases of diabetes being recorded in young adults, from an estimated 35 million to 48 million from 2012 to 2017, and the target population for UTI is expanding due to the increasing diabetic cases across the continent [5, 6]. A study done in sub-Saharan Africa in 2016 found that pathogens causing UTI in diabetic patients tend to be more resistant to administered antibiotics than pathogens causing UTI in non-diabetic patients[7]. This increased resistance to antibiotics could be attributed to the frequent use of antibiotics, which is prompted by frequent infections in diabetic patients [8]. In a study carried out on profiles of Ugandans with diabetes mellitus, it was found that 7.1% of women with diabetes were found to have relapsing UTI and 15.9% had reinfection of the urinary tract compared to women without diabetes, who had 2.0% and 4.1% relapse and reinfection, respectively [9, 10], and in other studies that have been done regionally, the prevalence of UTI was found to be 10.2% in Uganda [11]

Urinary tract infections (UTI) are some of the most common infections among diabetes patients [12]. An estimated 200 million individuals are affected by UTI yearly on a global basis, with a significant number of those affected being diabetics [12]; the International Diabetes Federation (IDF) reported that in the year 2016, there were 775,200 cases of patients suffering from diabetes in Kenya. A study carried out in Sub-Saharan Africa across different government hospitals showed the magnitude of asymptomatic urinary tract infections among diabetic patients. Among the 2000 diabetic patients involved in the study, it was found that 20.9% had asymptomatic bacteriuria [13, 14]. They further showed that diabetic patients are at a higher risk of contracting an UTI than non-diabetic patients. According to a study carried out on asymptomatic bacteriuria among diabetic patients attending Mulago National Referral Hospital, the

results obtained showed that diabetes patients are 40% more prone to UTI due to metabolic disorders and lowered immunity than non-diabetic 5% in the same cohort study [15, 16]. Considering the fact that UTI is the leading cause of morbidity among diabetics, a high prevalence of diabetes is likely to translate to a high prevalence of UTI [12]. Due to the weakened immunity and metabolic disorders among diabetics, the effects of UTI are adverse in this category of individuals. Complications associated with UTI cases among diabetics increase the financial burden on health authorities [17]. Early detection and treatment of UTI among diabetics could ultimately reduce morbidity, mortality, health care costs, and diabetes-related complications in the future. Also, there is a knowledge gap about the prevalence and associated factors of UTIs among diabetics; therefore, this study seeks to find out the prevalence and associated factors of UTIs among diabetics in order to fill out the knowledge gaps.

METHODOLOGY

Study Design
The study was a descriptive cross-sectional study. Interviews were conducted using a structured questionnaire developed to collect the relevant data to meet the aims and objectives of the study.

Area of Study
The study was done at Kiryandongo Hospital. The hospital was located in Kikube parish, Kiryandongo town council, and Kibanda constituency in Kiryandongo district, western Uganda. It was a government-owned hospital established in 1974 and has a 110-bed capacity. The coordinates of the hospital are 01°52'46"N32°03'43"E. It was located along the Kampala-Gulu highway, about 50km northeast of Masindi General Hospital and approximately 101 km northwest of Hoima regional referral hospital (Hoima city). The hospital serves people from Hoima, Masindi, Kiryandongo, and surrounding districts. Kiryandongo Hospital offers diabetic care.

Study Population
The study population was diabetes mellitus patients attending Kiryandongo Hospital.

Sample Size
The incidence rate of UTI was estimated to be 6% (as shown in some studies done in developing countries). Determined using the formula for simple random sampling using single proportions given by Kish Leslie [18].

$$n = \frac{z^2\,p\,q}{d^2}$$

Where;

n = Sample size

z = z value corresponding to a 95% level of significance = 1.96

p = expected proportion of population 6 = 0.06

q = (1 - p) = (1-0.06) = 0.94

d = absolute precision (5%)

Therefore, from the above sample size is:

$$n = \frac{1.96^2 \times 0.06 \times 0.94}{0.05 \times 0.05}$$

n = 86 members were recruited into the study.

Sampling Procedure
Purposive sampling was used for the study, and all diabetic patients attending Kiryandongo during the time of the study were requested to participate in the study.

Inclusion Criteria
All diabetic mellitus patients attending Kiryandongo Hospital.

Exclusion Criteria
i.   Diabetic patients who did not consent to take part in the study.
ii. Terminally ill diabetic patients.

Data Collection
Patients were recruited by the principal investigator or research assistants. They were informed of the intended study, consent was assured, and patients were assured of confidentiality. Research assistants filled in the data collection sheets attached to the patient file with the help of the staff on duty. Respondents were interviewed in English or their own language with the help of an interpreter, depending on which language they were conversant with.

Ethical Considerations
The proposal was presented to the school administrator for approval prior to beginning the study. Permission was obtained from the faculty dean of clinical medicine and dentistry at Kampala International University Western Campus for the study. The study was carried out in accordance with existing ethical guidelines. Informed consent was sought from every patient before the questionnaire was administered. Then, permission to collect data from different files was helpful. Confidentiality was held at all costs; no information was divulged to anyone other than the researchers. All the information that was obtained from the study was treated with the utmost confidentiality and was used only for the intended purpose.

RESULTS

Socio-demographic Characteristics of Study Participants

Diabetic patients with or without symptoms of UTI were enrolled into the study during the study period. A total of 86 patients with diabetes were included in

the study. Majority (57.0%) were aged ≥50years, married (67.4%), attained secondary education (37.2%), male (59.3%) and were residing in rural areas (57.0%) as illustrated in table 1 below.

Table 1: Baseline socio-demographic characteristics of the study participants

Variable	Frequency(N=86)	Percentage (%)
Age(Years)		
≤30	11	12.8
31-49	26	30.2
≥50	49	57.0
Marital status		
Married	58	67.4
Single	28	32.6
Level of education		
No formal education	15	17.4
Primary	27	31.4
Secondary	32	37.2
Tertiary	12	14.0
Sex		
Male	51	59.3
Female	35	40.7
Area of residence		
Urban	37	43.0
Rural	49	57.0

The prevalence of urinary tract infection among the studied patients was 14.0% (12).
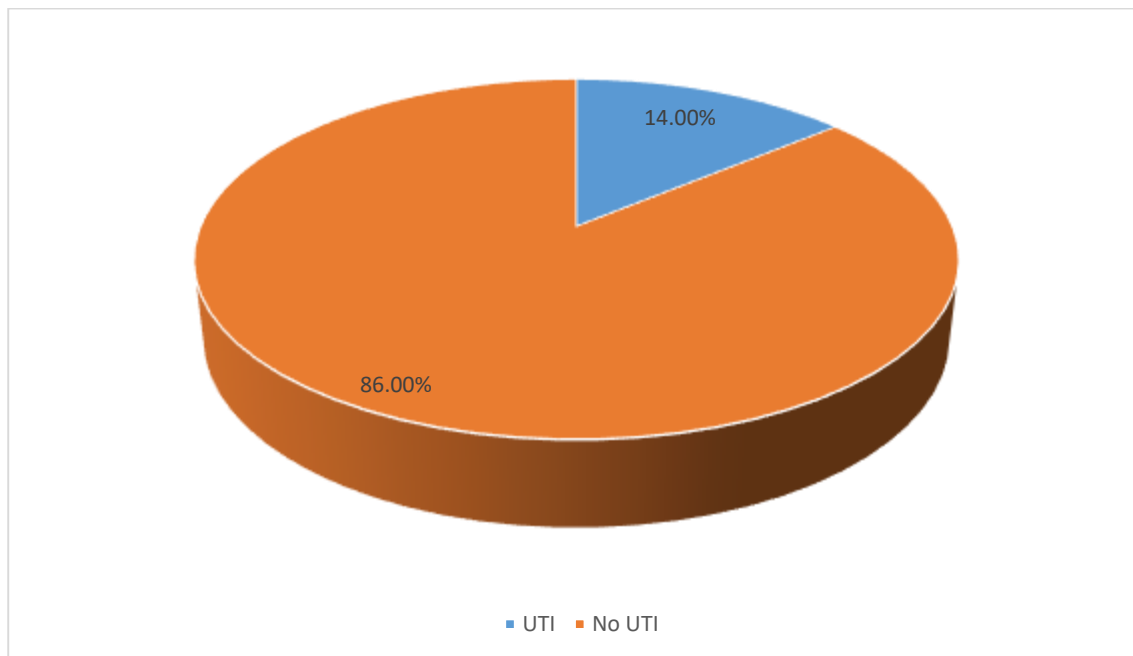

Figure 1: Prevalence of urinary tract infections among patients with diabetes

At bivariate analysis, a statistically significant correlation was observed between age, marital status, level of education, sex, area of residence, duration of diabetes, history of UTI, history of catheterization and knowledge of UTI with UTI among patients with diabetes (Table 2).

23

Table 2: Bivariate logistic regression analysis of factors associated with UTI among patients with diabetes

Variable	N	UTI	COR (95% CI)	P-value
Age(Years)				
≤30	11	01(9.1)	Reference	
31-49	26	03(11.5)	1.53(0.65-2.40)	0.021
≥50	49	08(16.3)	2.07(1.02-4.57)	0.049
Marital status				
Married	58	09(15.5)	1.86(0.98-3.21)	0.098
Single	28	03(10.7)	Reference	
Level of education				
No formal education	15	03(20.0)	2.34(1.13-4.36)	0.062
Primary	27	05(18.5)	1.49(0.85-2.20)	0.075
Secondary	32	04(12.5)	0.92(0.52-1.44)	0.472
Tertiary	12	01(8.3)	Reference	
Sex				
Male	51	07(13.7)	Reference	
Female	35	05(14.3)	3.16(1.50-6.72)	0.136
Area of residence				
Urban	37	04(10.8)	Reference	
Rural	49	08(16.3)	2.91(0.79-5.64)	0.079
Duration of diabetes				
≤5years	35	02(5.7)	Reference	
≥5years	51	10(19.6)	3.84(1.37-7.40)	0.006
History of UTI				
Yes	21	05(23.8)	6.75(2.66-10.29)	0.052
No	65	07(10.8)	Reference	
Use of detergents while bathing				
Yes	19	02(10.5)	Reference	
No	67	10(14.9)	1.09(0.54-2.67)	0.530
History of catheterization				
Yes	07	02(28.6)	6.28(2.95-8.17)	0.008
No	79	10(12.7)	Reference	
Knowledge of UTI				
Yes	54	04(7.4)	Reference	
No	32	08(25.0)	1.93(1.04-4.29)	0.106
Other chronic illnesses				
Yes	19	05(26.3)	1.20(0.57-3.10)	0.714
No	67	07(10.4)	Reference	

Age, sex, area of residence, duration of diabetes, history of UTI and history of catheterization were statistically significant at multivariate logistic regression analysis (Table 3).

Table 3: Multivariate analysis of factors associated with UTI among patients with diabetes

Variable	N	UTI	AOR(95% CI)	P-value
Age(Years)				
≤30	11	01(9.1)	Reference	
31-49	26	03(11.5)	1.15(0.33-1.72)	0.037
≥50	49	08(16.3)	1.69(0.65-3.24)	0.003
Marital status				
Married	58	09(15.5)	0.94(0.61-2.06)	0.087
Single	28	03(10.7)	Reference	
Level of education				
No formal education	15	03(20.0)	1.87(0.91-3.57)	0.055
Primary	27	05(18.5)	1.04(0.63-1.89)	0.063
Secondary	32	04(12.5)	0.51(0.29-1.13)	0.518
Tertiary	12	01(8.3)	Reference	
Sex				
Male	51	07(13.7)	Reference	
Female	35	05(14.3)	2.93(0.68-5.50)	0.002
Area of residence				
Urban	37	04(10.8)	Reference	
Rural	49	08(16.3)	2.36(0.41-5.07)	0.025
Duration of diabetes				
≤5years	35	02(5.7)	Reference	
≥5years	51	10(19.6)	3.10(1.12-6.54)	0.007
History of UTI				
Yes	21	05(23.8)	5.62(2.00-8.61)	0.045
No	65	07(10.8)	Reference	
History of catheterization				
Yes	07	02(28.6)	4.97(2.30-7.36)	0.039
No	79	10(12.7)	Reference	
Knowledge of UTI				
Yes	54	04(7.4)	Reference	
No	32	08(25.0)	1.00(0.75-3.52)	0.078

DISCUSSION

Long-term studies have linked diabetes mellitus to an increased risk of urinary tract infections. Furthermore, it is well known that individuals with diabetes have an increased risk of UTI complications, with the urinary tract being the most common location of infection among patients with diabetes. The prevalence of UTI among patients with diabetes in this study was 14.0%. This is lower compared to 33.9% and 51.3% reported in Ethiopia and Egypt, respectively[12, 19]. The study finding is also lower than the 20.6% reported in Kenya [20]. Furthermore, the prevalence is lower than the 40.2% reported in Tanzania [21]. Additionally, the prevalence is lower compared to 22.0% reported in eastern Uganda [22].

However, the study finding is lower than the 9.2% reported in Ghana [23]. The difference could be due to variations in socio-demographic characteristics.
The results of the study revealed that age, sex, area of residence, duration of diabetes, history of UTI, and history of catheterization were significantly associated with UTI. The odds of developing UTI were observed to increase with increasing age in this study. This is similar to a review that revealed that with increasing age, the risk of developing UTI in both sexes, especially in women, increases [24]. This is inconsistent with a study in Ethiopia that found no association between age and UTI among patients with diabetes [20]. A study in Uganda found an

increasing prevalence of UTI with increasing age [15]. Reduced urine flow, incomplete bladder emptying brought on by neuropathy, drops in estrogen with loss of vaginal flora in women, and prostate disease in men could all contribute to an increase in UTI occurrences in older diabetes patients [25]. In the current study, females were 2.93 times more likely to develop UTIs compared to males. It is generally acknowledged that women are more likely than men to have UTIs due to their reproductive function [26-30]. This is supported by another study in Ethiopia, which showed that female patients with diabetes were 3.77 times more likely to develop UTI than their counterparts [30-34]. This also appears to be connected to proximity to the anus, physiological bladder alterations brought on by aging or shortness of breath, and bladder neurological dysfunction [27-32]). Additionally, a study in Ghana observed a

higher risk of UTI among females compared to males [28]. This study observed that patients with a previous history of UTI were 5.62 times more susceptible to developing UTI than diabetic patients without a previous history. This is in line with a systematic review in Ethiopia [12]. Patients with a history of UTI might be more cautious to seek medical attention when UTI symptoms emerge, which is a possible explanation. The current study further found an increased risk of UTI among patients with diabetes for more than five years, which is in line with a study in Ethiopia [2]. This could be due to the long-term effects of diabetes, such as neuropathy and an impaired immune system. Chronic hyperglycemia may cause renal papillary necrosis, nephropathy, and cystopathy, which increase the risk of UTI [29-34].

CONCLUSION

This study demonstrates that the prevalence of UTI among patients with diabetes is high. Old age, being female, rural residence, duration of diabetes ≥5 years, having a previous history of UTI, and history of catheterization were predictors of UTI. Screening for UTI in diabetic individuals and early treatment should be made a public health priority since UTI in diabetic people has substantial medical and public health consequences.

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