Original Article

Urinary Clinical Manifestation In Type I And II Diabetes; An Observational Study

Dr. Fakhir Yousuf[1*], Dr. Wajeeha Elahi[2], Dr. Ameen Zubair Syed[3], Dr. Sunil Kumar[4], Dr. Imran Sharif[5], Dr. Akhtar Ali[6]

[1]FCPS, Consultant Urologist, Hamdard University, Karachi
[2]FCPS, Assistant Professor Nephrology, Hamdard University, Karachi
[3]FCPS, Consultant Nephrologist, Tabba Kidney Institute, Karachi
[4]FCPS Urology, Consultant Urologist, Karachi Institute of Kidney Disease, Karachi
[5]MBBS, FCPS, Head of Urology and Consultant Urologist, Karachi Institute of Kidney Disease, Karachi
[6]M.Phil. Assistant Professor, Department of Pharmacology, Ziauddin Medical College, Ziauddin University, Karachi
*Corresponding Author: Dr. Fakhir Yousuf, FCPS, Consultant Urologist, Hamdard University, Karachi
Email address: yousuf58@hotmail.com
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Abstract

Objective: Diabetes mellitus is a group of endocrine disorders characterized by excessive blood glucose levels in patients, either as a result of insufficient insulin secretion, improper cell response to insulin, or both. It is simple to identify and treat when frequent urination, and excessive thirst, are present. Therefore, the aim of this study was to determine the prevalence of urinary manifestations in people with type 1 and type 2 diabetes.

Methodology: This was a multicenter, cross-sectional study that was conducted using a non-probability sampling technique. The study duration was about six months, from March 1st, 2022, to August 31st, 2022. A total of 515 type 1 and type 2 diabetes patients, between the ages of 40 and 65, were included in the study. The socio-demographic parameters, such as age, gender, economic and health status, comorbidities, and urinary manifestations associated with both types of diabetes, were documented. Demographic factors, for instance, gender, comorbidities, and urinary clinical manifestations associated with type 1 and type 2 diabetes, were documented as frequencies and percentages.

Results: The study findings showed that out of 515 patients, 99(19.2%) had type 1 diabetes and 416(80.8%) had type 2 diabetes. Of them, 309(60.0%) were males and 206(40.0%) were females. The mean ages of type 1 and type 2 diabetes patients were 54.75±15.28 years. Approximately, 158(30.7%) type 1 and type 2 diabetic patients urinate frequently, and 213(41.4%) diabetes patients urinate twice the normal frequency during the day. Swelling of feet, ankles, hands, or eyes was observed in 323(62.7%) type 1 and type 2 diabetes patients, it occurred bilaterally in 113(35.0%) patients and unilaterally in 210(65.0%) patients.

Conclusion: This study concluded that the majority of patients present with typical symptoms of type 1 and type 2 diabetes, showing frequent urination and frequent thirst. Moreover, swelling of the feet, ankles, hands, and eyes was also observed.

Keywords: Nocturia, Type 1 and type 2 diabetes mellitus, Frequent urination.

INTRODUCTION

Diabetes mellitus (DM) is becoming more widely recognized as a serious health concern. Recent World Health Organization (WHO) data stated that 347 million people globally have diabetes, with type 2 diabetes accounting for 90% of cases. Due to the numerous clinical implications of DM and its associated conditions, patients with DM have a poor standard of life [1,2].

The American Diabetes Association has established four different classifications for diabetes mellitus [3]. The development of type 1 diabetes, which accounts for 5–10% of all instances of diabetes, is brought on by the loss of

pancreatic beta cells and the ensuing decreased insulin production. Contrarily, type 2 diabetes, which makes up 90–95% of all cases of the disease, is caused by insulin resistance as well as deficiencies with insulin secretion. The third type of diabetes, known as gestational diabetes, affects roughly 4% of all pregnancies in the United States and is diagnosed when there is any degree of glucose intolerance present at the beginning of pregnancy. Lastly, fourth diabetic disorders, which comprises genetic -cell deficiencies or defects in insulin action, pancreatic infectious diseases, endocrinopathies, infections induced by drugs, and genetic syndromes [3].

In recent years, type 2 diabetes has become more common [4,5]. It was estimated that 415 million adults had type 2 diabetes in 2015, and by 2040, that number is expected to rise to 642 million [4]. Male's incidenceincreased from 4.3% to 9%, and female's prevalence from 5% to 7.9% [5]. Amputation of the lower extremities, kidney disorders, viral disorders, and cardiovascular disease are among the diseases that type 2 diabetes makes people more susceptible to [6,7].

An individual with a genetic susceptibility to diabetes may develop the disease as a result of one or more environmental triggers such as dietary patterns. The clinical signs and symptoms of T1DM include frequent urination, extreme thirst, increased hunger, loss of weight, dry mouth, GIT problems, nausea, fatigue, vision blurring, breathlessness, frequently occurring skin infections, urinary tract infections, vaginal infections, anxiety or mood fluctuations, and bedwetting in children who have not been wet at night [8].

T2DM is characterized by insulin resistance and, probably, a little reduced insulin secretion. Excessive thirst, excessive urination, visual impairment, irritation, tiredness, numbness or tingling in the hands or feet, prolonged healing of wounds, yeast infections, increased appetite, a decrease in weight, and a greater chances of infections are some of the signs and symptoms of type 2 diabetes. Type 2 diabetes is primarily caused by genetics and lifestyle changes [9]. Type 2 diabetes is brought on by a number of lifestyle variables, including obesity, inactivity, and improper consumption of meals, tension, and urbanization. Beverages with sugar additives are one dietary component linked to a greater risk of type 2 diabetes [10].

The type and extent of diabetes have an influence on severity of symptoms. Those with significant hyperglycemia, especially children with absolute insulin insufficiency, may suffer excessive urine, increased appetite and thirst, loss of weight, and vision impairment. A few diabetes individuals, especially those with early phase of type 2 diabetes, are symptomless. Ketoacidosis or, less frequently, non-ketotic hyperosmolar syndrome, which result in stupor, coma, and, if left untreated, death, can develop in uncontrolled diabetes [11,12].

In any diabetic patient exhibiting symptoms suggestive of UTI, the diagnosis of UTI should be considered. For a lower UTI, these symptoms include frequency, urgency, dysuria, and suprapubic pain; for an upper UTI, these symptoms include costovertebral angle discomfort/tenderness, a high body temperature and shivers, with or with no symptoms of the lower urinary tract [13]. In a recent South Korean multi-center study of women with community-acquired acute pyelonephritis, abdominal discomfort, costovertebral angle soreness, and symptoms of lower UTI were considerably less common in diabetic patients than in non-diabetic patients [14]. Type 2 diabetes patients with UTI may exhibit hypo- or hyperglycemia, a non-ketotic hyperosmolar condition, or even ketoacidosis, all of which call for the immediate exclusion of infectious precipitating causes, such as UTI [15].

An extremely prevalent and undesirable lower urinary tract symptom is nocturia [16]. Age is a factor in nocturia frequency. According to comprehensive research, 25% of people in their 60s experience nocturia at least twice per night [17]. Nocturia can lead to falls, fractures, and a rise in elderly people mortality in addition to disrupting sleep and lowering quality of life. According to one meta-analysis, nocturia increases the incidence of fractures by 32% and falls by about 20% [18]. Additionally, a different meta-analysis has shown that nocturia is linked to a 1.27-fold increased risk of death [19]. Consequently, it is crucial to identify the causes of nocturia. Nocturia is strongly correlated with aging, but it is also greatly influenced by diabetes and hypertension [19].

There is still a dearth of data on the prevalence of the clinical manifestation of DM. Additionally, it is imperative to comprehend the clinical features associated with DM at the initial phase in order to timely diagnose. Therefore, the

aim of this study was to assess the prevalence of urinary clinical manifestations of type 1 and type 2 diabetes mellitus among the Pakistani population.

METHODOLOGY

This was a multicenter, cross-sectional study that was conducted using a non-probability sampling technique. The ethical approval was obtained from the Ethical Review Board of the concerned hospital. The study duration was about six months, from March 1st, 2022, to August 31st, 2022. A total of 515 type 1 and type 2 diabetes patients, between the ages of 40 and 65, were included in the study. Whereas, recipients with extensive weight loss, low fasting glucose, low glucose tolerance, and those who underwent any surgical procedure, or chemotherapy were excluded from the study.

The latest HbA1c, anestimate of glycemic control, was used to diagnose T1DM and T2DM patients. Gender, age, economic and health status, presence of co-morbidities, and clinical manifestations of diabetes were documented. Furthermore, body mass index (BMI) was evaluated by height and weight calculations.Assessed the existence of stress, anxiety, and depressive symptoms. Investigatorsobserved pulse rate, respiratory rate, and blood pressure. After three measurements, the maximum blood pressure and the average of the pulse rates were calculated. Information on urinary clinical characteristics of type 1 and type 2 diabetes was gathered through the use of a questionnaire. Freshly voided 5–10 ml of clean midstream urine samples were collected for examination in a sterile container. Samples were submitted immediately to the lab, for analysis. For the treatment of T1DM and T2DM patients, the initial course of treatment (initiation on either oral hypoglycemic medications or insulin, or initiation on lifestyle changes alone) was also recorded.

The data was entered and analyzed using SSPS version 20.0. Demographic factors,for instance, gender, comorbidities, and urinary clinical manifestations associated with type 1 and 2 diabetes, were documented as frequencies and percentages. For Continuous variables, such as age, weight, height, BMI, and vital signs were reported as means and standard deviations.

RESULTS

A total of 515 patients, of whom99(19.2%) hadtype 1diabetes and 416(80.8%) had type 2 diabetes, were included in the study. Of them, 309(60.0%) were males and 206(40.0%) were females. The mean ages of type 1 and type 2 diabetes patients were 54.75±15.28 years. The mean weight of the patient was 68.31±14.71 kg. The mean height of the patient was 67.64±10.71 inches. The mean BMI of patient was 24.96±10.70 kg/m^2. The mean respiratory rate of the patient was18.94±5.81 breaths/min. The mean temperature of the patient was 69.68±25.67 ^oF. The mean systolic blood pressure of thepatient was 172.53±48.89 mm Hg, and the mean duration of hypertension was 4.92±4.58 years. The mean heart rate of the patient was 85.11±11.43 beats/min. The mean RBS of patients was277.48±104.06, as shown in Table I.

The majority of diabetic patients belonged to the middle-class 304(59.0%), and 125(24.3%) belonged to the high class. Most of the type 1 and type 2 diabetes patients 338(65.6%) had a history of hypertension, and 368(71.5%) patients had a medical history of diabetes. Furthermore, a history of depression was detectedin 178(34.6%) diabetes patients. Around 176(34.2%) type 1 and type 2 diabetes patients had a history of smoking. More than half 268(52.0%) type 1 and type 2 diabetes patients were physically active. Type of diabetes showed that most of the patients 416(80.8%) had type 2 diabetes while type 1 diabetes was detected in 99(19.2%) patients. As far as the therapies are concerned to control their diabetes, oral hypoglycemic drugs were used by the 200(38.8%) diabetes patients, 128(24.9%) used insulin, 67(13.0%) patients controlled their sugar level through diet only, 74(14.4%) patients controlled by diet along with oral hypoglycemic drugs, and 46(8.9%) patients controlled by diet along with insulin,as shown in Table II.

The presence of urinary manifestations revealed that 158(30.7%) type 1 and type 2 diabetic patients urinate frequently, and 213(41.4%) diabetes patients urinate twice the normal frequency during the day, and 194(37.7%) diabetes patients urinatetwice the normal frequency during day, and wake up at night for urination. The majority of type 1 and type 2 diabetes patients 358(69.5%) urinate three times at night, while 142(27.6%) urinate every two hours. The color of urine indicated that light-colored urine was observed in 358(69.5%) diabetes patients and dark yellow urine was seen in 142(27.6%), as shown in Table III.

Clinical features related to fluid balance in diabetic patients revealed that blood pressure became worse in 243(47.2%) patients. Swelling of feet, ankles, hands, or eyes was observed in 323(62.7%) type 1 and type 2 diabetes patients, it occurredbilaterally in 113(35.0%) patients and unilaterally in 210(65.0%) patients. Grading of bilateral edema revealed that about 44(38.4%) patients showed mild edema, 54(48.0%) patients showed moderate edema, and severe edema was noticed in 15(13.6%) patients. Symptoms become worse at night in 239(46.4%) diabetes patients. Increased thirst was noticed in 198(38.4%) type 1 and type 2 diabetes patients, as shown in Table IV.

Table I: Demographic details of type 1 and 2 diabetes patients (n=515).

Variable	Mean±SD
Age (years)	54.75±15.28
Weight (kg)	68.31±14.71
Height (inch)	67.64±10.71
BMI (kg/m^2)	24.96±10.70
Respiratory Rate (breaths/min)	18.94±5.81
Temperature (ºF)	69.68±25.67
Systolic blood pressure (mmHg)	172.53±48.89
If yes (years)	4.92±4.58
Heartrate (beats/min)	85.11±11.43
Random blood sugar (RBS)	277.48±104.06

Table II: The prevalence of gender, comorbidities, socioeconomic status, and type of diabetes.

Variable		n	%
Gender	**Male**	309	60.0
	Female	206	40.0
Socio Economic Status	**Low**	86	16.7
	Middle	304	59.0
	High	125	24.3
Hypertension	**Yes**	338	65.6
	No	177	34.4
Diabetes Mellitus	**Yes**	368	71.5
	No	147	28.5
Depression	**Yes**	178	34.6

	No	337	65.4
History of Smoking	**Yes**	176	34.2
	No	339	65.8
Physical Activity	**Yes**	268	52.0
	No	247	48.0
Type of Diabetes	**Type I (Insulin-dependent diabetes mellitus)**	99	19.2
	Type II (Non–insulin-dependent diabetes mellitus)	416	80.8
Used therapies to control Diabetes	**Oral hypoglycemic drugs**	200	38.8
	Insulin	128	24.9
	Diet only	67	13.0
	Diet along with Oral hypoglycemic drugs	74	14.4
	Diet along with Insulin	46	8.9

Table III: Genitourinary manifestations in diabetic patients.

Variable		**n**	**%**
Frequent urination	**Yes**	158	30.7
	No	357	69.3
If yes then	**Twice thenormal frequency during day**	213	41.4
	Twice the normal frequency during day and have to wake up at night for urination"	194	37.7
	Less than normal frequency	108	21.0
Urination at night	**3 times at night**	358	69.5
	every two hour	142	27.6
	every hour	15	2.9
Color of urine	**Light-colored urine**	358	69.5
	Dark yellow urine	142	27.6
	Very dark or bloody urine	15	2.9

Table IV: Clinical features related to fluid balance in Diabetic patients.

Variable		**n**	**%**
BP control becomes worst	**Yes**	243	47.2

	No	272	52.8
Swelling of feet ankles hands or eyes	**Yes**	323	62.7
	No	192	37.3
Edema if yes then	**Bilateral**	113	35.0
	Unilateral	210	65.0
If bilateral then	**1+ Mild (Both ankles/feet)**	44	38.4
	2+ Moderate (Both feet, hands, lower arms and lower legs)	54	48.0
	3+ Severe (Generalized bilateral pitting edema, including both legs, arms feet and face)"	15	13.6
symptoms become worse at night	**Yes**	239	46.4
	No	276	53.6
Increased thirst	**Yes**	198	38.4
	No	317	61.6

DISCUSSION

Diabetes mellitus is a group of endocrine disorders which is characterized by the excessive blood glucose levels in patients, either as a result of insufficient insulin secretion, improper cell response to insulin, or both. Its numerous etiologies are characterized by hyperglycemia and abnormalities in the metabolism of fat, protein, and carbohydrates. It may go undiagnosed for many years, causing no pain, and only become apparent when symptoms like prolonged weight loss, blurred vision, a wound that won't heal, or even diabetic ketoacidosis, a stroke, renal failure, or cardiovascular disease manifest. It is simple to identify and treat when frequent urination, excessive thirst, and appetite are present [20].Therefore, this study demonstrated the urinary symptoms associated with type 1 and type 2 diabetes patients.

One of the cross-sectional research that was carried out in a tertiary care hospital of Karachi, Pakistan, in 2019. The study included 160 diabetic patients, who ranged in age from 11 to 90. There were 108 women and 52 men among the 160 patients. Of all subjects, 124 (78%) had type 2 diabetes, while 57 (36%) had type 1 diabetes. A total of 117 people (73%) displayed mental disorientation, 104 (65%) reported high blood pressure, 49 (31%) had nephropathy, a kidney disease, and 79 (49%) reported discomfort in their legs or knees. Some patients 99 (62 %), were found to experience greater hunger, 18 (74%) of those who reported having frequent urges to urinate and 123 (77 %) also reported being thirsty [21]. The present study was inconsistent with the above mentioned study and showed that most of the studied patients had type 2 diabetes 416(80.8%) with male predilection 309(60.0%). The majority of the type 1 and type 2 diabetes patients 338(65.6%) had a history of hypertension. Concerning urinary symptoms, it was revealed that 158(30.7%) type 1 and type 2 diabetic patients urinate frequently, and 213(41.4%) diabetes patients urinate twice as frequently during the day. Moreover, swelling of the feet, ankles, hands, or eyes was observed in 323(62.7%) type 1 and 2 diabetes patients while increased thirst was noticed in 198(38.4%) patients.

According to one of the Indian research, hypertension and diabetes mellitus were discovered in a total of 8.6% of elderly participants (including males and females),[22] which was less than that was observed in an earlier study carried out in Karnataka, India (9.02%) [23]. In contrast to prior research, the prevalence of hypertension and diabetes mellitus varies, which may be a result of regional differences in age, genetic history, lifestyle, environment,

methodological standards, and criteria for diagnosis [22]. These findings were inconsistent with the present study and revealed that the prevalence of hypertension 338(65.6%) and diabetes 368(71.5%) was higher in the present study.

Additionally, a population-based cross-sectional study conducted in 2017 by Anjana, et al. revealed that the total occurrence of diabetes in all 15 Indian states was 7.3%. Diabetes was more common in people who had higher SES in the rural regions of all states. However, people with lower SES had a greater incidence of diabetes in urban areas of some of the higher-income states. In all 15 states, the total incidence of pre-diabetes was 10.3%. In both urban and rural settings, age, male gender, overweight or obese, hypertension, and family history of diabetes were independent risk factors for the disease. It is quite concerning that diabetes is spreading to economically underprivileged groups in society, necessitating immediate preventive action [24]. These findings were not corroborated with the present findings and indicated that most of the type 1 and type 2 diabetes patients belonged to middle SES 304(59.0%).

Over the past 20 years, developing nations have seen an abrupt rise in the incidence of DM worldwide. Similarly, another population-based cross-sectional study conducted in India, which demonstrated that in comparison to rural areas, urban areas have a higher prevalence of DM. Adults who are older than 40, are obese, and have high blood pressure are more prone to acquire diabetes mellitus. Modifying one's lifestyle and reducing risk factors are necessary for DM management [25]. The present study was in accordance with the above mentioned research and showed that adults with a mean age of 54.75±15.28 years, a higher BMI, and presence of comorbidities such as hypertension were the risk factors for developing diabetes.

Diabetes is a frequent cause of nocturia for a number of reasons. The flow of urine in the night can be greatly increased by osmotic diuresis brought on by hyperglycemia [26]. Additionally, peripheral nerve stimulation that results in bladder sensory dysfunction or hyperactive detrusor or diabetes-induced cerebrovascular disease may be the reason of a hyperactive bladder [26]. According to a Japanese study, 25% of diabetic individuals also experienced bladder detrusor hyperreflexia [26]. As far as the present study is concerned, the majority of type 1 and type 2 diabetes patients 358(69.5%) urinated three times at night, while 142(27.6%) urinatedevery two hours.

Similarly, another study indicated that nearly all newly diagnosed diabetic patients experienced frequent urination (100%) as well as persistent thirst (79%) [27]. Likewise, another research demonstrated late presentation of diabetes in nations with lower incomes [28]. The reason for the late presentation in this situation is probably due to inadequate patient knowledge of diabetes along with little clinical awareness of diabetes among healthcare professionals. Many low-income nations rely on the presence of obvious symptoms to diagnose diabetes because high-risk patients are not currently offered diabetes screening through primary care services [28]. These findings were not in accordance with the present study and revealed that most of the diabetes patients 304(59.0%) were belonged to middle-class families. Frequent urination and increased thirst were present in 158(30.7%) and 198(38.4%) type 1 and 2 diabetes patients, respectively.

CONCLUSION

This study concluded that the majority of patients present with typical symptoms of type 1 and type 2 diabetes, showing frequent urination and frequent thirst. Moreover, swelling of the feet, ankles, hands, and eyes was also observed. Moreover, having comorbid conditions like diabetes and hypertension increased a person's risk of developing type 1 and type 2 diabetes. Patient education and lifestyle changes are crucial for enhancing the health and quality of life of people with diabetes mellitus.

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