OPEN ACCESS   ORIGIONAL ARTICLE

AWARENESS AND DEVELOPMENT OF COMPLICATIONS IN DIABETIC PATIENTS VISITING IN OPD.

Muhammad Ahmer Saleem[1], Nadia Kiran[2], Marvi Memon[3], Ammarah jamil[4]

ABSTRACT:
OBJECTIVE: The objective of this study was to assess the awareness about diabetes and its complications among diabetic patients and to determine the association between diabetic awareness and medication compliance in patients suffering from diabetes. **Study Design:** Cross-sectional study. **Study period:** The study was conducted for Four months after ethical approval from IRB. **Study Setting:** Study data was collected from multisite, which includes Karachi institute of Kidney disease (KIKD), Shine Humanity (Thatta), and a Primary Care Unit located in Karachi and Hyderabad. **MATERIAL and METHODS:** Total 800 patients were involved in the study; Data was collected during detail interviews from diabetes diagnosed patients on a structured questionnaire, having patient's demographical details, the complications of diabetes and awareness regarding diabetes were asked and recorded on a questionnaire. Data was examined by SPSS 26. **RESULTS:** A total 0f 800 patients diagnosed with diabetes were included in our study, in which 374 (46.7%) were male patients and 426 (53.3%) were women patients. The results elaborated 352 (44%) out of 800 patients had a good knowledge of diabetes whereas 448 (56%) had a poor knowledge regarding diabetes. The Data indicating comparison between the knowledge level of diabetes and the compliance to medicines among study participants; based on the findings, majority of the participants have a poor knowledge of diabetes. Furthermore, those with a low medication compliance also had a lack of awareness for diabetes. A statistically significant (p<0.05) relation between knowledge level and medicine compliance was demonstrated among the study participants. **CONCLUSION:** Study observed lack of awareness regarding diabetes and its complications. The unawareness of diabetes and its complications found a significant relationship with medication compliance among diabetic patients. It was observed that raising awareness about the complications associated with diabetes is intimately linked to medication compliance. Patients who are well-informed about the risks and consequences of non-compliance are more likely to take their medications as directed, leading to better disease management, reduced complications, and improved overall health outcomes.
KEYWORDS: Diabetes, Diabetic complications, Awareness, Medication compliance.

1. General Physician, Burni Medical Centre, Karachi, Pakistan.
2. MBBS,RMP, Karachi
3. Medical officer, MBBS, RMP, Shine humanity Garib Sons clinic, Gharo, district Thatta.
4. Family physician, MBBS, MCPS (family medicine) Karachi institute of kidney diseases,

FOR CORRESPONDANCE: Dr. Muhammad Ahmer Saleem,General Physician, Burni Medical Centre, Karachi, Pakistan. Email: ahmersaleem@live.com. Contact: 03340224402.

INTRODUCTION

"Diabetes mellitus" (DM) is a serious chronic non-communicable ailment that has an impact on the world economy.[1] At its foundation, diabetes mellitus is a problem with the body's

capacity to control glucose, which is necessary for providing energy to our cells.[2] Whether due to a lack of insulin production or resistance to its effects, every aspect of a person's well-being is affected by the consequences, from daily activities to long-term health prospects. It also has significant adverse effects on the physical and mental health, productivity, and patient's quality of life, which has long-term socioeconomic repercussions. As the occurrence of diabetes remains to rise globally, understanding the potential complications associated with this condition becomes increasingly crucial.[3] According to the "International Diabetes Federation" (IDF), in 2022, 26.7% of grownups in Pakistan are pretentious by this disease making the total number of circumstances around 33,000,000.[4] It has been verified that uncontrolled diabetes can lead to many diabetes related complications. These complications may be sudden or develop over time. Chronic conditions include those involving the micro- and macro-blood vessels, respectively.[5,6] Diabetic retinopathy, diabetic neuropathy (both sensory and motor), and diabetic nephropathy are all examples of micro-vascular problems. Cardiovascular disease, which can lead to angina or a heart attack; peripheral arterial disease, which can lead to intermittent claudication; cerebrovascular incidents, such as TIAs and strokes; sensory neuropathy; and vascular damage in diabetic feet are all examples of macro-vascular problems.[3,7] Acute consequences include pulmonary and gingival infections, as well as coma and hyperosmolar diseases due to hyperglycemia.[8] The prevalence and incidence of the disease have grown worldwide, especially in developing nations. Therefore, the difficulty of the issue and its complexity are now accompanied by an increased financial burden. Since diabetes mellitus is a chronic condition, so it's appropriate management is essential to enhancing quality of life.[4,9] In some cases, especially with Type 2 diabetes, individuals may have mild or even no symptoms at all, especially in the early stages of the disease. This can lead to a lack of awareness as there are unnoticeable warning signs such as excessive thirst, frequent urination, or unexplained weight loss. Undiagnosed diabetes can also lead to complications as high blood sugar levels persist without treatment. The unawareness of diabetes is a significant public health concern because it means that a portion of the population is not receiving the necessary medical care and education to manage their condition. This can lead to a greater burden on healthcare systems and increased healthcare costs. On the other hand awareness and vigilance are the cornerstones of managing diabetes and preventing complications. Diabetic patients must educate themselves about the potential risks and take proactive steps to maintain optimal health, working closely with their healthcare team to ensure the best possible outcomes. Early detection and intervention can make a significant difference in reducing the influence of diabetes-related complications on a patient's life.

The aim of this study was to identify knowledge gaps among diabetic patients and develop effective interventions to improve awareness of diabetes complications. The findings have important implications for diabetic patient management and care. By identifying factors influencing awareness, targeted interventions can improve patient education and awareness, leading to better disease management, health outcomes, and quality of life.

MATERIALS METHODS

This "Cross-sectional" study was conducted for Four months of time period from 15th March 2023 to 15th September 2023. The research protocol was reviewed and approved by the "Institutional Review Board of the College of Family Medicine Pakistan". Study data was collected from multisite, which includes the "Karachi Institute of Kidney Disease" (KIKD), Shine Humanity (Thatta), and a Primary Care Unit located in Karachi and Hyderabad. A total of 800 patients, diagnosed with diabetes were enrolled in this study by the following inclusion criteria. The sample size was calculated by using OpenEpi software by following Confidence level = 95% and Precision = 3%. The age limit of the patients was 18 years and above, diagnosed cases of Type 1, Type 2 Diabetes Mellitus and Gestational diabetes, patients who agreed to participate in the study and gave informed consent and a minimum of three (>3) months since the diagnosis of diabetes were included in the study, whereas Patients who had a mental disability and

patients who disagreed to participate were excepted from the study. Patients fulfilling the presence standards were asked for informed verbal consent. Data was collected on a hard copy of the questionnaire by the principal investigator and co-investigator. The questionnaire consisted four sections of questions covering demographic details e.g, age, gender, ethnicity, years of schooling, marital status, monthly household income, occupation, BMI, and Comorbidities. Patient's and family's history regarding diabetes, awareness of diabetic complications, and compliance were used to collect the information. All the data was kept confidential and anonymous. Awareness as outcome was measured at the time of analysis.

Data Analysis:
Data were analyzed by using SPSS version 26. Mean±Sd/ Median (IQR) was reported for quantitative variables. E.g, Age, duration of diabetes, BMI, years of education, household income. The mean or median was reported after assessing the normality. Frequency and percentages were reported for all the categorical variables. E.g, gender, marital Table-I showing "Socio-demographical features of Diabetic patients".

status, ethnicity, occupation, comorbidities, patient's and family's history regarding diabetes, questions about awareness, and questions about compliance. The Chi-square / Fisher exact test was functional to see the connotation among the awareness of diabetic difficulties with the rest of the categorical variables and compliance. P value <0.05 was considered as statistically important

RESULTS
A total 0f 800 patients diagnosed with diabetes were involved in our study, a total number of 374 (46.7%) were male patients, while 426 (53.3%) were "female patients", As per the data collected majority of them were female compared to their counterparts while most of them were of younger age 244 (30.5%) in the age group 18-29 year. The mean age of study participants was 51.7 ± 11.4 with a range of 1–83 years. Almost two third of them were from the urban areas 493 (61.6%) and 307 (38.4) patients from rural areas. The mean duration of diabetes reported by participants was 6.2 ± 6.5 years, with a range of 0.1–54 months Study reported all necessary socio-demographical features of patients visiting in OPD.

Table-I Socio-Demographic features of Diabetic patients presenting in OPD		
Socio-demographic variables	**Categories**	**n (%)**
Age	• 18-29 • 30-39 • 40-49 • 50 and above	244 (30.5) 229 (28.6) 198 (24.7) 129 (16.2)
Gender	• Male • Female	374 (46.7) 426 (53.3)
Education	• No formal • Primary • Secondary • Higher	210 (26.2) 319 (40.0) 163 (20.3) 108 (13.5)
Marital Status	• Unmarried/Single • Married • Widowed • Divorced	245 (30.7) 416 (52.0) 86 (10.7) 53 (6.6)
Residence	• Urban • Rural	493 (61.6) 307 (38.4)
Occupation	• Housewife • Farmer • Labor	157 (19.6) 165 (20.6) 185 (23.1)

	• Merchant • Government Job	200 (25.0) 93 (11.6)
Duration of DM	• ≤ 5 years • 6-10 year • > 10 years	529 (66.1) 178 (22.3) 93 (11.6)
Family history of DM	• Yes • No	229 (28.6) 571 (71.4)
Treatment used for DM	• Oral • Injectable(insulin) • Both	265 (33.2) 429 (53.6) 106 (13.2)
Household Income	• < 25000 PKR • 25000-50000 PKR • 50001- 100000 PKR • > 100000 PKR	301 (37.6) 137 (17.2) 165 (20.6) 197 (24.6)

According to this present study, the majority of the participants were suffering from type II DM followed by type I DM and Gestational diabetes. (As shown in graph, Figure 1)
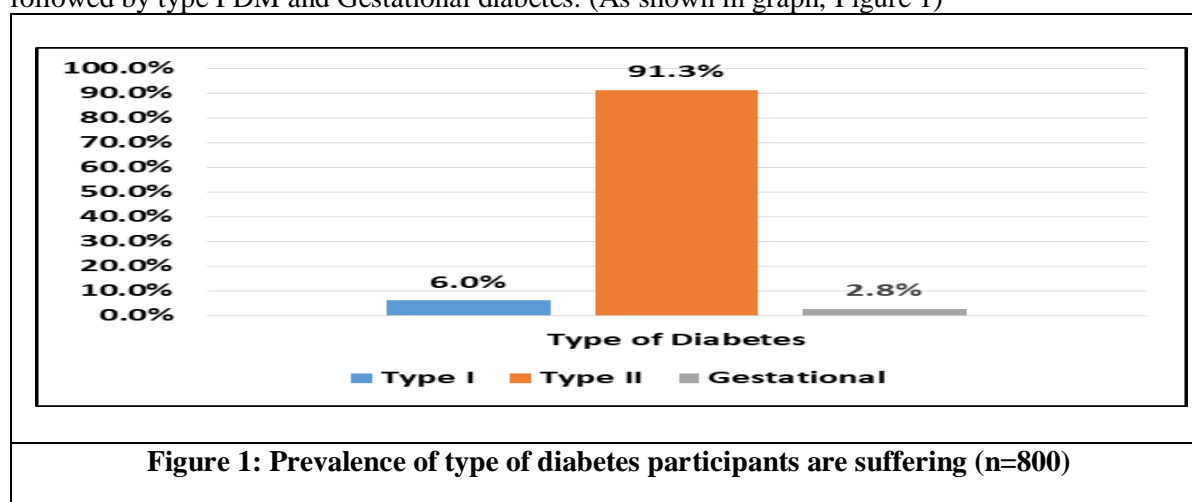

Figure 1: Prevalence of type of diabetes participants are suffering (n=800)

The prevalence, duration, and type of complication details of study participants are mentioned in Table II below. Based on the findings majority of the participants was suffering from diabetes related complications. Among those who were suffering from the complications, the majority were suffering for <2 years followed by 2-5 years and >5 years respectively. Half of the participants reported that they were suffering from decreased sensations in the lower limb (neuropathy). (Table II)

Table II: Prevalence and duration of Complications of Diabetes among Study Participants		
Variables	Categories	n (%)
Are you suffering from any complications of diabetes?	• Yes • No • Don't Know	690 (86.3) 86 (10.7) 24 (3.0)
If yes, how long have you been suffering from these diabetic complications?	• <2 years • 2-5 years • > 5 years	352 (51.0) 258 (37.4) 80 (11.6)
Which diabetic complications, are you suffering from?	• Decreased sensations in the lower limb (Neuropathy) • Muscle weakness and pain • Decreased and/or Blurry vision (retinopathy/Cataract)	401(50.0) 10 (1.2) 18 (2.2)

• Infection (UTI, Respiratory, Skin)	24 (3.0)
• Poor/delayed wound healing	79 (10.0)
• Ulcers in foot / Toenail Infections. (Diabetic Foot)	83 (10.4)
• Kidney-related issues / Swelling / decreased urine output. (Nephropathy)	54 (6.7)
• Raised Blood Pressure >130/90mmHg (Hypertension)	82 (10.2)
• Dental Cavity	49 (6.0)

Participant's awareness regarding diabetes and its complications is present in Table III. Majority of the participants didn't know about the normal level of fasting blood glucose. The majority of participants replied that frequent urination followed by increased thirst and blurring of vision are the communal indications of improved serum glucose level. Whereas, the majority of them reported that sweating and tremors are the most collective indications of low blood sugar. According to the majority of participants, diabetic foot and eye-related problems are the most common complications of uncontrolled diabetes. (Table III)

Table III: Awareness of Diabetes and its Complications among Study Participants

Variables	Categories	n (%)
What is a standard abstaining blood sugar level?	• < 70 mg/dl • 70–110 mg/dl • 126 mg/dl • Don't know	49 (6.0) 157 (19.6) 39 (5.0) 555 (69.4)
What are the mutual indications of high blood sugar? (More than one option)	• Increased thirst • Frequent urination • The blurring of vision • Weakness • Dry mouth • Confusion	533 (66.6) 554 (69.2) 385 (48.1) 373 (46.6) 171 (21.4) 68 (8.5)
"What are the most common symptoms of low blood sugar"? (More than one option)	• Palpitation • Tremor • Sweating • The blurring of vision • Decreased coordination	321 (40.1) 436 (54.5) 238 (59.2) 107 (26.6) 62 (15.4)
"Which of the following complications can happen when diabetes is not well controlled"?	• Diabetic foot • Eye complications • Heart complications • Neuropathy • Renal complications • Stroke • Teeth decay • Hypertension • Sexual dysfunction	577 (72.1) 581 (72.6) 554 (69.2) 431 (54.0) 429 (53.6) 317 (39.6) 261 (32.6) 281 (35.1) 194 (24.2)
"Can dietary modification prevent diabetic complications"?	• Yes • No • Don't know	511 (64.0) 271(34.0) 18 (2.0)

"Does physical work or exercise help to prevent diabetic complications"?	• Yes • No • Don't Know	558(69.7) 109 (13.6) 133 (16.7)
If you are having a low blood glucose reaction, you should?	• Exercise • Lie down and rest • Drink some juice	60 (7.5) 172(21.5) 384 (48.0)

The Data indicating comparison between the knowledge level of diabetes and the compliance to medicines among study participants; based on the findings, majority of the participants have a poor knowledge of diabetes. Furthermore, those with a low compliance also had a lack of awareness for diabetes. A statistically significant (P<0.05) relation between knowledge level and medicine compliance were demonstrated among the study participants. (Table IV)

Table IV: Comparison between Knowledge of Diabetes and Medicine Compliance

Medicine Compliance	Knowledge level		Total	P value
	Poor (448)	Good (352)		
Low	150	22	172	
Moderate	273	283	556	0.000*
High	25	47	72	

DISCUSSION

Diabetes is widely recognized as an emerging epidemic that has a cumulative impact on almost every country, age group, and economy across the world.[10] Uncontrolled diabetes can lead to various comorbid conditions, which are additional health problems that often coexist with diabetes.[11] A person's general well-being and quality of life may be negatively affected by the presence of certain coexisting diseases. According to the International Diabetes Federation report, the number of patients with diabetes is expected to increase from its current 415 million cases in 2015 to over 640 million by the year 2040. However, the financial and human cost of controlling diabetes can be overwhelming, and an estimated 50% of people with diabetes are ignorant of their illness, increasing the chance of complications related to diabetes.[12] Raising awareness among diabetes patients about their condition is crucial for their overall health and well-being. Empowering them with knowledge and encouraging self-management can lead to better diabetes control and reduced complications. Patient education and awareness can lead to improved diabetes management, better health outcomes, and an enhanced quality of life for individuals living with diabetes. It's essential to provide ongoing support and encouragement as patients navigate their diabetes journey.

This research study found significant results regarding study goals. As this study was mainly carried out in OPD's of Urban areas therefore the study found almost two third of patients belongs to urban areas (shown in table-I). Among all the study population nearly half of them had a primary level of education 319 (40%), whereas 163 (20.3%) secondary level, 108 (13.5) higher level of education and 210 (26.2%) were illiterate. According to current research study, 690 (86.3%) patients were suffering from other comorbid, 86 (10.7%) did not experience any comorbid, whereas 24 (3.0%) were not sure about the comorbid they were suffering. It was observed during research that patient with uncontrolled diabetes were suffering from most of the complications. Research reported 401(50.0%) Decreased sensations in the lower limb (Neuropathy), 10 (1.2%) Muscle weakness and pain, 18 (2.2%) Decreased and/or Blurry vision (retinopathy/Cataract), 24 (3.0%) Infection (UTI, Respiratory, Skin), 79 (10.0%) Poor/delayed wound healing, 83 (10.4%) Ulcers in foot / Toenail Infections (Diabetic Foot), 54 (6.7%) Kidney-related issues /

Swelling / decreased urine output. (Nephropathy), 82 (10.2%) Raised Blood Pressure >130/90mmHg (Hypertension), and 49 (6.0%) Dental Cavity patients were suffering from diabetes complications. *Al-Esawi H (2021)* et al reported in study was conducted in Riyadh, Saudi Arabia to determine the prevalence of diabetes complication (DC). Study reported 65.8% of prevalence of (DC), Cardiovascular disease, peripheral neuropathy, ophthalmic disease, mental health issues, diabetic foot problems, nephropathy, and cerebrovascular disease all had relative prevalence rates of 47.3%, 41.9%, 30.2%, 7.7%, 7.4%, 3.1%, and 2.8%.[13] Many other studies also reported increasing prevalence of diabetes complications in diabetic patients.

Diabetes is known as a chronic disease that has an impact on quality of patient's life, in many research studies the duration of diabetes and its complication are always under the focus. This current research study reported the duration of diabetes in patients as 529 (66.1%) ≤ 5 years, 6-10 year 178 (22.3%), and >10 years 93 (11.6%), The mean duration of diabetes was reported 6.2 ± 6.5 years, with a range of 0.1–54 months whereas as *Nazir et al* reported The mean (SD) period of sickness was 5.58 (4.09) years.[14] Awareness of diabetes and its complication in diabetic patients was the main objective of this study, study observe the lack of knowledge regarding diabetes and its complications, during the interview multiple questions about diabetes and its complications that patients were experiencing, the results elaborated 352 (44%) out of 800 patients had a good knowledge of diabetes whereas 448 (56%) had a poor knowledge regarding diabetes. 577 (72.1%) diabetic patients know about diabetic foot, 581 (72.6%) Eye complications, 554 (69.2%) Heart complications, 431 (54.0%) Neuropathy, 429 (53.6%) Renal complications, 317 (39.6%) Stroke, 261 (32.6%) Teeth decay, 281 (35.1%) Hypertension, 194 (24.2%) Sexual dysfunction. Study also observed that The level of knowledge and medical compliance are directly proportion, meanwhile the patients having good knowledge about diabetes they were following medical advice and treatments, whereas patients with poor knowledge didn't follow the treatment protocols (as shown in table-IV). Muscle weakness (75.8% of patients), lower-extremity sensory defect (76.9% of patients), eye problems (70.4% of patients), diseases (66.8% of patients), complications of the foot like amputation (63.1%), and hypertension (62%) were all known to patients in Anwar et al.'s study of complications of diabetes in Pakistan. The majority of participants in a Dhaka, Bangladesh study on DC knowledge (91; 48.9%) agreed that coronary artery disease was the most serious risk associated with uncontrolled diabetes; this was followed by "risk of cerebrovascular disease" (27; 14.7%), kidney disease (24; 13%), and eye disease (9; 4.9%).[15]

CONCLUSION

Study observed lack of awareness regarding diabetes and its complications. The unawareness of diabetes and its complications found a significant relationship with medication compliance among diabetic patients. It was observed that raising awareness about the complications associated with diabetes is intimately linked to medication compliance. Patients who are well-informed about the risks and consequences of non-compliance are more likely to take their medications as directed, leading to better disease management, reduced complications, and improved overall health outcomes.Therefore it is essential step to raise awareness about diabetes and its complications. By bridging the gap in awareness, we can authorize patients to take control of their well-being, decrease the burden of diabetes-related complications, and ultimately lead healthier, more fulfilling lives.

AUTHORS' CONTRIBUTIONS: All persons who meet authorship criteria are listed as authors, and all authors certify that they have participated in the work to take public

responsibility of this manuscript. All authors read and approved the final manuscript.

CONFLICT OF INTEREST: No competing interest declared.

REFERENCES

1. Jaspers L, Colpani V, Chaker L, van der Lee SJ, Muka T, Imo D, Mendis S, Chowdhury R, Bramer WM, Falla A, Pazoki R. The global impact of non-communicable diseases on households and impoverishment: a systematic review. European Journal of Epidemiology. 2015 Mar;30:163-88.

2. Zhang J, Liu J, Su H, Sun F, Lu Z, Su A. A wearable self-powered biosensor system integrated with diaper for detecting the urine glucose of diabetic patients. Sensors and Actuators B: Chemical. 2021 Aug 15;341:130046.

3. Tsabish SA. Is diabetes becoming the biggest epidemic of the twenty-first century? Int J Med Sci Public Health 2007;1(2):V

4. Federation ID. Diabetes prevalence 2022 [updated 04/02/2022. Available from: https://idf.org/our-network/regions-members/middle-east-and-north-africa/members/43-pakistan.html.

5. Anwer I, Shahzad M, Ijaz N, Gill SI, Shahzad A, Usman M. Awareness and Understanding of Diabetes Complications among Patients of Diabetes Mellitus. Pak J Med. 2022;16(1):92-5.

6. Chawla A, Chawla R, Jaggi S. Microvasular and macrovascular complications in diabetes mellitus: Distinct or continuum? Indian journal of endocrinology and metabolism. 2016;20(4):546-51

7. Harding JL, Pavkov ME, Magliano DJ, Shaw JE, Gregg EW. Global trends in diabetes complications: a review of current evidence. Diabetologia. 2019;62(1):3-16.

8. Belsti Y, Akalu Y, Fekadu H, Animut Y. Awareness of complications of diabetes mellitus and its associated factors among type 2 diabetic patients at Addis Zemen District Hospital, northwest Ethiopia. BMC Research Notes. 2019;12:1-7.

9. Hoque MA, Islam MDS, Khan MDAM, Ahasan HN. Knowledge of diabetic complications in a diabetic population. Journal of Medicine. 2009;10(2):90-3.

10. Papatheodorou K, Banach M, Bekiari E, Rizzo M, Edmonds M. Complications of diabetes 2017. Journal of diabetes research. 2018 Mar 11;2018.

11. Kalyani RR, Golden SH, Cefalu WT. Diabetes and aging: unique considerations and goals of care. Diabetes care. 2017 Apr;40(4):440.

12. International Diabetes Federation, IDF Diabetes Atlas, International Diabetes Federation, Brussels, Belgium, 7th edition, 2015.

13. Al-Esawi H, Amer SA. Prevalence of complications among saudi males type 2 diabetic patients in Riyadh Primary Health Care Centers, 2019. Diabetes Updates. 2021;7:1-1.

14. Nazir SU, Hassali MA, Saleem F, Bashir S, Aljadhey H. Disease related knowledge, medication adherence and glycaemic control among patients with type 2 diabetes mellitus in Pakistan. Primary care diabetes. 2016 Apr 1;10(2):136-41.

15. Hoque MA, Islam MDS, Khan MDAM, Ahasan HN. Knowledge of diabetic complications in a diabetic population. Journal of Medicine. 2009;10(2):90-3.