



## **Effect of Gender and Risk Factors in Complications of Type 2 Diabetic Mellitus among Patients Attending Diabetic Clinic in Mnazi Mmoja Hospital, Zanzibar**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. Authors CJO, SAY and SAM designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors CJO, SSS, SCV, AEM, EIO, HKS, HAI, MSM and WSA managed the analyses of the study and also the literature searches. All authors read and approved the final manuscript.*

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### **ABSTRACT**

Diabetes type 2 (T2D) had caused the loss of millions of lives all over the world. About 50% of the patients with T2D die because of cardiovascular disease (CVD), primarily myocardial infarction and stroke. Many of the leading risk factors for CVD coexist and act synergistically to increase cardiovascular events. The purpose of this descriptive cross-sectional study was to determine the prevalence, patterns, and certain predictive factors in the complications of T2D patients attending

diabetic clinics at Mnazi Mmoja hospital. A total of 138 respondents made up of 58 females and 80 males within the age brackets of 30-40, 41-50, 51 – 60, and 61 above were recruited for this study. Data were analysed and interpreted based on certain predictive factors and variables, including smoking, alcohol, excessive salt intake, lipid intake, sedentary lifestyle, family history of diabetes, and hypertension, on how they relate to the development of complications of type 2 diabetes. Pearson Chi-Square test was used to compare the levels of significances. Probability values of less or equal to 0.05 were accepted to be significant. The combination of salt intake, sedentary lifestyle, family history of diabetes, and lipid intake was the commonest risk factor for developing complications of T2D. However, alcohol and cigarette smoking had the most negligible impact on developing complications in T2D. The result also shows the patients between the age bracket of 30 and 40 have more risk factors for developing complications. The result showed no gender difference in the number of risk factors. There was a statistically significant association between some of the risk factors (smoking, alcohol, sedentary lifestyle, and salt intake) and the gender of respondents ( $p < 0.05$ ). Males smoked (43.8%) and consumed alcohol (32.5%) than females, while females were prone to a sedentary lifestyle (63.8%) and consume salt (82.8%) than males. On the other hand, this research showed that the significant complication for both males and females are numbness, pain sensation, and dry skin (diabetic neuropathy). Gender and certain predictive risk factors like salt intake, sedentary lifestyle, and family history of diabetes, and lipid intake are fundamental parameters to be tackled to reduce the complications of type 2 diabetes mellitus. There is a greater need now for awareness of the risk factors through effective health promotion in Zanzibar. Also, secondary prevention through regular screening, early detection, and appropriate treatment of chronic complications could reduce the morbidity and mortality caused by diabetes mellitus.

*Keywords: Diabetes type 2; Gender; risk factors; sedentary lifestyle.*

## 1. INTRODUCTION

Type 2 diabetes (T2D) can be considered one of the chronic diseases of a more significant impact on the public health system. In addition to causing a high degree of morbidity and mortality, the metabolic control of diabetes and the treatment of its complications have a high cost for health services [1]. At a macrovascular level, patients with diabetes may develop ischemic heart disease, cerebrovascular disease, and peripheral vascular disease, leading to morbidity and mortality. The microvascular level can lead to vision impairment (retinopathy), neuronal damage (neuropathies), and kidney disease (nephropathy), which are more common causes of irreversible blindness, non-traumatic lower-limb amputations, and chronic kidney diseases [2]. This proves the severity of diabetes, as the reported complications affect different systems in the body, and the sequelae can severely compromise the patients' quality of life.

As widely known, diabetes is a known factor associated with an excess risk of cardiovascular mortality. In this context, pieces of evidence highlight that diabetic women are at a higher risk, especially in the postmenopausal period [3]. Mortality and disability after a first vascular event are higher in women, and evidence is reporting

that women receive less medical care regarding cardiovascular complications even in the presence of diabetes. The increased burden of cardiovascular complications in diabetic women is not entirely understood, and many factors have been advocated trying to explain such sex-gender effect [4]. First, women come later and in worse clinical conditions to the diagnosis of diabetes. Second, they are more obese at diagnosis and reach a much lesser extent guideline target goals as to metabolic, lipidemic, or blood pressure control. Third, they have a lesser chance of receiving all the diagnostic and therapeutic measures than their diabetic male counterpart, even if it is well known that mortality after a first cardiovascular event is more elevated in diabetic women. Finally, anti-aggregating and hypotensive drugs seem to be less productive in diabetic women, while the side effects of hypoglycemic agents seem to be more frequent in females [4-5].

Many risk factors contribute to the development of T2D, such as sedentary lifestyle, consumption of high-energy diets, alcohol intake, increased life expectancy, development of obesity, genetic factors that favor the disease, making some people more susceptible to it [1]. Also, there are gender differences responsible for the development of T2D. Both cases lead to severe

complications such as retinopathy, nephropathy, neuropathy, stroke, and diabetic foot ulcers [5]. The widely recognized association between type 2 diabetes and cardiovascular disease (CVD) has a different significance according to sex, being more assertive in diabetic women than men. Diabetic women seem to lose their female advantage toward CVD, being more exposed to this complication irrespective of menopausal status [6]. Accordingly, in newly diagnosed diabetic subjects without clinical CVD, carotid atherosclerosis was more prevalent among diabetic women than in non-diabetic female controls, thus confirming the loss of the protective effects of estrogens on the vascular wall at early stages of the disease [7]. A meta-analysis of 37 prospective cohort studies investigated the risk of fatal coronary heart disease (CHD) in type 2 diabetes in a total of 447,064 patients. The results of this analysis indicated a higher rate of fatal CHD events in diabetic compared with non-diabetic subjects (5.4 vs. 1.6%), but more interestingly, a 50% higher relative risk for deadly events in diabetic women than in diabetic men (RR 3.50, 95% CI 2.70-4.53 vs. 2.06, 1.81- 2.34;  $P < 0.0001$ ) [6]

Type 2 diabetes accounts for well over 90% of diabetes in Sub-Saharan Africa, and population prevalence proportions ranged from 1% in rural Uganda to 12% in urban Kenya. Reported type 1 diabetes prevalence was low and ranged from 4 per 100,000 in Mozambique to 12 per 100,000 in Zambia [8]. Gestational diabetes prevalence varied from 0% in Tanzania to 9% in Ethiopia. Proportions of patients with diabetic complications ranged from 7-63% for retinopathy, 27-66% for neuropathy, and 10-83% for microalbuminuria. Diabetes is likely to increase the risk of several essential infections in the region, including tuberculosis, pneumonia, and sepsis. Meanwhile, antiviral treatment for HIV increases the risk of obesity and insulin resistance. A Five-year mortality proportion of patients with diabetes varied from 4-57%. The Screening studies identified high ratios (> 40%) with previously undiagnosed diabetes and low levels of adequate glucose control among once diagnosed diabetics. The various barriers to accessing diagnosis and treatment included a lack of diagnostic tools and glucose monitoring equipment and the high cost of treatment. The total annual cost of diabetes in the region was estimated *at a staggering* US\$67.03 billion, or about US\$8836 per diabetic patient [8].

## 2. MATERIALS AND METHODS

### 2.1 Study Design

A descriptive cross-sectional study was used to collect data at Mnazi Mmoja diabetic clinic located in the urban west region Unguja, Zanzibar, Tanzania. The study was conducted in four (4) clinics as follows:-Medical, Obstetrics and Gynaecology, General Surgery, and Orthopaedic clinic.

### 2.2 Study Population

A total of one hundred and thirty-eight (138) volunteers aged  $\geq 30$  years old with T2D comprising of eighty (80) males and fifty-eight (58) females were recruited for this study. The study's objectives were explained, and their consent was taken while ethical clearance was obtained from the Zanzibar Health Research Institute ethics committee. Inclusion criteria include all T2D subjects  $\geq 30$  years with complications, while exclusion criteria include all patients of type 1 diabetes, all patients with T2D <30 years of age, and all patients with T2D without complications.

### 2.3 Study Variables

The study variables include age, gender, education level, occupation, sedentary lifestyle, alcoholism, family history, obesity, and duration as risk factors of complications of T2D.

### 2.4 Data Collection

The pre-tested questionnaires were administered to the subjects, but interviews were done in their local dialect to capture the required information when they cannot read.

### 2.5 Data Analysis

The data were analyzed using the Statistical Package of Science and Social Sciences (SPSS) software version 15 (IBM Chicago) and Epi info. The Pearson's correlation coefficient was used to compare the degree of associations. Probability values of less or equal to 0.05 were accepted as significant.

## 3. RESULTS and DISCUSSION

The table shows the major complications for both males and females is diabetic neuropathy represented by numbness, pain sensation, and

dry skin in the extremities, and a high prevalence (82%) of the legs as the numbness part.

The result showed no gender difference in the number of risk factors. There was no statistically significant association between gender and the number of reported risk factors ( $p > 0.05$ ). However, male respondents had more risk factors than females. For example, 3.8% of males had no risk factors compared to 3.4% of females, and 3.8% and 1.3% of males had seven and 8 risk factors compared to females' 3.4% with seven risks and none with up to eight risk factors.

There was a statistically significant association between some of the risk factors (smoking, alcohol, sedentary lifestyle, and salt intake) and the gender of respondents ( $p < 0.05$ ). Males smoked (43.8%) and consumed alcohol (32.5%) than females, while females were prone to a sedentary lifestyle (63.8%) and consume salt

(82.8%) than males. There was no gender difference in the family history of hypertension.

There were statistically significant associations between the gender of respondents and some types of complications ( $P < 0.05$ ). Males (51.3%) frequently urinated than females (32.8%). Females (24.1%) recorded more blurred vision than males (12.5%).

Sedentary lifestyle, Family history of hypertension, and family history of diabetes had a relationship with clinic attendance.

The study showed the combination of salt intake, sedentary lifestyle, family history of diabetes, and lipid intake as the commonest risk factors for developing complications of T2D. However, the sedentary lifestyle was seen to directly impact the complication of T2D, although alcohol and cigarette smoking have the most negligible impact on the development of complications in T2D. The result agreed with those of other

**Table 1. Socio-demographic characteristics of respondents (Age group 30-40, 41-50, 51-60, 61- Above: Sex (male and female), Marital Status (single, married, divorced, widowed)**

Variable	Frequency	Percentage (%)
<b>Age (years)</b>		
30-40	47	34.1
41-50	34	24.6
51-60	34	24.6
61 and above	23	16.7
Mean age 48.98±12.439		
<b>Sex</b>		
Female	58	42.0
Male	80	58.0
<b>Marital status</b>		
Single	16	11.6
Divorced	41	29.7
Married	54	39.1
Widow	27	19.6
<b>Location</b>		
North	9	6.5
South	58	42.0
Urban	71	51.4
<b>Occupation</b>		
Employed	34	24.6
Self-employed	41	29.7
Unemployed	63	45.7
<b>Education</b>		
Illiterate	13	9.4
Primary	47	34.1
Secondary	43	31.2
Diploma	15	10.9
Degree	17	12.3
Advanced	3	2.2

workers who also identified a longer duration of diabetes, hypertension, and dyslipidaemia as significant risk factors for developing complications [4,9]. Physical inactivity increases the risk of many adverse health conditions, including major non-communicable diseases such as coronary heart disease and T2D, shortening life expectancy. As most of the world's population are inactive, this link presents a major public health issue [10]. It is evident that the less active you are, the greater the risk of T2D. Physical activity helps control weight, uses up glucose as energy, and makes the cells more sensitive to insulin. The recent massive increase in the consumption of highly salted processed foods has increased the intake of salt [11]. The World Health Organization (WHO) suggests a global target of maximum salt intake of 5 g/day for adults [12]. However, the average salt intake in most countries worldwide is approximately 9 to 12 g/day [13]. A prospective study in 932 Finnish men and 1003 women, with an average follow-up of 18 years, demonstrated that a higher salt intake (measured by 24 h urinary sodium) was associated with an increased risk of T2D independent of potential confounding factors including physical inactivity, obesity, and hypertension [14]. The mechanism of the

association between high intake of sodium and the risk of T2D, although not well understood, may be attributed to either through obesity or via the renin-angiotensin-aldosterone system's deleterious axis. These can increase inflammatory cytokines' production and raise oxidative stress; consequently, exacerbating insulin resistance and decreasing insulin secretion [15-16].

On the other hand, this research also shows the major complications for both males and females is diabetic neuropathy which is represented by numbness, pain sensation, and dry skin in the extremities. Our work showed a high prevalence (82%) of the legs as the numbness part. Other workers equally reported a high prevalence of peripheral neuropathy in youths with type 2 diabetes [2]. Diabetic neuropathies are a family of nerve disorders caused by diabetes. It can be classified as peripheral, autonomic, proximal, and focal, which affects different parts of the body in different ways. Diabetic foot ulcers may develop, mainly because of the abnormal distribution of pressure. We hypothesize that early detection of diabetic neuropathy could result in less hospitalization of patients with foot ulcers and fewer lower-extremity amputations.

**Table 2. Prevalence of the major risk factors in both males and females**

<b>Variable</b>	<b>Frequency</b>	<b>Percentage (%)</b>
<b>Smoking</b>		
No	100	72.5
Yes	38	27.5
<b>Alcohol</b>		
No	110	79.7
Yes	28	20.3
<b>Sedentary lifestyle</b>		
No	67	48.6
Yes	71	51.4
<b>Excessive salt intake</b>		
No	88	63.8
Yes	50	36.2
<b>Lipid intake</b>		
No	75	54.3
Yes	63	45.7
<b>Family history of diabetic mellitus</b>		
No	47	34.1
Yes	91	65.9
<b>Family history of hypertension</b>		
No	51	37.0
Yes	87	63.0
<b>Salt intake</b>		
No	37	26.8
Yes	101	73.2

*Smoking, alcohol, sedentary lifestyle, excessive salt intake, lipid intake, family history of DM, family history of hypertension, and Salt intake has 27.5%, 20.3%, 51.4%, 36.2%,45.7%,65.9%, 63%, and 73% respectively*

**Table 3. Frequency distribution of the various complications**

Variable	Frequency	Percentage (%)
<b>Frequency urination</b>		
Twice	25	18.1
Thrice	53	38.4
More than thrice	60	43.5
<b>Blurred vision</b>		
Good	53	38.4
Moderate	60	43.5
Poor	24	17.4
Very poor	1	0.7
<b>Numbness</b>		
No	49	35.5
Yes	89	64.5
<b>Numbness part</b>		
All	13	14.6
Arms	3	3.4
Legs	73	82
<b>Pain sensation</b>		
Mild	70	50.7
Moderate	51	37.0
Severe	17	12.3
<b>Crackle in feet</b>		
No	75	54.3
Yes	63	45.7
<b>Dry skin</b>		
No	62	44.9
Yes	76	55.1

**Table 4. Percentage of male and female with 0, 1, 2, 3, 4, 5, 6, and 7 risk factors**

		No. of risk factor(s)									Total
		None	1	2	3	4	5	6	7	8	
<b>Sex</b>	Female	2	3	8	12	14	10	7	2	0	58
		3.4%	5.2%	13.8%	20.7%	24.1%	17.2%	12.1%	3.4%	0.0%	100.0%
	Male	3	2	8	25	14	10	14	3	1	80
		3.8%	2.5%	10.0%	31.3%	17.5%	12.5%	17.5%	3.8%	1.3%	100.0%
<b>Total</b>		5	5	16	37	28	20	21	5	1	138
		3.6%	3.6%	11.6%	26.8%	20.3%	14.5%	15.2%	3.6%	0.7%	100.0%

*Pearson Chi-Square =5.124, p value =0.744*

This study found that most of the patients attended clinics regularly (73.9% against 26.1%). Out of those who regularly attended the clinic, 44.2% were using insulin, which means that the patients failed to control their blood glucose level using lifestyle modifications or oral hypoglycemic drugs. They, however, showed a more remarkable improvement of 65.9%. There was a statistically significant association between some of the risk factors (smoking, alcohol, sedentary lifestyle, and salt intake) and the gender of respondents ( $p < 0.05$ ). Males smoked (43.8%) and consumed alcohol (32.5%) than females, while females were prone to a sedentary lifestyle

(63.8%) and consume salt (82.8%) than males. Some workers collaborated that high daily alcohol consumption, smoking, and systolic hypertension are stronger risk factors in men [17].

In contrast, others observed that elevated triglycerides and physical inactivity are stronger in women [4,18]. There are several ways in which smoking may increase a person's risk of developing type 2 diabetes. The chemicals in cigarettes can cause harm to the body's cells and interfere with their normal function. This can cause inflammation throughout the body, which may decrease insulin's effectiveness [19].

**Table 5. Association between gender and the major risk factors**

Risk factors	Sex		Total	Pearson Chi-Square	p-value
	Female (n=58)	Male (n=80)			
<b>Smoking</b>					
No	55(94.8)	45(56.3)	100(72.5)	25.077	<b>0.000</b>
Yes	3(5.2)	35(43.8)	38(27.5)		
<b>Alcohol</b>					
No	56(96.6)	54(67.5)	110(79.7)	17.546	<b>0.000</b>
Yes	2(3.4)	26(32.5)	28(20.3)		
<b>Sedentary lifestyle</b>					
No	21(36.2)	46(57.5)	67(48.6)	6.103	<b>0.013</b>
Yes	37(63.8)	34(42.5)	71(51.4)		
<b>Excessive salt intake</b>					
No	38(65.5)	50(62.5)	88(63.8)	0.132	0.716
Yes	20(34.5)	30(37.5)	50(36.2)		
<b>Lipid intake</b>					
No	31(53.4)	44(55.0)	75(54.3)	0.033	0.857
Yes	27(46.6)	36(45.0)	63(45.7)		
<b>Family history of diabetes</b>					
No	18(31.0)	29(36.3)	47(34.1)	0.407	0.523
Yes	40(69.0)	51(63.8)	91(65.9)		
<b>Family history of hypertension</b>					
No	18(31.0)	33(41.3)	51(37.0)	1.506	0.220
Yes	40(69.0)	47(58.8)	87(63.0)		
<b>Salt intake</b>					
No	10(17.2)	27(33.8)	37(26.8)	4.670	<b>0.031</b>
Yes	48(82.8)	53(66.3)	101(73.2)		

**Table 6. Association between gender and types of complications**

Complications	Sex		Total	Pearson Chi-square	p-value
	Female (n=58)	Male (n=80)			
<b>Frequency of urination</b>					
2x	14(24.1)	11(13.8)	25(18.1)	6.222	0.049
3x	25(43.1)	28(35.0)	53(38.4)		
4x	19(32.8)	41(51.3)	60(43.5)		
<b>Blurred vision</b>					
Good	24(41.4)	29(36.3)	53(38.4)	6.972	0.047
Moderate	19(32.8)	41(51.3)	60(43.5)		
Poor	14(24.1)	10(12.5)	24(17.4)		
Very poor	1(1.7)	0(0.0)	1(0.7)		
<b>Numbness</b>					
No	20(34.5)	29(36.3)	49(35.5)	0.046	0.830
Yes	38(65.5)	51(63.8)	89(64.5)		
<b>Pain sensation</b>					
Mild	23(39.7)	47(58.8)	70(50.7)	5.408	0.067
Moderate	25(43.1)	26(32.5)	51(37.0)		
Severe	10(17.2)	7(8.8)	17(12.3)		
<b>Crackle in feet</b>					
No	33(56.9)	42(52.5)	75(54.3)	0.262	0.609
Yes	25(43.1)	38(47.5)	63(45.7)		

**Table 7. Comparison of risk factors and clinic attendance**

Risk factors	DM clinic		Total	Pearson Chi-Square	p-value
	No (n=36)	Yes (n=102)			
<b>Smoking</b>					
No	25(25.0)	75(75.0)	100(100.0)	0.223	0.637
Yes	11(28.9)	27(71.1)	38(100.0)		
<b>Alcohol</b>					
No	27(24.5)	83(75.5)	110(100.0)	0.668	0.414
Yes	9(32.1)	19(67.9)	28(100.0)		
<b>Sedentary lifestyle</b>					
No	24(35.8)	43(64.2)	67(100.0)	6.399	<b>0.011</b>
Yes	12(16.9)	59(83.1)	71(100.0)		
<b>Excessive salt intake</b>					
No	26(29.5)	62(70.5)	88(100.0)	1.507	0.220
Yes	10(20.0)	40(80.0)	50(100.0)		
<b>Lipid intake</b>					
No	20(26.7)	55(73.3)	75(100.0)	0.029	0.866
Yes	16(25.4)	47(74.6)	63(100.0)		
<b>Family history of diabetes</b>					
No	18(38.3)	29(61.7)	47(100.0)	5.512	<b>0.019</b>
Yes	18(19.8)	73(80.2)	91(100.0)		
<b>Family history of hypertension</b>					
No	20(39.2)	31(60.8)	51(100.0)	7.232	<b>0.007</b>
Yes	16(18.4)	71(81.6)	87(100.0)		
<b>Salt intake</b>					
No	8(21.6)	29(78.4)	37(100.0)	0.523	0.470
Yes	28(27.7)	73(72.3)	101(100.0)		

**Table 8. Comparison of major complications and clinic attendance**

Complications	DM clinic		Total	Pearson chi-square	p-value
	No (n=36)	Yes (n=102)			
<b>Frequency of urination</b>					
2x	7(28.0)	18(72.0)	25(100.0)	0.087	0.957
3x	14(26.4)	39(73.6)	53(100.0)		
4x	15(25.0)	45(75.0)	60(100.0)		
<b>Blurred vision</b>					
Good	10(18.9)	43(81.1)	53(100.0)	4.860	0.182
Moderate	18(30.0)	42(70.0)	60(100.0)		
Poor	7(29.2)	17(70.8)	24(100.0)		
very poor	1(100.0)	0(0.0)	1(100.0)		
<b>Numbness</b>					
no	13(26.5)	36(73.5)	49(100.0)	0.008	0.930
yes	23(25.8)	66(74.2)	89(100.0)		
<b>pain sensation</b>					
Mild	21(30.0)	49(70.0)	70(100.0)	3.187	0.203
Moderate	9(17.6)	42(82.4)	51(100.0)		
Severe	6(35.3)	11(64.7)	17(100.0)		
<b>Crackle in feet</b>					
No	23(30.7)	52(69.3)	75(100.0)	1.787	0.181
Yes	13(20.6)	50(79.4)	63(100.0)		

The result showed no relationship in all the complications  $p > 0.05$



**Table 9. Association between occupation and risk factors**

Risk factors	Occupation			Total	Pearson Chi-Square	p-value
	Employed	Self-employed	Unemployed			
<b>Smoking</b>						
No	27(27.0)	24(24.0)	49(49.0)	100(100.0)	5.700	0.058
Yes	7(18.4)	17(44.7)	14(36.8)	38(100.0)		
<b>Alcohol</b>						
No	28(25.5)	29(26.4)	53(48.2)	110(100.0)	2.950	0.229
Yes	6(21.4)	12(42.9)	10(35.7)	28(100.0)		
<b>Sedentary lifestyle</b>						
No	22(32.8)	21(31.3)	24(35.8)	67(100.0)	6.426	<b>0.040</b>
Yes	12(16.9)	20(28.2)	39(54.9)	71(100.0)		
<b>Excessive salt intake</b>						
No	18(20.5)	25(28.4)	45(51.1)	88(100.0)	3.464	0.177
Yes	16(32.0)	16(32.0)	18(36.0)	50(100.0)		
<b>Lipid intake</b>						
No	11(14.7)	24(32.0)	40(53.3)	75(100.0)	9.043	<b>0.011</b>
Yes	23(36.5)	17(27.0)	23(36.5)	63(100.0)		
<b>Family history of diabetes</b>						
No	11(23.4)	11(23.4)	25(53.2)	47(100.0)	1.885	0.390
Yes	23(25.3)	30(33.0)	38(41.8)	91(100.0)		
<b>Family history of hypertension</b>						
No	12(23.5)	14(27.5)	25(49.0)	51(100.0)	0.380	0.827
Yes	22(25.3)	27(31.0)	38(43.7)	87(100.0)		
<b>Salt intake</b>						
No	11(29.7)	14(37.8)	12(32.4)	37(100.0)	3.591	0.166
Yes	23(22.8)	27(26.7)	51(50.5)	101(100.0)		

*Occupation of respondents was statistically associated with a sedentary lifestyle (p=0.040) and lipid intake (p=0.011)*

**Table 10. Association between occupation and complications**

Complications	Occupation			Total	Pearson chi-square	p-value
	Employed	Self-employed	Unemployed			
<b>Frequency of urination</b>						
2x	7(28.0)	8(32.0)	10(40.0)	25(100.0)	1.501	0.826
3x	12(22.6)	18(34.0)	23(43.4)	53(100.0)		
4x	15(25.0)	15(25.0)	30(50.0)	60(100.0)		
<b>Blurred vision</b>						
Good	20(37.7)	14(26.4)	19(35.8)	53(100.0)	13.560	<b>0.035</b>
Moderate	10(16.7)	23(38.3)	27(45.0)	60(100.0)		
Poor	4(16.7)	4(16.7)	16(66.7)	24(100.0)		
very poor	0(0.0)	0(0.0)	1(100.0)	1(100.0)		
<b>Numbness</b>						
No	18(36.7)	14(28.6)	17(34.7)	49(100.0)	6.544	<b>0.038</b>
Yes	16(18.0)	27(30.3)	46(51.7)	89(100.0)		
<b>Pain sensation</b>						
Mild	19(27.1)	22(31.4)	29(41.4)	70(100.0)	4.946	0.293
Moderate	13(25.5)	16(31.4)	22(43.1)	51(100.0)		
Severe	2(11.8)	3(17.6)	12(70.6)	17(100.0)		
<b>Crackle in feet</b>						
No	24(32.0)	21(28.0)	30(40.0)	75(100.0)	4.926	0.085
Yes	10(15.9)	20(31.7)	33(52.4)	63(100.0)		

*Occupation of respondents was statistically associated with blurred vision ( $p=0.035$ ) and numbness ( $p=0.038$ )*

Additionally, cell damage caused by the meeting of the chemicals from cigarette smoke with oxygen can lead to oxidative stress. Both oxidative stress and inflammation may be related to an increased risk of diabetes [20]. Smokers have a 30 to 40 percent more likelihood of developing type 2 diabetes than nonsmokers. Smoking can also make managing the disease and regulating insulin levels more difficult. High levels of nicotine can reduce insulin effectiveness, causing smokers to need more insulin to regulate blood sugar levels [19]. Too much alcohol may cause chronic inflammation of the pancreas, impairing its ability to secrete insulin and potentially lead to diabetes [21]. A sedentary lifestyle and salt intake in women can result in obesity, increasing the risk of insulin resistance among people with type 2 diabetes.

The research result also showed a statistically significant association between the gender of respondents and some types of complications ( $P < 0.05$ ). Males (51.3%) frequently urinated more than the females (32.8%). This means that the male gender may be at a higher risk of developing diabetic nephropathy due to increased urination frequency. The females (24.1%) recorded more blurred vision than males (12.5%), suggesting that females may be more subjected to diabetic retinopathy.

The result showed no relationship between major complications and clinic attendance ( $p > 0.05$ ). This was, however, unexpected. This can be due to poor adherence to medication, poor follow-up of doctors' advice, and poor awareness of diabetic health education. There was also an association between occupation and risk factors. Occupation of respondents was statistically associated with a sedentary lifestyle ( $p = 0.040$ ) and lipid intake ( $p = 0.011$ ), as shown in the  $p$  values, respectively. Also, the occupation of respondents was statistically associated with blurred vision ( $p = 0.035$ ) and numbness ( $p = 0.038$ ).

#### 4. CONCLUSION

The major complication for both males and females is diabetic neuropathy, represented by numbness, pain sensation, and dry skin in the extremities. In contrast, the female diabetics showed more signs of nephropathy and retinopathy compared to the male counterparts. The patient's education and awareness are essential for properly managing and preventing complications in type 2 diabetic patients. We

recommend the improvement of proper health education during clinics. Health promotion jingles should equally be aired on our radios and televisions in the Kiswahili language to improve the knowledge base of our communities. Doctors and caregivers should do proper counseling to diabetic patients so that they can attend the clinic regularly. Finally, follow-up is mandatory for diabetic patients to avoid developing minor and significant type 2 diabetic Mellitus complications. It is seen from the study that several patients are attending the clinic but still develop complications due to lack of proper follow-up. Above all, we suggest secondary prevention through regular screening, early detection, and appropriate treatment of chronic complications to reduce the morbidity and mortality caused by diabetes mellitus

#### CONSENT AND ETHICAL APPROVAL

Permission was sought and granted from the Second Vice President's office, responsible for all research conducted in Zanzibar. Approval was obtained from the Zanzibar Health Research Institute ethics committee with No; ZAHREC/03/ST/MARCH/2020/34. Respondents' written consent has been collected and preserved by the author(s).

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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