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An Examination of Risk Factors and Quality of Life of Patients with Diabetes Mellitus Foot Syndrome

I. E. Okeji [a], C. E. Ijioma [b], I. O. Abali [c], O. J. Orji [d], T. C. Olusakin [e], O. O. Odufuwa [f], O. Ofumwengbe-Evba [g], U. E. Ojumonu [h], W. O. Ngumoha [i], E. A. Kalesanwo [j], A. C. Onyeoguzoro [k], O. E. Aminu-Ayinde [l], E. J. Maduku [m] and A. I. Airaodion [n*]

[a] Department of General Medicine, North Cumbria Integrated Care, NHS Foundation Trust, UK.
[b] Department of Internal Medicine, Abia State Specialist Hospital and Diagnostic Centre, Umuahia, Nigeria.
[c] Department of Surgery, Abia State University, Uturu, Nigeria.
[d] Department of Acute Medicine, University Hospitals of Derby and Burton, NHS Foundation Trust, UK.
[e] Department of Internal Medicine, Vine Branch Medical Centre, Ibadan, Oyo State, Nigeria.
[f] Department of Internal Medicine, Highland Specialist Hospital, Ibadan, Oyo State, Nigeria.
[g] Department of Internal Medicine, Edo Medical Centre, Benin City, Edo State, Nigeria.
[h] Medical Student, Abia State University Teaching Hospital, Aba, Nigeria.
[i] Department of Surgery, Cottage Hospital, Auchi Polytechnic, Auchi, Edo State, Nigeria.
[j] Department of Surgery, Olabisi Onabanjo University Teaching Hospital, Sagamu, Ogun State, Nigeria.
[k] Department of Public Health, Westcare Hospital, Ejigbo, Lagos State, Nigeria.
[l] Department of Accident and Emergency, Mountain Top University Hospital, Prayer City, Ogun State, Nigeria.
[m] Department of Internal Medicine,163 Nigeria Air Force Hospital Yola, Adamawa State, Nigeria.
[n] Department of Biochemistry, Federal University of Technology, Owerri, Imo State, Nigeria.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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**Corresponding author: Email: augustineairaodion@yahoo.com;*

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ABSTRACT

Aim: This study examined risk factors and quality of life (QoL) among patients with Diabetes Mellitus Foot Syndrome (DMFS).
Methodology: The study employed a cross-sectional design. A total of 250 individuals, both male and female, diagnosed with Diabetes Mellitus were enrolled in the study. The participants were recruited from outpatient clinics of the Federal Medical Centre Owo, Ondo State, Nigeria. Eligible participants were individuals aged 18 years or older, diagnosed with Diabetes Mellitus, who were willing to participate and capable of providing informed consent. A structured questionnaire was utilized to collect the data. Data analyses were performed using a statistical package for social science (SPSS) version 25.
Results: The participants' ages ranged from less than 20 to over 60, with the majority aged between 50 and 59 years (36.4%). About 63.2% of participants reported a DMFS diagnosis, with 53.8% suffering for between 1-5 years. Every participant diagnosed with DMFS was on medication for the condition, and 38.6% had undergone surgical treatment. The frequency of blood sugar level checks, smoking, alcohol consumption, the presence of other chronic diseases, and use of special footwear for diabetes patients were among the significant risk factors impacting QoL. Regarding QoL, the majority of the participants rated their overall health status as fair (39.2%), with 44.8% always feeling pain or discomfort in their feet, and 58.8% had to take time off work or school due to DMFS. Among those suffering from DMFS, satisfaction with current treatment was high, with 55.6% either very satisfied or satisfied. However, 88.8% reported that their condition negatively impacted their daily activities, and over half (52.4%) reported experiencing stigma or discrimination due to their diabetes. A chi-square test demonstrated that risk factors significantly associated with poorer QoL included infrequent blood sugar checks, smoking, alcohol consumption, presence of other chronic diseases, and lack of special diabetic footwear.
Conclusion: The study provides valuable insights into the impact of DMFS on patients' QoL and underscores the significance of effective risk factor management. The results can guide healthcare professionals and policy-makers in designing targeted interventions and policies to improve QoL for DMFS patients.

Keywords: Diabetes mellitus foot syndrome; quality of life; risk factors.

1. INTRODUCTION

Diabetes Mellitus (DM) is a chronic metabolic disorder that is characterized by hyperglycemia due to impaired insulin secretion, resistance to insulin action, or both. It is one of the leading health problems globally, with the World Health Organization (WHO) estimating that the number of individuals with diabetes had risen to 537 million in 2021 [1]. Sub-Saharan Africa, including Nigeria, has not been spared from the burden of DM with an estimated prevalence rate of 5.7% [2].

Diabetic mellitus foot syndrome (DMFS) is a common and serious complication of DM and refers to foot problems in individuals with DM as a result of peripheral neuropathy and/or peripheral arterial disease. It is estimated that up to 34% of individuals with diabetes may experience DMFS during their lifetime [3]. DMFS can lead to foot ulcers, infection, and ultimately, non-traumatic lower extremity amputations (LEAs) in severe cases.

The quality of life (QoL) of patients suffering from DMFS is severely affected. Complications from DMFS such as foot ulcers, amputations, and associated mobility restrictions contribute to decreased physical functioning, emotional distress, and a significantly lower health-related quality of life (HRQoL) [4].

Ondo State, Nigeria, like many other states in the country, is grappling with a growing prevalence of DM and its complications, including DMFS. However, there is a paucity of studies focusing on DMFS in this region, especially with regards

to risk factors and the associated quality of life for patients. Hence, there is a need to comprehensively examine these aspects to inform interventions aimed at improving the health outcomes of individuals with DM and DMFS.

Several risk factors have been identified for DMFS. These include poor glycaemic control, the duration of DM, smoking, the presence of peripheral neuropathy, peripheral arterial disease, foot deformities, and the presence of calluses [5]. However, in the context of Ondo State, the role of these risk factors in DMFS needs to be explored further, along with other potential risk factors, such as local socio-economic and cultural factors.

In terms of QoL, the impact of DMFS on QoL in Nigeria has not been comprehensively investigated. It is important to understand the specific challenges faced by patients with DMFS in Nigeria and how their QoL is affected. This information will help to develop interventions and policies aimed at improving their QoL.

This study, therefore, aims to fill the identified gaps in the literature by examining the risk factors and quality of life of patients with DMFS in Ondo State, Nigeria. The findings will provide critical insights into the specific needs of these patients and inform the development of targeted interventions.

2. METHODOLOGY

The study employed a cross-sectional design to examine the risk factors and quality of life of patients with Diabetes Mellitus Foot Syndrome (DMFS). Cross-sectional studies are beneficial for identifying and assessing the prevalence and distribution of health-related states within a population at a specific point in time [5]. A total of 250 individuals, both male and female, diagnosed with Diabetes Mellitus were enrolled in the study. The participants were recruited from outpatient clinic of the Federal Medical Centre Owo, Ondo State, Nigeria. Eligible participants were individuals aged 18 years or older, diagnosed with Diabetes Mellitus, who were willing to participate and capable of providing informed consent.

A structured questionnaire was utilized to collect the data. The questionnaire was composed of three sections: (1) Personal and Clinical Information, (2) Lifestyle and Risk Factors, and (3) Quality of Life Assessment. The questionnaire was developed and validated through extensive literature review and expert opinion, ensuring that it covered all pertinent information required for the study [6].

For quality-of-life assessment, a validated tool, the EQ-5D index, which is a measure used to assess the quality of life in terms of five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression, was used [7]. However, the researchers chose a more specific approach to capture aspects uniquely relevant to individuals with DMFS. Data collection was conducted through face-to-face interviews by trained personnel to ensure accuracy and completeness of data. The interviews were conducted in a private setting to maintain participant confidentiality.

Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to summarize the data. For inferential statistics, chi-square tests were employed to examine the association between lifestyle and risk factors and the overall quality of life of diabetes patients. A p-value of less than 0.05 was considered statistically significant. All analyses were performed using a statistical package for social science (SPSS) version 25.

3. RESULTS

The results for the demographic information, educational level, marital status, occupation, years since diabetes diagnosis, type of diabetes, and information about diabetic foot syndrome among the study participants are presented in Table 1. It shows that the sample consisted of more women (52.40%) than men (47.60%), and that the majority of the participants were between the ages of 50-59 years (36.40%). Most of the participants had a secondary level of education (55.60%) and were married (73.20%). It also indicates that most participants had been diagnosed with diabetes for 6-10 years (38.80%) and the majority of them had Type 2 diabetes (91.20%). In addition, more than half of the participants (63.20%) had been diagnosed with DMFS. Table 2 presents information about lifestyle habits and other risk factors that could impact the health status of the participants. The majority of the participants checked their blood sugar once a day (50.80%) and did not smoke (75.20%). Also, most participants did not consume alcohol (61.60%), were unsure about their diet (35.60%), and sometimes exercised

(40.40%). A large percentage (69.20%) had a family history of diabetes mellitus.

Table 3 provides data on how participants rate their overall health status, their ability to perform daily activities, and their social participation. It also gives insight into their management of DMFS symptoms and overall quality of life. A large percentage of the participants rated their overall health status and ability to perform daily activities as 'fair' (39.20% and 32.40% respectively). Most participants also reported always feeling pain or discomfort in their feet (44.80%) and feeling often anxious or stressed due to their diabetes (36.40%). The majority of the participants mentioned that their condition negatively affects their daily activities (88.80%).

Table 4 investigates the effect of various lifestyle and risk factors on the overall quality of life of the participants. Factors such as the frequency of blood sugar level checks, smoking, alcohol consumption, having other chronic diseases, wearing special footwear, having diabetic neuropathy, and systemic arterial hypertension were found to be statistically significant ($p<0.05$), indicating that these factors significantly affect the quality of life of these patients.

4. DISCUSSION

This research examines the risk factors and quality of life of patients with Diabetes Mellitus Foot Syndrome (DMFS), which is a serious complication of diabetes that can lead to significant morbidity and mortality [8]. The study sought to identify the key risk factors associated with DMFS and to understand how the condition impacts the patients' quality of life. As depicted in Table 1, the participants in the study were nearly evenly split by gender, with a slight majority of females (52.4%). The distribution of gender is in line with global estimates indicating a slightly higher prevalence of diabetes in women than men [9]. However, the relationship between gender and risk for diabetes mellitus foot syndrome (DMFS) remains unclear and should be a focus for further research.

The age distribution indicates that the largest percentage of participants was aged 50-59 (36.4%). This finding aligns with literature suggesting that the risk for DMFS increases with age [10]. The prevalence of diabetes and associated complications, including DMFS, has been found to increase significantly after the fifth decade of life [11]. This could be due to several age-related factors, including decreased physical activity, increased weight, or age-related changes in glucose metabolism.

Concerning education, more than half of the participants had secondary education (55.6%), and a significant percentage had tertiary education (24.8%). Education may play a crucial role in the prevention and management of DMFS, as higher educational levels are associated with better diabetes knowledge, self-management practices, and adherence to treatment [12].

The majority of the participants were married (73.2%). Marital status can significantly influence health outcomes, as married individuals often have better access to social and emotional support, which can help manage chronic conditions like diabetes [13].

Occupationally, the highest proportion of participants were civil servants (29.6%), followed by retirees (22.4%) and the unemployed (21.6%). Previous research suggests that sedentary professions like civil service roles might be associated with an increased risk of diabetes due to reduced physical activity [14]. Furthermore, joblessness or retirement could result in less structured daily routines, potentially affecting diabetes management and increasing the risk for complications like DMFS.

In terms of the duration of diabetes diagnosis, a large percentage (38.8%) of participants were diagnosed with diabetes between 6-10 years ago. Long duration of diabetes is a known risk factor for developing DMFS (Amin et al., 2018). Regarding the type of diabetes, an overwhelming majority of participants (91.2%) had Type 2 diabetes. This aligns with global estimates as Type 2 diabetes is significantly more common than Type 1 [15].

Approximately 63.2% of participants had been diagnosed with DMFS. This high percentage signals the significant risk of DMFS among diabetic patients. Moreover, every DMFS diagnosed patient was taking medication, emphasizing the importance of medical treatment in managing this condition. Finally, nearly 39% of participants had previously undergone surgical treatment for DMFS. This is a crucial finding as it underscores the severity of DMFS and the necessity for invasive interventions in many cases.

This study brings significant insights into the lifestyle choices and associated risk factors for this patient demographic. From the study, it is observed that half of the participants (50.8%) checked their blood sugar levels daily, which is in line with the American Diabetes Association's recommendation of daily monitoring for better glucose control [15]. However, 9.2% of the sample checked their blood glucose levels inconsistently, suggesting a need for education on the importance of regular monitoring.

Smoking and alcohol consumption, known to worsen diabetes outcomes, were reported by 24.8% and 38.4% of the participants, respectively [15,16]. Moreover, only 31.2% of participants reported having a balanced diet, with 35.6% unsure of their dietary habits. This is concerning, as a balanced diet is fundamental in diabetes management [17]. Exercise is critical in managing blood glucose levels and reducing the risk of complications in diabetes [18]. Despite this, 16.8% of respondents rarely exercised. Interestingly, none of the respondents never exercised, which is a positive finding in managing diabetes.

With regards to comorbidities, 38.4% of the participants reported being diagnosed with other chronic diseases such as heart disease and hypertension. This finding is significant, considering the known association between diabetes and these conditions [19].

Foot care habits were also assessed, with only 25.2% of participants always checking their feet for wounds or injuries. This is an area of concern, as diligent foot care is essential in preventing and managing foot complications in diabetes [20]. Furthermore, only 33.2% used special footwear designed for diabetes patients, a tool known to reduce the risk of foot ulceration [21]. A large majority (69.2%) reported a family history of diabetes mellitus, and more than half of the sample had either diabetic neuropathy (53.2%) or peripheral vascular disease (51.2%). Both conditions are significant risk factors for the development of foot ulcers [22].

The quality of life in patients with DMFS was found to be significantly impacted. When patients were asked to rate their overall health status, a majority rated it as fair (39.2%) or poor (31.6%) [23]. This may indicate the severe toll DMFS can take on patients' health status. This is further reflected in their ability to carry out daily activities, with a significant portion of the patients rating their ability as fair (32.4%) or poor (21.6%) [24].

Social activities, another key component of quality of life, were also impacted. About 30% of the patients reported poor ability to engage in social activities, and 20.4% reported very poor ability. The impact of DMFS on these aspects of patients' lives underscores the broad effects of the syndrome beyond just physical health [25].

The ability of patients to manage their DMFS symptoms varied, with only 19.2% reporting good or very good management ability. Meanwhile, 44% reported fair, poor, or very poor management ability. It suggests that a significant proportion of patients struggle with symptom management, which can worsen the quality of life [26].

The level of anxiety and stress experienced by patients due to their condition was also high, with 31.6% always feeling anxious and 36.4% often feeling anxious. This suggests that DMFS contributes significantly to mental health difficulties, which are known to negatively affect quality of life [27]. Furthermore, most patients (44.8%) reported always experiencing pain or discomfort in their feet, while 88.8% reported that their condition negatively affects their daily activities, again highlighting the significant burden of DMFS on patients' lives [4].

The survey results also suggested that 58.8% of patients needed to take time off work or school due to DMFS, indicating the far-reaching consequences of the syndrome on patients' socio-economic status [28]. Despite the challenges they face, a majority of patients reported feeling supported in managing their diabetes (87.6%), and a significant portion reported being satisfied or very satisfied with their current treatment (55.6%). These results highlight the importance of healthcare providers' support and effective treatments in managing DMFS [26].

However, stigma remains a significant issue, with 52.4% of patients reporting they have experienced discrimination or stigma because of their diabetes, potentially leading to negative mental health outcomes and decreased social participation [29]. Moreover, diabetes was reported to have affected relationships with family and friends for 56% of patients, indicating its significant impact on personal relationships [30].

Table 1. Personal and clinical information of participants

Variable	Frequency (250)	Percentage (%)
Gender		
Male	119	47.60
Female	131	52.40
Age (in years)		
Less than 20	9	3.60
20 – 29	21	8.40
30 – 39	25	10.00
40 - 49	45	18.00
50 – 59	91	36.40
60 and above	59	23.60
Educational level		
No Formal Education	16	6.40
Primary Educations	33	13.20
Secondary Education	139	55.60
Tertiary Education	62	24.80
Marital Status		
Single	11	4.40
Married	183	73.20
Separated/Divorce	21	8.40
Widowed	35	14.00
What is your current occupation?		
Farmer	13	5.20
Trader	39	15.60
Civil Servant	74	29.60
Student	14	5.60
Unemployed	54	21.6
Retiree	56	22.40
How many years have you been diagnosed with diabetes?		
Less than one year	38	15.20
1 – 5 years	52	20.80
6 – 10 years	97	38.80
More than 10 years	63	25.20
What type of diabetes do you have?		
Type 1	18	7.20
Type 2	228	91.20
Others	4	1.60
Have you ever been diagnosed with foot syndrome related to diabetes?		
Yes	158	63.20
No	92	36.80
If yes, how long have you been suffering from Diabetic mellitus foot syndrome (DMFS)?		
Less than one year	16	10.13
1 – 5 years	85	53.80
6 – 10 years	38	24.05
More than 10 years	19	12.03
Are you currently taking any medication for DMFS?		
Yes	158	100.00
No	00	0.00
Have you previously undergone any surgical treatment for DMFS?		
Yes	61	38.61
No	97	61.39

Table 2. Lifestyle and risk factors assessment

Variable	Frequency (n = 250)	Percentage (%)
How often do you check your blood sugar levels?		
More than once a day	17	6.80
Once a day	127	50.80
Few times a week	41	16.40
Once a week	38	15.20
Sometimes	23	9.20
Rarely	4	1.60
Never	00	0.00
Do you smoke?		
Yes	62	24.80
No	188	75.20
Do you consume alcohol?		
Yes	96	38.40
No	154	61.60d
How would you describe your diet?		
Balanced	78	31.20
High in fats	11	4.40
High in carbohydrates	38	15.20
High in proteins	27	10.80
Vegetarian/Vegan	7	2.80
Not sure	89	35.60
How often do you exercise?		
Always	42	16.80
Often	65	26.00
Sometimes	101	40.40
Rarely	42	16.80
Never	00	0.00
Have you ever been diagnosed with other chronic diseases (e.g., heart disease, hypertension)?		
Yes	96	38.40
No	154	61.60
How often do you check your feet for any wounds or injuries?		
Always	63	25.20
Often	87	34.80
Sometimes	77	30.80
Rarely	15	6.00
Never	8	3.20
Do you wear special footwear designed for diabetes patients?		
Yes	83	33.20
No	167	66.80
Do you have a family history of diabetes mellitus?		
Yes	173	69.20
No	77	30.80
Have you previously or do you currently have diabetic neuropathy?		
Yes	133	53.20
No	117	46.80
Have you previously or do you currently have peripheral vascular disease?		
Yes	128	51.20
No	122	48.80
Have you previously or do you currently have Systemic Arterial Hypertension?		
Yes	132	52.80
No	118	47.20

Table 3. Quality of life assessment

Variable	Frequency	Percentage (%)
How will you rate your overall health status?		
Very Good	23	9.20
Good	41	16.40
Fair	98	39.20
Poor	79	31.60
Very Poor	9	3.60
How will you rate your ability to carry out normal daily activities?		
Very Good	29	11.60
Good	42	16.80
Fair	81	32.40
Poor	54	21.60
Very Poor	44	17.60
How will you rate your ability to participate in social activities?		
Very Good	24	9.60
Good	38	15.20
Fair	62	24.80
Poor	75	30.00
Very Poor	51	20.40
How will you rate your ability to manage your symptoms related to DMFS?		
Very Good	18	7.20
Good	30	12.00
Fair	68	27.20
Poor	31	12.40
Very Poor	11	4.40
No DMFS	92	36.80
How will you rate your overall quality of life?		
Excellent	36	14.40
Good	52	20.80
Fair	79	31.60
Poor	61	24.40
Very Poor	22	8.80
How often do you feel anxious or stressed due to your diabetes?		
Always	79	31.60
Often	91	36.40
Sometimes	75	30.00
Rarely	5	2.00
Never	00	0.00
How often do you feel pain or discomfort in your feet?		
Always	112	44.80
Often	59	23.60
Sometimes	37	14.80
Rarely	31	12.40
Never	11	4.40
Does your condition negatively affect your daily activities?		
Yes	222	88.80
No	28	11.20
Have you needed to take time off work or school due to diabetes foot syndrome?		
Yes	147	58.80
No	11	4.40
No DMFS	92	36.80
How would you describe your level of pain associated with diabetes foot syndrome		
Extremely Painful	47	18.80
Very Painful	66	26.40

Variable	Frequency	Percentage (%)
Painful	37	14.80
Normal	8	3.20
Not Painful	00	0.00
No DMFS	92	36.80
How satisfied are you with your current treatment for diabetes foot syndrome		
Very satisfied	71	28.40
Satisfied	68	27.20
Normal	19	7.60
Unsatisfied	00	0.00
Very unsatisfied	00	0.00
No DMFS	92	36.80
Do you feel supported in managing your diabetes?		
Yes	219	87.60
No	31	12.40
Have you ever experienced discrimination or stigma because of your diabetes?		
Yes	131	52.40
No	119	47.60
Has diabetes affected your relationship with your family and friends?		
Yes	140	56.00
No	110	44.00

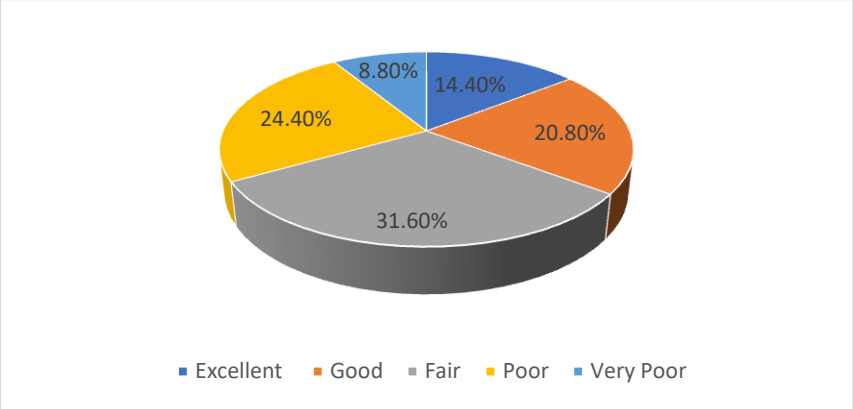

Fig. 1. Overall rating of quality of life of diabetes patients

This study examined numerous lifestyle habits and conditions, including blood sugar monitoring, smoking and alcohol consumption, dietary habits, exercise routines, chronic diseases, foot care, use of special footwear, family history of diabetes, and the presence of diabetic neuropathy, peripheral vascular disease, and systemic arterial hypertension. It is crucial to understand the implications of these variables on the patient's quality of life (QoL). QoL is a subjective measure of overall life satisfaction and includes both positive and negative dimensions of life [31].

Regular monitoring of blood sugar levels was associated with better QoL ($\chi2=6.476$, $p=0.042$), which aligns with previous research indicating that active self-management and monitoring can improve health outcomes and QoL [32]. A significant finding is the effect of smoking and alcohol consumption on the QoL of diabetes patients. Both factors showed a negative impact on QoL ($\chi2=8.347$, $p=0.028$; $\chi2=7.248$, $p=0.031$), further highlighting the detrimental effects of these behaviors on diabetes management and overall health [33].

The study did not find a significant effect of diet on QoL ($\chi2=1.561$, $p=0.278$), nor did it find a significant correlation between exercise frequency and QoL ($\chi2=2.558$, $p=1.071$). This may suggest that while maintaining a balanced diet and engaging in regular physical activity are important aspects of diabetes management, they may not be the sole determinants of QoL [18].

Table 4. Effect of lifestyle and risk factors on the quality of life of diabetes patients

Risk Factors	How will you rate your overall quality of life?					χ^2	P-value
	Excellent	Good	Fair	Poor	Very Poor		
How often do you check your blood sugar levels?						6.476	0.042*
More than once a day	8	5	4	0	0		
Once a day	21	28	63	15	0		
Few times a week	7	19	8	7			
Once a week	0	0	4	25	9		
Sometimes	0	0	0	14	9		
Rarely	0	0	0	0	4		
Never	0	0	0	0	0		
Do you smoke?						8.347	0.028*
Yes	2	4	4	30	22		
No	34	48	75	31	0		
Do you consume alcohol?						7.248	0.031*
Yes	4	4	11	55	22		
No	32	48	68	6	0		
How would you describe your diet?						1.561	0.278
Balanced	9	18	32	19	0		
High in fats	2	5	0	1	3		
High in carbohydrates	8	11	10	5	4		
High in proteins	5	8	11	1	2		
Vegetarian/Vegan	3	1	1	1	1		
Not sure	9	9	25	34	12		
How often do you exercise?						2.558	1.071
Always	8	11	13	7	3		
Often	13	16	15	13	8		
Sometimes	12	21	34	29	5		
Rarely	3	4	17	12	6		
Never	0	0	0	0	0		
Have you ever been diagnosed with other chronic diseases (e.g., heart disease, hypertension)?						8.346	0.002*
Yes	0	2	17	55	22		
No	36	50	62	6	0		
How often do you check your feet for any wounds or injuries?						3.057	1.005
Always	11	10	22	12	8		
Often	10	16	31	22	8		
Sometimes	9	20	23	21	4		
Rarely	4	5	1	5	0		
Never	2	1	2	1	2		
Do you wear special footwear designed for diabetes patients?						9.016	0.002*
Yes	21	32	27	3	0		
No	15	20	52	58	22		

Risk Factors	How will you rate your overall quality of life?					χ^2	P-value
	Excellent	Good	Fair	Poor	Very Poor		
Do you have a family history of diabetes mellitus?						3.050	0.967
Yes	21	41	63	37	11		
No	15	11	16	24	11		
Have you previously or do you currently have diabetic neuropathy?						7.641	0.019*
Yes	11	13	49	40	20		
No	25	39	30	21	2		
Have you previously or do you currently have peripheral vascular disease?						2.034	1.107
Yes	20	31	29	34	14		
No	16	21	50	27	8		
Have you previously or do you currently have Systemic Arterial Hypertension?						7.4251	0.021*
Yes	11	12	49	40	20		
No	25	40	30	21	2		

Presence of other chronic diseases like heart disease and hypertension was found to be negatively associated with QoL (χ2=8.346, p=0.002). Co-morbidity of chronic conditions can complicate diabetes management and deteriorate the QoL [34,35]. Additionally, the study showed that patients who regularly check their feet for wounds and injuries and those who use specially designed footwear for diabetes had a better QoL (χ2=3.057, p=1.005; χ2=9.016, p=0.002). This could emphasize the importance of preventive measures in managing diabetes foot syndrome [21].

Interestingly, a family history of diabetes did not significantly impact QoL (χ2=3.050, p=0.967). The study also found that the presence of diabetic neuropathy, peripheral vascular disease, and systemic arterial hypertension were negatively associated with QoL (χ2=7.641, p=0.019; χ2=2.034, p=1.107; χ2=7.4251, p=0.021). These findings are consistent with existing literature which identifies these complications as major factors affecting QoL in diabetes patients [36,37].

5. CONCLUSION AND RECOMMENDA-TIONS

The study underscores the multifaceted impact of DMFS on patients' lives, extending beyond health implications to affect their mental wellbeing, social life, and relationships. The findings call for an integrated approach to managing DMFS that encompasses both physical and mental healthcare, along with socio-economic support, stigma reduction, and public education efforts. the study offers valuable insights into the relationship between risk factors and QoL among diabetes patients. More importantly, it underscores the need for comprehensive interventions that target lifestyle changes, disease management, and preventive care. Health education interventions are necessary to improve self-care behaviours and, subsequently, the quality of life in this population.

CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard guideline participant consent and ethical approval has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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