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Original Article

Quality of Life Among Patients with Type 2 Diabetes Mellitus in a Rural Health Training Centre: A Cross-Sectional Analytical Study

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ABSTRACT

Background: Diabetes mellitus is a chronic non-communicable disease that affects multiple dimensions of health and well-being. As survival improves, assessment of quality of life (QoL) has become an essential component of comprehensive diabetes care, particularly in primary care and rural settings.
Objectives: To assess the quality of life among patients with type 2 diabetes mellitus and to determine its association with selected sociodemographic and clinical factors.
Methods: A facility-based cross-sectional analytical study was conducted at a Rural Health Training Centre attached to a tertiary care hospital. A total of 300 patients with type 2 diabetes mellitus aged 30 years and above were included using systematic random sampling. Data were collected through face-to-face interviews using a pretested semi-structured questionnaire and the World Health Organization Quality of Life–BREF (WHOQOL-BREF) instrument. Domain scores were calculated and transformed to a 0–100 scale. Associations between QoL domains and explanatory variables were analyzed using appropriate statistical tests, with $p < 0.05$ considered statistically significant.
Results: The study population predominantly consisted of middle-aged and older adults, females, literate individuals, and those belonging to nuclear families. The highest mean QoL score was observed in the psychological domain (70.45 ± 8.64), followed by environmental (68.94 ± 8.10), social (66.18 ± 14.22), and physical domains (64.82 ± 12.10). Younger age, higher educational status, nuclear family type, employment, and shorter duration of diabetes (<5 years) were significantly associated with better quality of life across multiple domains.
Conclusion: Patients with type 2 diabetes mellitus demonstrated an overall favorable quality of life; however, sociodemographic and disease-related factors significantly influenced QoL outcomes. Integrating psychosocial support, patient education, and early intervention into routine diabetes care may further enhance quality of life, particularly in rural primary healthcare settings.

Keywords: *Diabetes mellitus; Quality of life; WHOQOL-BREF; Rural health; Type 2 diabetes.*

INTRODUCTION

Diabetes mellitus is a major global public health challenge and one of the most prevalent chronic non-communicable diseases worldwide.[1] The progressive nature of diabetes, coupled with its long-term complications and lifelong treatment requirements, imposes a substantial burden not only on physical health but also on psychological, social, and environmental well-being. [2] As survival among individuals with diabetes improves due to advances in medical care, attention has increasingly shifted toward patient-centered outcomes such as quality of life (QoL), which reflects an individual's perception of their overall health and ability to function in daily life. [3]

Quality of life is a multidimensional construct encompassing physical health, psychological state, social relationships, and interaction with the environment. [4] In patients with diabetes, QoL is influenced by several factors including glycemic control, duration of illness, presence of complications, treatment adherence, socioeconomic status, family support, and lifestyle behaviors. [5] Poor QoL among diabetic patients has been associated with suboptimal self-care, reduced medication adherence, increased healthcare utilization, and worse clinical outcomes, making it an essential outcome measure in diabetes management. [6]

Several studies conducted in India and other low- and middle-income countries have consistently demonstrated that diabetes adversely affects quality of life. [7] Facility-based studies using generic and disease-specific QoL instruments have reported lower scores particularly in the physical and social domains, highlighting the functional limitations and social challenges experienced by diabetic patients. [8] Sociodemographic factors such as older age, female gender, lower educational status, unemployment, and longer duration of diabetes have been identified as important determinants of poorer QoL. These findings underscore the need for holistic diabetes care beyond glycemic control alone. [9]

Comparative studies have further shown that individuals with diabetes have significantly poorer quality of life compared to non-diabetic populations, emphasizing the psychosocial impact of the disease and its treatment. [10] Education level, comorbid conditions, medication adherence, sleep quality, and self-care behaviors have emerged as key modifiable factors influencing QoL. [11] Evidence also suggests that social support systems, family structure, and economic security play a protective role in enhancing quality of life among diabetic patients, particularly in community and primary care settings. [12]

Despite the growing body of evidence, most available studies are either limited by small sample sizes, restricted geographic coverage, or focus predominantly on clinical variables, with less emphasis on social determinants such as family type and employment status. [13] Furthermore, there is considerable heterogeneity in QoL outcomes across regions and populations, highlighting the influence of contextual and cultural factors. [14] In India, especially in primary care and community-based settings, there remains a need for large-scale studies that comprehensively assess quality of life and its associated sociodemographic and clinical determinants among diabetic patients. [15,16]

In this context, the present study was undertaken to assess the quality of life among patients with type 2 diabetes mellitus using the WHOQOL-BREF instrument and to examine its association with key sociodemographic and clinical factors. Understanding these associations is essential for designing targeted interventions that address not only medical management but also the psychosocial and environmental needs of diabetic patients, thereby improving overall well-being and long-term outcomes.

Objectives

- To assess the quality of life across physical, psychological, social, and environmental domains among patients with type 2 diabetes mellitus using the WHOQOL-BREF instrument.
- To determine the association of selected sociodemographic and clinical factors—including age, educational status, family type, employment status, and duration of diabetes—with quality of life among diabetic patients.

MATERIALS AND METHODS

Study Design and Setting

This was a facility-based cross-sectional analytical study conducted at the Rural Health Training Centre (RHTC) attached to a tertiary care teaching hospital. The RHTC caters to a defined rural population and provides comprehensive primary healthcare services, including regular non-communicable disease (NCD) clinics for diabetes management.

Study Population

The study population comprised patients diagnosed with type 2 diabetes mellitus who attended the diabetic clinic at the RHTC during the study period. All eligible patients visiting the facility for routine follow-up or treatment were considered for inclusion in the study.

Study Duration

The study was carried out over a period of six months, including participant recruitment, data collection, and data entry.

Inclusion and Exclusion Criteria

Inclusion criteria

- Patients diagnosed with type 2 diabetes mellitus
- Age ≥30 years
- On treatment or follow-up for diabetes at the RHTC

- Willing to participate and provide written informed consent

Exclusion criteria
- Patients who were severely ill or cognitively impaired at the time of interview
- Patients with known psychiatric illness affecting the ability to respond reliably
- Patients unwilling to participate in the study

Sample Size and Sampling Technique
The sample size was calculated based on previous studies assessing quality of life among diabetic patients using the WHOQOL-BREF instrument. Considering an expected prevalence of good quality of life of approximately 60%, with a 95% confidence level and 6% absolute precision, the minimum required sample size was estimated to be 267. After accounting for possible non-response, a final sample size of 300 participants was included in the study.

A systematic random sampling technique was used to select study participants from the diabetic clinic attendance register. Eligible patients were enrolled consecutively until the desired sample size was achieved.

Study Procedure
After obtaining approval from the Institutional Ethics Committee, eligible patients attending the diabetic clinic were approached by the investigator. The purpose of the study was explained in the local language, and written informed consent was obtained. Data were collected through face-to-face interviews using a pretested, semi-structured questionnaire.

The questionnaire consisted of two parts:
1. Sociodemographic and clinical details, including age, sex, education, marital status, employment status, family type, and duration of diabetes.
2. Assessment of quality of life using the World Health Organization Quality of Life–BREF (WHOQOL-BREF) questionnaire, which includes 26 items covering four domains: physical health, psychological health, social relationships, and environmental health.

Privacy and confidentiality were ensured during the interview process.

Operational Definitions
- Quality of life (QoL): The individual's perception of their position in life in the context of culture and value systems, assessed using the WHOQOL-BREF questionnaire.
- Good quality of life: Higher domain scores on the WHOQOL-BREF scale, indicating better perceived well-being.
- Duration of diabetes: Time elapsed since the diagnosis of type 2 diabetes mellitus, categorized as <5 years and ≥5 years.
- Family type: Classified as nuclear or joint family based on household composition.

Statistical Analysis
Data were entered into Microsoft Excel and analyzed using the Statistical Package for Social Sciences (SPSS) software version 26. Continuous variables were summarized as mean and standard deviation, while categorical variables were expressed as frequencies and percentages. WHOQOL-BREF domain scores were calculated according to the WHO scoring manual and transformed to a scale ranging from 0 to 100. Associations between quality of life domain scores and selected sociodemographic and clinical variables were assessed using appropriate inferential statistical tests. A p value of <0.05 was considered statistically significant.

Ethical Consideration
Ethical approval for the study was obtained from the Institutional Ethics Committee of the tertiary care hospital prior to initiation of the study. Written informed consent was obtained from all participants after explaining the purpose and procedures of the study. Confidentiality of participant information was strictly maintained, and participation was entirely voluntary, with the option to withdraw at any stage without affecting their medical care.

RESULTS
Among the 300 diabetic patients included in the study, the majority belonged to the older age group of 51–60 years (46.7%), followed by those aged 41–50 years (32.6%), while 20.7% were in the 30–40-year age group. Females constituted a slightly higher proportion of the study population (54.0%) compared to males (46.0%). Most participants were literate (82.0%), with only 18.0% being illiterate. A large majority of the participants were married (90.7%), whereas 7.3% were unmarried and 2.0% were separated. Employment status was almost evenly distributed, with 50.7%

of participants being employed and 49.3% unemployed. With regard to family structure, more than two-thirds of the participants (68.0%) belonged to nuclear families, while 32.0% resided in joint families. (Table 1)

Table 1. Sociodemographic Characteristics of Diabetic Patients (N = 300)

Variable	Category	Frequency	Percentage
Age group (years)	30–40	62	20.7
	41–50	98	32.6
	51–60	140	46.7
Sex	Male	138	46.0
	Female	162	54.0
Educational status	Illiterate	54	18.0
	Literate	246	82.0
Marital status	Married	272	90.7
	Unmarried	22	7.3
	Separated	6	2.0
Employment status	Unemployed	148	49.3
	Employed	152	50.7
Family type	Nuclear	204	68.0
	Joint	96	32.0

The assessment of quality of life using the WHOQOL-BREF questionnaire demonstrated relatively favorable domain scores across all four domains. The highest mean score was observed in the psychological health domain (M = 70.45, SD = 8.64), followed by the environmental health domain (M = 68.94, SD = 8.10). The social relationships domain also showed a comparatively high mean score (M = 66.18, SD = 14.22). The physical health domain had the lowest mean score among the four domains, although it remained within a favorable range (M = 64.82, SD = 12.10). Overall, the findings indicate a generally good quality of life among the diabetic patients included in the study. (Table 2)

Table 2. Mean WHOQOL-BREF Domain Scores Among Diabetic Patients (N = 300)

WHOQOL-BREF Domain	Mean	SD
Physical health	64.82	12.10
Psychological health	70.45	8.64
Social relationships	66.18	14.22
Environmental health	68.94	8.10

Quality of life domain scores varied significantly according to age group. Participants aged <45 years demonstrated higher mean scores across all four WHOQOL-BREF domains compared with those aged ≥45 years. The differences were statistically significant for the physical domain (M = 69.74, SD = 11.84 vs. M = 61.92, SD = 11.66; $p < .001$), psychological domain (M = 73.12, SD = 8.21 vs. M = 68.92, SD = 8.77; $p = .002$), social relationships domain (M = 70.65, SD = 13.94 vs. M = 63.52, SD = 14.01; $p < .001$), and environmental domain (M = 72.10, SD = 7.42 vs. M = 66.98, SD = 8.21; $p < .001$). These findings indicate that younger diabetic patients experienced a significantly better quality of life across all domains when compared to their older counterparts. (Table 3)

Table 3. Quality of Life Domain Scores According to Age Group (N = 300)

Domain	<45 years (n = 110) Mean ± SD	≥45 years (n = 190) Mean ± SD	p value
Physical	69.74 ± 11.84	61.92 ± 11.66	<0.001*
Psychological	73.12 ± 8.21	68.92 ± 8.77	0.002*
Social	70.65 ± 13.94	63.52 ± 14.01	<0.001*
Environmental	72.10 ± 7.42	66.98 ± 8.21	<0.001*

*-statistically significant

Educational status also showed a statistically significant association with quality of life across all WHOQOL-BREF domains. Literate participants consistently reported higher mean scores than illiterate participants in the physical (M = 66.01, SD = 12.02 vs. M = 59.48, SD = 11.22; $p = .001$), psychological (M = 71.38, SD = 8.41 vs. M = 66.22, SD = 8.84; $p < .001$), social relationships (M = 67.52, SD = 14.06 vs. M = 60.10, SD = 13.18; $p < .001$), and environmental domains (M = 69.98, SD = 7.88 vs. M = 64.02, SD = 7.96; $p < .001$). Overall, higher educational attainment was associated with a significantly better quality of life among diabetic patients across all assessed domains. (Table 4)

Table 4. Association Between Educational Status and WHOQOL-BREF Domain Scores (N = 300)

Domain	Illiterate (n = 54) Mean ± SD	Literate (n = 246) Mean ± SD	p value

Physical	59.48 ± 11.22	66.01 ± 12.02	0.001*
Psychological	66.22 ± 8.84	71.38 ± 8.41	<0.001*
Social	60.10 ± 13.18	67.52 ± 14.06	<0.001*
Environmental	64.02 ± 7.96	69.98 ± 7.88	<0.001*

*-statistically significant

Family type and employment status showed a significant association with quality of life, particularly in the social relationships domain. Participants belonging to nuclear families reported a significantly higher mean social domain score compared with those from joint families (M = 68.92, SD = 13.84 vs. M = 60.42, SD = 14.36; p < .001). Similarly, employed participants demonstrated a significantly better social quality of life than unemployed participants (M = 69.18, SD = 14.02 vs. M = 63.01, SD = 14.41; p < .001). These findings suggest that living in a nuclear family setup and being gainfully employed are associated with more favorable social interactions and perceived social support among diabetic patients. (Table 5)

Table 5. Association of Family Type and Employment Status with Quality of Life Domains (N = 300)

Variable	Category	Social Domain Mean ± SD	p value
Family type	**Nuclear (n = 204)**	**68.92 ± 13.84**	<0.001*
	Joint (n = 96)	60.42 ± 14.36	
Employment status	Employed (n = 152)	69.18 ± 14.02	<0.001*
	Unemployed (n = 148)	63.01 ± 14.41	

*-statistically significant

The duration of diabetes was also significantly associated with quality of life across all four WHOQOL-BREF domains. Participants with a shorter duration of diabetes (<5 years) reported higher mean scores in the physical domain (M = 67.84, SD = 11.96) compared with those with a longer duration of illness (≥5 years; M = 60.62, SD = 11.81), with the difference being statistically significant (p < .001). Similar patterns were observed in the psychological domain (M = 72.18, SD = 8.31 vs. M = 67.92, SD = 8.71; p = .002), social relationships domain (M = 69.74, SD = 13.96 vs. M = 61.48, SD = 14.12; p < .001), and environmental domain (M = 71.02, SD = 7.86 vs. M = 65.98, SD = 8.12; p < .001). Overall, a shorter duration of diabetes was associated with a significantly better quality of life across all domains, indicating the cumulative negative impact of prolonged disease duration on physical, psychological, social, and environmental well-being. (Table 6)

Table 6. Association Between Duration of Diabetes and WHOQOL-BREF Domain Scores (N = 300)

Domain	<5 years (n = 176) Mean ± SD	≥5 years (n = 124) Mean ± SD	p value
Physical	67.84 ± 11.96	60.62 ± 11.81	<0.001*
Psychological	72.18 ± 8.31	67.92 ± 8.71	0.002*
Social	69.74 ± 13.96	61.48 ± 14.12	<0.001*
Environmental	71.02 ± 7.86	65.98 ± 8.12	<0.001*

*-statistically significant

DISCUSSION

The sociodemographic profile of participants in the present study revealed a predominance of middle-aged and older adults, females, literate individuals, married participants, and those belonging to nuclear families. This pattern is comparable to the findings reported by Chandran et al., who observed a higher representation of females, married individuals, and literates in a rural South Indian setting [1]. Similar demographic trends were also documented in studies from Nigeria and Thailand, where female participants and older age groups constituted the majority of diabetic populations [2,3]. In contrast, Yassin et al. reported a much older cohort with a larger proportion of participants aged above 65 years, reflecting regional and healthcare access differences [9]. The higher proportion of nuclear families observed in the present study aligns with the social transition noted in recent Indian studies and may have implications for social support and quality of life.

The overall WHOQOL-BREF domain scores in the present study indicated a relatively better quality of life across all four domains, with the highest scores observed in the psychological and environmental domains. These findings contrast with those of Chandran et al., who reported lower mean scores, particularly in the social domain, among diabetic patients attending a rural health facility [1]. Similarly, Okpuruka et al. found significantly poorer quality of life scores among diabetic patients when compared to non-diabetic controls, emphasizing the negative impact of diabetes on multiple domains of life [2]. However, findings from Manjunath et al. and Patel et al. demonstrated moderate to good domain-wise QoL scores, particularly in psychological and environmental domains, which are consistent with the relatively

favorable QoL observed in the present study [5,7]. These variations may be attributable to differences in healthcare delivery, patient education, and family support systems.

Age-wise comparison of quality of life domains in the present study showed that participants aged less than 45 years had significantly higher scores across all domains compared to those aged 45 years and above. This observation is consistent with findings from Tamornpark et al., who reported that younger diabetic patients had significantly greater odds of having good quality of life compared to older individuals [3]. Similar age-related declines in QoL have been reported by Singh et al. and Patel et al., where increasing age and longer disease duration were associated with poorer quality of life [7,10]. Chandran et al. also noted that younger participants demonstrated better physical, social, and environmental domain scores, supporting the present findings [1]. The decline in QoL with advancing age may reflect cumulative disease burden, complications, and reduced functional capacity.

Educational status emerged as a significant determinant of quality of life in the present study, with literate participants exhibiting significantly higher scores across all WHOQOL-BREF domains. This finding corroborates the observations of Okpuruka et al., who reported higher HRQOL scores among diabetics with tertiary education compared to those with lower educational attainment [2]. Similar associations were reported by Alaofè et al., where education was identified as a significant predictor of diabetes-specific quality of life [4]. Studies from India and Benin have consistently highlighted the role of education in enhancing disease understanding, self-care practices, and coping strategies, thereby improving QoL outcomes [5,12]. These findings underscore the importance of patient education as a cornerstone of comprehensive diabetes care.

In the present study, participants belonging to nuclear families and those who were employed demonstrated significantly better social domain scores compared to their counterparts. This finding aligns with the results of Tamornpark et al., who observed higher odds of good quality of life among individuals living alone or with spouses compared to those living with extended family members [3]. Alaofè et al. also identified occupation and social support as key factors associated with better quality of life among patients with type 2 diabetes [4]. Similarly, Mishra et al. reported improved quality of life among employed and adherent patients, highlighting the role of financial independence and structured routines [6]. These results suggest that autonomy, stable income, and focused family support may positively influence social well-being in diabetic patients.

The duration of diabetes showed a strong inverse association with quality of life across all domains in the present study, with patients having a shorter duration of illness reporting significantly better QoL scores. This finding is consistent with observations by Chandran et al. and Patel et al., who reported poorer quality of life among patients with longer disease duration [1,7]. Singh et al. and Yassin et al. similarly demonstrated that prolonged duration of diabetes was associated with worse QoL scores, likely due to the cumulative impact of complications, treatment fatigue, and psychosocial stressors [9,10]. Comparable results have also been reported in multinational studies, reinforcing the need for early intervention, sustained follow-up, and complication prevention strategies to preserve quality of life in diabetic patients.

Limitations

This study was conducted in a single rural health training centre, which may limit the generalizability of the findings to other settings. Additionally, the cross-sectional design precludes establishing causal relationships between quality of life and its associated factors.

CONCLUSION AND RECOMMENDATIONS

The present study demonstrates that patients with type 2 diabetes mellitus attending a rural health training centre exhibited a generally favorable quality of life across physical, psychological, social, and environmental domains. Younger age, higher educational status, nuclear family structure, employment, and shorter duration of diabetes were associated with significantly better quality of life. These findings highlight the multidimensional impact of diabetes and emphasize the importance of addressing sociodemographic and disease-related factors alongside routine clinical management to enhance overall well-being among diabetic patients.

Based on the study findings, it is recommended that diabetes care programs adopt a holistic, patient-centered approach that integrates psychosocial assessment with standard medical treatment. Regular quality of life evaluation, patient education initiatives, counseling services, and family involvement—particularly targeting older patients, those with lower education, unemployment, and longer disease duration—should be strengthened at the primary care level to improve long-term outcomes and quality of life among diabetic patients.

REFERENCES

1. Chandran VS, Shah PB. Quality of life in patients with diabetes in a Rural Health and Training Centre. Journal of Family Medicine and Primary Care. 2025 Jul 1;14(7):2826-30.

2. Okpuruka PO, Anarado AN, Nwonu E, Chinweuba A, Ogbonnaya NP, Opara HC, Anetekhai CJ. Health-related Quality of Life (HRQOL) of Patients with Type 2 Diabetes Mellitus and People without Diabetes at a Tertiary Hospital in Port-Harcourt, Rivers State, Nigeria. International Journal of Medicine and Health Development. 2022 Apr 1;27(2):151-9.
3. Tamornpark R, Utsaha S, Apidechkul T, Panklang D, Yeemard F, Srichan P. Quality of life and factors associated with a good quality of life among diabetes mellitus patients in northern Thailand. Health and Quality of Life Outcomes. 2022 May 20;20(1):81.
4. Alaofè H, Amoussa Hounkpatin W, Djrolo F, Ehiri J, Rosales C. Factors associated with quality of life in patients with type 2 diabetes of South Benin: A cross-sectional study. International Journal of Environmental Research and Public Health. 2022 Feb 18;19(4):2360.
5. Manjunath K, Christopher P, Gopichandran V, Rakesh PS, George K, Prasad JH. Quality of life of a patient with type 2 diabetes: a cross-sectional study in rural South India. Journal of family medicine and primary care. 2014 Oct 1;3(4):396-9.
6. Mishra R, Sharma SK, Verma R, Kangra P, Dahiya P, Kumari P, Sahu P, Bhakar P, Kumawat R, Kaur R, Kant R. Medication adherence and quality of life among type-2 diabetes mellitus patients in India. World Journal of Diabetes. 2021 Oct 15;12(10):1740.
7. Patel B, Oza B, Patel K, Malhotra S, Patel V. Health related quality of life in type-2 diabetic patients in Western India using World Health Organization Quality of Life–BREF and appraisal of diabetes scale. International journal of diabetes in developing countries. 2014 Jun;34(2):100-7.
8. Azharuddin MD, Kapur P, Adil M, Ghosh P, Sharma M. Health-related quality of life and sleep quality among North Indian type 2 diabetes mellitus patients: evidence from a cross-sectional study. Sleep Medicine. 2020 Sep 1;73:93-100.
9. Yassin FA, Eldooma I. Quality of Life Assessment Among Type-2 Diabetic Patients Attending Health Care Centers, Wad Medani, Sudan. Sudan Journal of Health Sciences. 2025 Apr 30;3(1):39-49.
10. Singh DB, Dmello MK, Alex A. Quality of Life (QoL) among patients with diabetes mellitus: A hospital based study. Journal of Krishna Institute of Medical Sciences (JKIMSU). 2025 Apr 1;14(2).
11. Aarthy R, Mikocka-Walus A, Pradeepa R, Anjana RM, Mohan V, Aston-Mourney K. Quality of life and diabetes in India: a scoping review. Indian journal of endocrinology and metabolism. 2021 Sep 1;25(5):365-80.
12. Aschalew AY, Yitayal M, Minyihun A. Health-related quality of life and associated factors among patients with diabetes mellitus at the University of Gondar referral hospital. Health and quality of life outcomes. 2020 Mar 10;18(1):62.
13. Kataria P, Bhasin SK, Upadhyay MK, Madhu SV. Quality of life among type 2 diabetes patients aged 30–64 years attending diabetes clinic in a tertiary care hospital in East Delhi, India. International Journal of Diabetes in Developing Countries. 2023 Dec;43(6):929-35.
14. Somappa HK, Venkatesha M, Prasad R. Quality of life assessment among type 2 diabetic patients in rural tertiary centre. Int J Med Sci Public Health. 2014 Apr 1;3(4):415-7.
15. Yeole UL, Jiandani MP, Kunjir SR, Bhat SM. Quality of life of patients with type 2 diabetes mellitus: A cross-sectional study. Medical Journal of Dr. DY Patil University. 2020 Jul 1;13(4):311-4.
16. Subramaniam S, Somasundaram A, E C, KN PS, Banu JH, Banumathi G, Selvarajan S, Chandrasekaran SD, Cynthia S, MTM study group. Makkalai Thedi Maruthuvam: evaluating equity in non-communicable disease care through a doorstep primary health program in Tamil Nadu, India. BMC Primary Care. 2025 Dec 15.