

Association of Comorbidities with Quality of Life among Patients with Type 2 Diabetes Mellitus in Urban Meerut: A Community-Based Cross-Sectional Study

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Abstract

Background: Type 2 Diabetes Mellitus (T2DM) is frequently associated with multiple comorbidities that adversely affect patients' quality of life (QoL). Understanding the burden of comorbid conditions and their relationship with QoL is essential for comprehensive diabetes care. **Objectives:** To find out the prevalence of comorbidities among patients with T2DM and to determine their association with quality of life. **Material and Methods:** A Community-based cross-sectional study was carried out among 350 Type-2 Diabetes mellitus patients in an urban area of Meerut. Data regarding socio-demographic profile, presence and number of comorbidities were collected. Quality of life assessment was done using standardized Physical Component Summary (PCS) and Mental Component Summary (MCS) scores. Statistical analysis used: Statistical analysis included descriptive statistics, Mann-Whitney U test, and comparison of mean scores across number of comorbidities. **Results:** Among 350 participants, 67.7% had at least one comorbidity. Obesity (57.4%) was the most common co-morbid condition followed by hypertension (56%). Participants with comorbidities had significantly lower median PCS (50 vs 100), MCS (60 vs 80), and overall QoL scores (60 vs 100) compared to those without comorbidities ($p < 0.001$). Mean QoL scores progressively declined with increasing number of comorbidities. **Conclusion:** Presence and increasing number of comorbidities significantly impair quality of life among patients with T2DM. Integrated management addressing multiple comorbidities is essential to improve overall wellbeing.

Keywords: Type 2 diabetes mellitus, Comorbidities, Quality of life, Multiple comorbidity

Introduction

Type 2 Diabetes Mellitus (T2DM) is a chronic metabolic disorder posing major public health challenges globally and in India. According to the International Diabetes Federation (IDF) Diabetes Atlas 2025, approximately 589 million adults aged 20-79 years are living with diabetes globally, and this number is projected to increase to 853 million by 2050, representing nearly 13% of the world's adult population. India contributes substantially to this global burden, ranking among the countries with the highest number of individuals affected by diabetes.[1]

The rising prevalence of T2DM has been accompanied by an increasing burden of comorbid conditions such as hypertension, obesity, dyslipidaemia, and cardiovascular diseases. These coexisting conditions contribute significantly to morbidity, mortality, healthcare utilization, and economic burden. Furthermore, the presence of multiple comorbidities

complicates disease management, adversely affects treatment adherence and self-care practices, and substantially reduces the quality of life of affected individuals.

The most commonly reported comorbidities among individuals with diabetes were hypertension (62%), followed by acid peptic disease (27%), chronic backache (21%), and arthritis (21%).[2]

Comorbidities in type 2 diabetes (T2D) significantly accelerate disease progression and worsen physical, psychological, and social wellbeing. They negatively impact overall well-being, complicate treatment, and heighten healthcare needs, costs, and economic burdens. Additionally, comorbidities, particularly when combined with depression, further reduce life expectancy and diminish the quality of life for individuals with T2D. [3] This subsequently resulted in poor adherence to treatment and self-care practices, thereby negatively impacting patients' health outcomes.[4]

Although several hospital-based studies have been done on quality of life among diabetic patients, community-based evidence evaluating the magnitude of comorbidities and their association with QoL among diabetic patients in India remains limited. Furthermore, evidence from North India, particularly western Uttar Pradesh, is scarce. Hence, this study was conducted to determine the prevalence and pattern of comorbidities among Type 2 DM patients and to assess the association of comorbidities with their Quality of life among them.

Material and Methods

A community-based cross-sectional study was conducted among 350 patients diagnosed with Type 2 Diabetes Mellitus (T2DM). The study was conducted from 1st September 2023 to 30th October 2024 for a period of one year. Adult patients aged 18 years and above who had a confirmed diagnosis of T2DM and provided written informed consent were included in the study. Severely ill or bedridden patients, those who were unwilling to participate, and individuals not previously diagnosed with diabetes mellitus were excluded.

The sample size was calculated using the formula: $n = (Z_{1-\alpha/2})^2 \times (SD)^2 / d^2$, at 95% confidence interval was taken as 1.96, SD represented the standard deviation, and d was the acceptable deviation fixed at 2.5. Based on a previous study, the standard deviation was considered to be 23.17.[5] The calculated minimum sample size was 330, which was increased to 350 after accounting for a 5% non-response rate.

The present study was conducted in the urban area of Meerut district. Meerut city comprises 90 municipal wards, of which one ward was selected randomly.[6] A line list of the diabetic patients was obtained from the Urban Health Centre in the area and using systematic random sampling a total of 350 participants were selected for the study.

Data were collected using a structured questionnaire, which was pre-tested among 40 diabetic patients residing in a non-study area and necessary modifications were made before final data collection. Data were collected through face-to-face interviews, which captured information on presence and type of comorbidities and number of comorbid conditions. For this study, comorbidity referred to two or more medical conditions existing simultaneously regardless of their causal relationship.[7]

Quality of life (QoL) was assessed by the validated Short Form-36 (SF-36) questionnaire, which has been extensively used among diabetic populations and demonstrates acceptable reliability and validity in Indian settings.[8] Using this questionnaire, the standardised Physical Component Summary (PCS), Mental Component Summary (MCS) and the overall QoL score was calculated as the mean of all domain scores and subsequently categorized into good and poor QoL. Participants scoring above the mean were classified as having good QoL, whereas those scoring equal to or below the mean were categorized as having poor QoL.[9,10]

Data were entered and analysed using Jamovi 2.3.28. Frequencies and percentages were computed for categorical variables, while mean and standard deviation were calculated for continuous variables. The Mann-Whitney U test was used to compare QoL scores between groups. A p-value less than 0.05 was considered statistically significant.

Ethical clearance was obtained from the Institutional Ethics Committee, and written informed consent was secured from all participants.

Results

A total of 350 diabetes mellitus patients were assessed for the presence of comorbidities and their influence on the Quality of life of the participants. Among the study participants, almost half (48.9%) were aged 38-58 years, while 32.6% belonged to the 58-78 years age group, indicating that the study population was predominantly composed of middle-aged and older adults. Males constituted 57.4% of the study population, and the majority of participants were Hindus (86.6%).

Table 1: Distribution of participants according to the presence of comorbidity

Comorbidity	Frequency (%)
Present	237(67.7)
Absent	113(32.3)

Out of the total participants, a majority of 237 (67.7%) reported the presence of at least one comorbid condition, while 113 (32.3%) of participants reported no comorbid conditions. (Table 1)

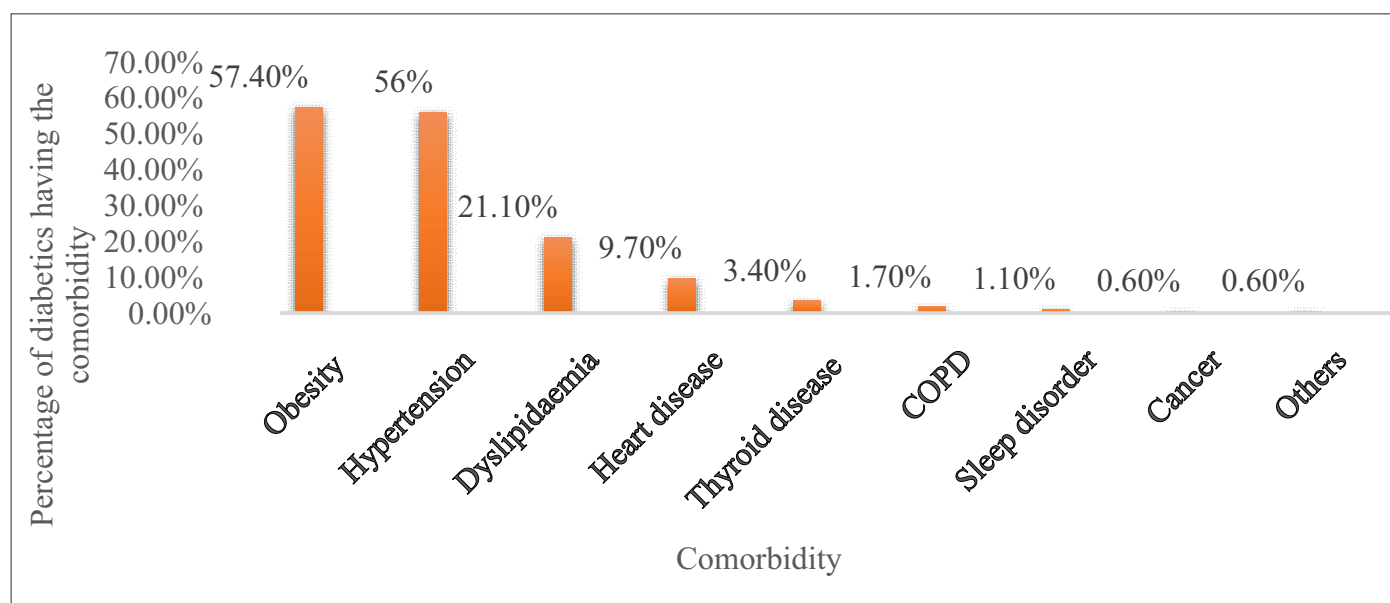


Figure 1: Distribution of participants according to the presence of comorbidity (*Multiple responses) (n=237)

Among the comorbid conditions, obesity (57.4%) was most commonly reported, followed by hypertension (56%). Dyslipidaemia was observed in 21.1% of participants, while 9.7% reported heart disease. Other conditions included thyroid disorders (3.4%), chronic obstructive pulmonary disease (COPD) (1.7%), sleep disorders (1.1%), cancer (0.6%), and other chronic illnesses (0.6%). (Figure 1)

Table 2: Association Between Comorbidity Status and Quality of Life

Comorbidities	Physical Component Summary Score			Mental Component Summary Score			Overall		
	Median (IQR)	Q1- Q3	Min- Max	Median (IQR)	Q1-Q3	Min- Max	Median (IQR)	Q1- Q3	Min- Max
Present	50 (75)	25- 100	0- 100	60(47.50)	32.50- 80	0- 100	60(75)	25- 100	0- 100
Absent	100 (25)	75- 100	0- 100	80(20)	70-90	0- 100	100 (25)	75- 100	0- 100
p-value*	<0.001			<0.001			<0.001		

* Mann-Whitney U test

Table 2 demonstrates a statistically significant association between the presence of comorbidities and quality of life across physical, mental, and overall health domains. Participants affected by comorbidities demonstrated significantly poorer physical health status, as reflected by lower median PCS scores compared to participants without comorbidities [50 (IQR: 75) vs. 100 (IQR: 25)]; ($p < 0.001$). Similarly, the median Mental Component Summary (MCS) score was lower among those with comorbidities [60 (IQR: 47.50) vs. 80 (IQR: 20); $p < 0.001$]. The Overall Quality of Life score also differed significantly ($p < 0.001$), with participants having comorbidities demonstrating a lower median of 60 (IQR: 75), in contrast to a median of 100 (IQR: 25) in those without comorbidities. The high PCS scores among participants without comorbidities may indicate preserved physical functioning in relatively younger or recently diagnosed individuals.

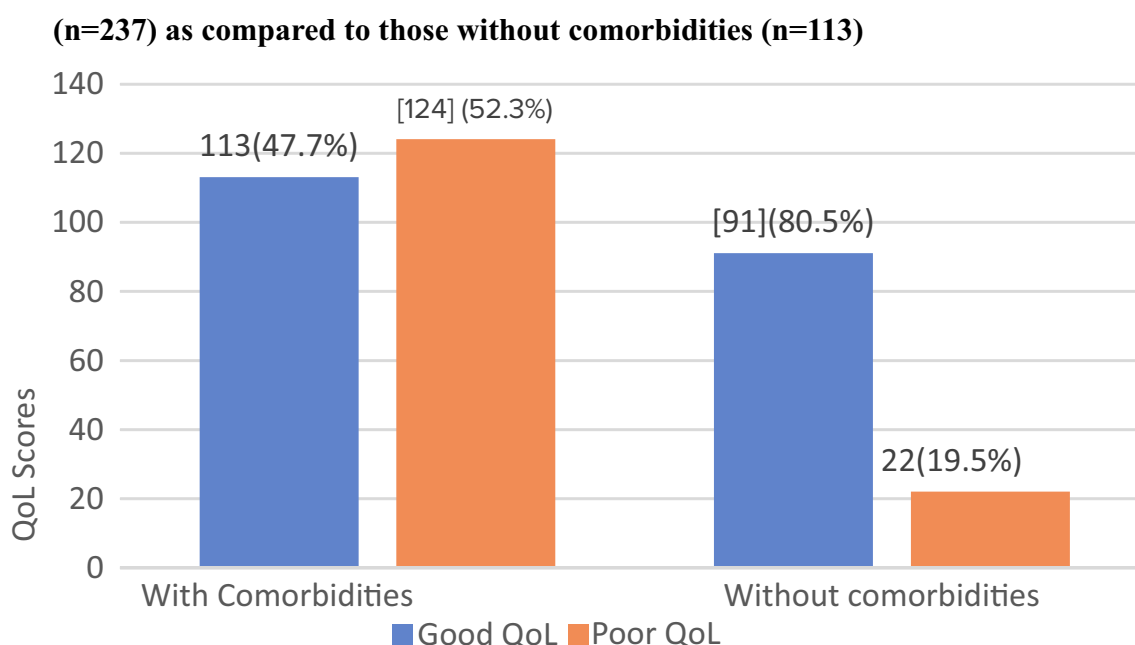


Figure 2: Distribution of Quality of Life (QoL) status among those having comorbidities.

Among the 237 individuals having comorbidities, 52.3% participants reported poor QoL, while 47.7% were found to have good QoL score. The majority of participants who did not have any comorbidities (80.5%) were found to have a good quality of life. (Figure 2)

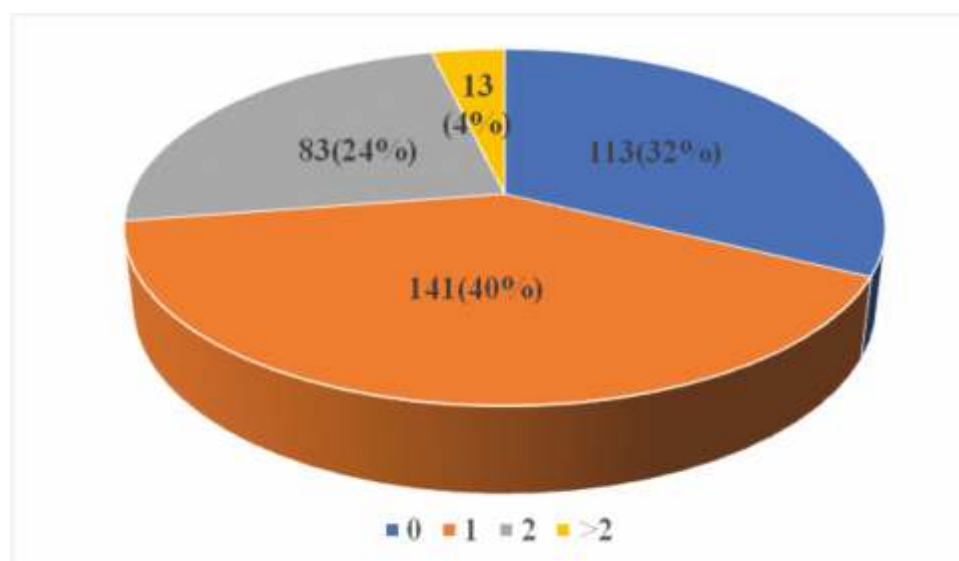


Figure 3: Distribution of participants based on the number of comorbidities (n=350)

Based on the number of comorbidities, 40% of participants had one comorbid condition, 24% had two, 4% had more than two, while 32% reported no comorbidities. (Figure 3)

Table 3: Mean Quality of Life Scores by Number of Comorbid Conditions

Number of co-morbidities	Mean $\pm$ SD	
	Physical Component Score (PCS)	Mental Component Score (MCS)
0	73.64 $\pm$ 22.60	71.38 $\pm$ 19.88
1	59.99 $\pm$ 23.72	60.04 $\pm$ 23.95
2	55.42 $\pm$ 22.95	54.25 $\pm$ 24.39
>2	43.48 $\pm$ 21.48	46.54 $\pm$ 24.09
p-value*	<0.001	<0.001

*Kruskal-Wallis test

A progressive decline in mean QoL scores was observed with an increasing number of comorbidities. Participants with no comorbidities reported the highest mean PCS (73.64 $\pm$ 22.60) and MCS (71.38 $\pm$ 19.88). In contrast, those with one comorbidity had lower mean scores (PCS: 59.99 $\pm$ 23.72; MCS: 60.04 $\pm$ 23.95), those with two comorbidities experienced a further decrease (PCS: 55.42 $\pm$ 22.95; MCS: 54.25 $\pm$ 24.39) and those with more than two comorbidities recorded the lowest mean scores for both PCS (43.48 $\pm$ 21.48) and MCS (46.54 $\pm$ 24.09). Statistically significant differences were observed in both PCS and MCS scores across categories of number of comorbidities ($p < 0.001$). (Table 3)

Discussion

The present study revealed a substantial burden of comorbidities among patients with Type 2 Diabetes Mellitus, with nearly two-thirds (67.7%) of participants reporting at least one coexisting condition. This highlights the nature of diabetes as a chronic metabolic disorder frequently accompanied by additional non-communicable diseases.

Comorbid conditions such as hypertension, cardiovascular disease, and dyslipidaemia are known to frequently co-occur with diabetes and can compound the challenges of disease management, leading to increased medication burden, reduced physical functioning, and greater psychological distress, factors that collectively impair quality of life (QoL). The most prevalent co-morbidity found among the study participants was obesity, affecting 57.4% of the participants, followed by hypertension (56%). Dyslipidaemia was also common, observed in 21.1% of participants and cardiovascular disease in 9.7%. Less common conditions included thyroid

disorders, COPD, sleep disorders, and cancer. Similar findings were reported by Vaibhav et al (2016)¹¹, found the most common co-morbidity was hypertension (52.2%) and dyslipidaemia was present in 47.8% of respondents. Likewise, Pati S et al (2020)² reported 84% of participants had at least one comorbidity and the most frequently reported comorbid conditions included hypertension (62%), acid peptic disease (27%), chronic back pain (21%), and arthritis (21%). The high prevalence of obesity observed in the present study may be attributed to ongoing epidemiological transitions marked by increased sedentary lifestyles and changing dietary patterns in urban populations.

A significant association was observed between the presence of comorbidities and reduced quality of life. Participants with comorbidities had significantly lower median Physical Component Summary (PCS), Mental Component Summary (MCS), and overall QoL scores compared to those without comorbidities. This indicates that the presence of additional chronic conditions significantly compromises physical functioning, increases psychological burden, and diminishes general life satisfaction, thus disrupting daily life and negatively impacting overall quality of life. This is consistent with findings of Sharma S et al (2021)¹², in their study found that comorbidities were significantly associated with lower scores in role physical and vitality domains.

Furthermore, the majority of participants without comorbidities reported good QoL, whereas poor QoL was more frequent among those with comorbid conditions. These findings suggest that the coexistence of additional chronic illnesses adversely affects both physical and psychological well-being.

Comorbidity increases symptom burden, treatment complexity, and psychological stress, which likely explains the observed reduction in QoL. Similarly, Jose SD et al (2022) 13 reported that individuals with comorbidity had 2.91 times higher odds of having poor QoL than compared to those without such conditions. Study done by Pati S et al (2020) 2 found that as the number of comorbidities increased, both PCS and MCS scores declined, where patients with four or more comorbidities had the lowest PCS (26.1 ± 10.7) and MCS (42.8 ± 7.6) scores. These findings emphasise the need for integrated chronic disease management rather than single-disease approaches.

Conclusion

The present study depicts a high prevalence of comorbidities among patients with Type 2 Diabetes Mellitus (67.7%), highlighting the substantial burden of comorbidity in the studied community. Obesity (57.4%) and hypertension (56%) emerged as the most common coexisting conditions, reflecting the interconnected nature of metabolic and cardiovascular risk factors in this population. The presence of comorbidities significantly reduced physical, mental, and overall quality of life. More than half, 52.3%, of the participants with comorbidities reported poor QoL, compared to those without comorbidities. It was found that an increasing number of comorbidities further worsens QoL. Thus, comprehensive management strategies addressing comorbidity are essential in community health settings.

Recommendations

In view of the high burden of multimorbidity and its significant impact on quality of life, routine screening for common comorbid conditions should be incorporated into standard diabetes care at all levels of healthcare. Regular monitoring of blood pressure, lipid profile, and anthropometric indicators such as Waist-Hip Ratio should be emphasized to enable early identification of cardiovascular risk. Establishing integrated non-communicable disease (NCD) clinics at the primary healthcare level and developing multidisciplinary clinics for coordinated management of diabetes, hypertension, obesity, and cardiovascular diseases can facilitate comprehensive care.

Lifestyle modification interventions, particularly structured weight management programs combining dietary counselling, physical activity, and behavioural therapy, should be strengthened. Additionally, screening for psychosocial stressors using validated tools and provision of psychological counselling services should be integrated into routine care, especially for patients with multimorbidity. The introduction of integrated digital health records to track diabetes and associated comorbidities may further enhance continuity of care and improve long-term health outcomes.

Limitations

The findings of the present study should be interpreted in light of certain limitations. As the study employed a cross-sectional design, causal relationships between comorbidities and

quality of life cannot be established. Additionally, the study was conducted in a single randomly selected ward of Meerut city due to logistic and resource-constraints, which may limit the generalizability of the findings to other urban or rural settings. Potential recall bias may have occurred because some comorbidities were self-reported, though some of them were later confirmed by clinical measures. Selection bias was minimized through systematic random sampling.

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