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Beyond blood sugar: Mapping the biopsychosocial parameters of urban adults with type 2 diabetes mellitus in India

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Abstract:
Type 2 diabetes mellitus requires integrated assessment of metabolic, psychological and social factors to support effective disease management. Therefore, it is of interest to assess the biological, psychological and social support status of 60 adults with type 2 diabetes mellitus in Choolai, Chennai. Data were collected using clinical measurements, the UCLA Loneliness Scale and the Multidimensional Scale of Perceived Social Support. Moderate social support (75.00%) and low loneliness (53.33%) were predominant, with a mean BMI of 27.46 ± 2.38 kg/m². Thus, social support was negatively correlated with loneliness ($r = -0.258$, $p = 0.027$), highlighting the importance of psychosocial assessment in comprehensive diabetes care.

Keywords: Type 2 diabetes mellitus (T2DM), adult, body mass index (BMI), glycemic control, loneliness, social support, cross-sectional studies, India

Background:
Diabetes has become a defining non-communicable disease of modern urban life. The NCD Risk Factor Collaboration estimated 828 million adults with diabetes in 2022, with treatment gaps remaining large in many low- and middle-income settings **[1]**. For nurses, this growing burden is not only a matter of fasting blood sugar or tablets; it also concerns how people live, relate and cope with a lifelong condition. The biopsychosocial model is useful because it connects biological risk with emotional state and the support available for daily self-care. In diabetic patients, central adiposity is a practical biological warning sign. A cohort analysis reported that waist circumference and waist-to-hip (W/H) ratio can reflect intra-abdominal fat and may predict type 2 diabetes risk better than BMI alone **[2]**. Psychological and social dimensions are equally important. A 20-year continuation from the HUNT study found that adults reporting high loneliness had more than two times the odds of developing type 2 diabetes **[3]**. Indian evidence also shows that depression and anxiety occur in adults with type 2 diabetes and are predicted by factors such as obesity, marital status, glycaemic control and comorbidities **[4]**. Social support may buffer this burden; structural equation modelling among patients with type 2 diabetes found links among social support, depression, alexithymia and glycaemic control **[5]**. Therefore, it is of interest to examine the correlation among these domains and associations with demographic and clinical variables, with the intention of providing a concise, nursing relevant profile that can guide person centred diabetes care in urban community settings.

Materials and Methods:
A quantitative descriptive cross-sectional design was used. The study was conducted in Choolai, Chennai and Tamil Nadu. The population comprised adults diagnosed with type 2 diabetes mellitus, residing in Choolai for at least 6 months and available during the period of data collection. Sixty participants aged 25–60 years were selected by non-probability convenience sampling. Adults who were critically ill or had reported comorbidities, cognitive impairment, or mental impairment were excluded. Data were gathered using socio-demographic variables (age, sex, marital status, education, occupation, family size, income, housing, religion, physical activity, dietary habit, smoking and alcohol use); clinical variables (duration of diabetes, treatment regimen, frequency of blood sugar monitoring and presence of diabetes-related complications); biological parameters (height, weight, BMI, fasting blood sugar, postprandial blood sugar, systolic and diastolic blood pressure, serum cholesterol and hip waist ratio); the UCLA Loneliness Scale; and the Multidimensional Scale of Perceived Social Support. The tools were content validated by nursing experts. Before data collection, the purpose of the study was explained in simple language and participants were assured that refusal would not affect their care. Height and weight were used to calculate BMI, blood pressure was recorded using standard technique and blood sugar values were taken from available records or measurements documented during data collection. Ethical approval was obtained from the Institutional Ethics Committee of Madras Medical College, Chennai and permission was obtained from the Block Medical Officer, Choolai. Written informed consent was obtained and anonymity and confidentiality were maintained. Data were coded in Microsoft Excel and analysed using SPSS. Frequencies, percentages, means and standard deviations described the sample. A $p \leq 0.05$ was considered statistically significant.

Results:
Among 60 adults with type 2 diabetes mellitus, 46.67% were aged 51–60 years, 38.33% were aged 41–50 years and 15.00% were aged 25–40 years. Most participants were male (60.00%), single (73.33%), educated up to secondary level (46.67%), self-employed (35.00%), living in rented houses (73.33%) and from families of 4–6 members (60.00%). Monthly family income was ₹10,000–20,000 for 40.00% and ₹20,001–30,000 for 33.33%. Moderate physical activity was reported by 55.00%, mixed diet

by 88.34%, never smoking by 58.33% and non-drinking by 55.00%. Clinically, diabetes duration was 6–10 years in 31.67%, 1–5 years in 26.67% and 11–15 years in 26.67%. Oral hypoglycaemic agents were used by 68.33%, insulin by 5.00%, combined oral and insulin therapy by 13.33%, herbal treatment by 11.67% and other treatment by 1.67%. Blood sugar monitoring was rare in 61.66%, monthly in 26.67%, weekly in 10.00% and daily in only 1.67%. Diabetes-related complications were reported by 33.33%. Biological findings showed a mean height of 162.68 ± 8.27 cm, weight 73.20 ± 7.93 kg, BMI 27.46 ± 2.38 kg/m², fasting blood sugar 156.43 ± 157.93 mg/dL, postprandial blood sugar 203.08 ± 43.49 mg/dL, systolic blood pressure 132.12 ± 11.96 mmHg, diastolic blood pressure 79.55 ± 8.74 mmHg and hip waist ratio 1.15 ± 0.31. The UCLA Loneliness Scale mean score was 49.88 ± 6.03; 53.33% had low loneliness and 46.67% had moderate loneliness. Perceived social support mean score was 47.43 ± 5.11; support was moderate in 75.00% and low in 25.00%. No participant reported high loneliness or high support **(Table 1).** Perceived social support was negatively correlated with loneliness ($r = -0.258$, $p = 0.027$). BMI correlated strongly with hip-waist ratio ($r = 0.615$, $p < 0.01$), fasting blood sugar with hip-waist ratio ($r = 0.330$, $p = 0.011$), postprandial blood sugar with systolic blood pressure ($r = 0.477$, $p < 0.01$) and diastolic blood pressure ($r = 0.413$, $p < 0.01$) and systolic with diastolic blood pressure ($r = 0.575$, $p < 0.01$). Loneliness was significantly associated with age, gender and presence of complications ($p = 0.05$); moderate loneliness was more common in the 51–60-year group (64.29%), males (58.33%) and participants with complications (65.00%). Perceived social support was significantly associated with age and monthly income ($p = 0.05$); moderate support was highest among adults aged 41–50 years (86.96%) and among those with monthly income of ₹30,001 or above (100.00%). These findings suggest that both illness burden and economic context shaped the psychosocial profile of the sample.

Table 1: Key bio psychosocial findings among adults with type 2 diabetes mellitus (n = 60).

Domain	Indicator	Value
Demographic	Age 51–60 years	28 (46.67%)
Demographic	Male gender	36 (60.00%)
Clinical	Diabetes duration 6–10 years	19 (31.67%)
Clinical	Rare blood sugar monitoring	37 (61.66%)
Biological	BMI	27.46 ± 2.38 kg/m²
Biological	FBS / PPBS (mg/dL)	156.43 ± 157.93 / 203.08 ± 43.49
Biological	Systolic / diastolic BP (mmHg)	132.12 ± 11.96 / 79.55 ± 8.74
Psychological	Low / moderate loneliness	32 (53.33%) / 28 (46.67%)
Social	Low / moderate perceived social support	15 (25.00%) / 45 (75.00%)
Correlation	Support vs loneliness	r = –0.258, p = 0.027

Discussion:

This study shows that adults with diabetes in the urban Chennai community carried measurable biological risk together with moderate psychosocial vulnerability. The mean BMI was in the overweight range and the hip waist ratio correlated with both BMI and fasting blood sugar. These patterns matter because social disconnection has recently been linked with diabetic microvascular complications at strength comparable to conventional risk factors such as blood pressure and physical activity **[6]**. Nearly half of the participants reported moderate loneliness and one-fourth reported low perceived social support. Although severe loneliness was not observed, the absence of high social support is clinically important. A UK Biobank study of adults with type 2 diabetes found that loneliness and social isolation predicted mortality outcomes, supporting the need to treat social connection as part of diabetes risk assessment **[7]**. Another study among people with diabetes showed that life events, depressive features and perceived social support require repeated assessment for effective management **[8]**. The negative correlation between support and loneliness in this study was modest but significant. This means that even small improvements in social support may reduce emotional isolation. Psychological distress studies also strengthen this interpretation; moderate and severe distress has been associated with poor glycaemic control among patients with diabetes **[9, 10]**. At the same time, longitudinal GRADE findings remind us that emotional distress does not always predict future glycaemic outcomes in every population, suggesting that context, disease duration and treatment stage modify the relationship **[11, 12]**. The associations of loneliness with age, gender and complications and of support with age and income indicate that psychosocial care should be targeted. Peer support and distress focused interventions are promising because diabetes distress can mediate depression and glycaemic control **[13]** and tailored psychological interventions reduce diabetes distress in adults with type 2 diabetes **[14]**. In practice, this means that a brief nursing review should ask not only about medicine intake and diet, but also about who helps the patient during illness, whether the patient feels alone and how often glucose is actually checked. Nurses can use these findings to screen routinely for loneliness, support gaps and self-monitoring barriers during community follow-up **[15]**.

Conclusion:

Adults with type 2 diabetes in this study had an overweight status, elevated blood sugar, moderate loneliness and only low to moderate perceived social support. Significant links among support, loneliness, adiposity, glycaemia and blood pressure show that diabetes care should extend beyond biomedical monitoring. Nurse led screening for psychosocial risk, family support, complications and regular self-monitoring may improve person-centred diabetes management in urban communities.

Ethical approval: Obtained from the Institutional Ethics Committee of Madras Medical College, Chennai.

Informed consent: Obtained in writing from all participants.

Conflict of interest: The authors declare no conflict of interest.

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