

Prevalence of Overweight, Obesity and Hypertension among Adults with Type 2 Diabetes Mellitus Attending a Primary Health-Care Facility: A Cross-Sectional Study

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ABSTRACT

Background: Type 2 diabetes mellitus frequently coexists with excess adiposity and hypertension, creating a clustered cardiometabolic burden that is especially relevant to primary health care in India.

Objective: To estimate the prevalence of overweight, obesity and hypertension among adults with type 2 diabetes mellitus attending a primary health-care facility, and to examine the distribution of hypertension across body mass index categories.

Methods: A facility-based cross-sectional study included 108 adults with type 2 diabetes mellitus. Anthropometric, blood pressure, glycaemic and treatment-related variables were analysed. Body mass index was classified using Asian Indian cut-offs. Descriptive statistics and 95% confidence intervals were calculated. Categorical associations were examined using Pearson chi-square tests after checking expected cell frequencies.

Results: The mean age was 50.94 ± 8.67 years and the mean duration of diabetes was 7.03 ± 4.42 years. Overweight was present in 29 (26.9%) participants and obesity in 55 (50.9%), giving a combined overweight/obesity prevalence of 77.8% (95% CI 69.1-84.6). Hypertension was recorded in 51 (47.2%; 95% CI 38.1-56.6). Hypertension differed significantly across BMI categories (Pearson $\chi^2=85.89$, $df=2$, $p<0.001$); all expected cell counts in the 2×3 contingency table exceeded 5. Hypertension prevalence was similar in rural and urban participants ($p=0.881$).

Conclusion: Excess body weight and hypertension were common among adults with type 2 diabetes attending the primary health-care facility. The concentration of hypertension among participants with obesity reinforces the value of integrated weight, blood pressure and glycaemic risk assessment during routine diabetes care.

Keywords: Type 2 Diabetes Mellitus, Obesity, Overweight, Hypertension, Body Mass Index, Primary Health Care, India.

INTRODUCTION

Diabetes mellitus is a major non-communicable disease and a persistent cause of cardiovascular, renal, neurological and ophthalmic morbidity. Type 2 diabetes accounts for most diabetes worldwide, and its long-term consequences are strongly shaped by accompanying cardiovascular risk factors, particularly excess adiposity and raised blood pressure.^[1]

India now carries a very large metabolic disease burden. The nationally representative ICMR-INDIAB study estimated diabetes prevalence at 11.4%, hypertension at 35.5% and generalised obesity at 28.6%, with substantial variation across states and between rural and urban populations.^[2] Earlier phases of the same programme had already shown that obesity and hypertension are closely linked with diabetes risk across diverse Indian settings.^[3]

Body mass index deserves particular attention in Asian Indians because cardiometabolic risk develops at comparatively lower BMI levels. Indian and Asia-Pacific classifications therefore commonly identify BMI 23.0-24.9 kg/m² as overweight and BMI ≥25.0 kg/m² as obesity.^[4,5] This lower threshold is clinically important in primary care, where apparently modest weight excess may coexist with diabetes, hypertension and other metabolic abnormalities.

Hypertension further amplifies vascular risk in people with diabetes. ICMR-INDIAB data demonstrated substantial hypertension prevalence across both urban and rural India, with diabetes and generalised obesity among its important correlates.^[6] Tamil Nadu surveillance likewise documents a high burden of raised blood pressure, diabetes and obesity-related risk factors, underscoring the need for integrated NCD assessment at first-contact health facilities.^[7]

For community medicine practice, facility-level estimates remain useful because they describe the clustering of modifiable risk factors in the population actually seeking care. The present study was therefore undertaken to estimate the prevalence of overweight, obesity and hypertension among adults with type 2 diabetes mellitus attending a primary health-care facility and to describe the relationship between BMI category and hypertension.

MATERIALS AND METHODS

Study Design and Setting

A facility-based cross-sectional study was carried out among adults with type 2 diabetes mellitus attending a primary health-care facility in Urban Health Centre, L.N. City Medical College & Sevakunj Hospital, Indore, Madhya Pradesh from June 2025 to June 2026.

Study Population

The analysis included 108 adults with type 2 diabetes mellitus for whom the required sociodemographic, anthropometric, blood pressure, glycaemic and treatment variables were available.

Variables and Measurements

The recorded variables included age, sex, educational status, occupation, residence, duration of diabetes, body mass index (BMI), waist circumference, systolic blood pressure, diastolic blood pressure, hypertension status, glycated haemoglobin (HbA1c) and current diabetes treatment. BMI was grouped as normal (<23.0 kg/m²), overweight (23.0-24.9 kg/m²) and obese (≥25.0 kg/m²). Hypertension status was analysed as recorded in the clinical study record, while systolic and diastolic blood pressure were summarised separately.

Data Quality Control

All participant-level records were checked for completeness, duplicate entries, physiologically implausible ranges and internal agreement between measured BMI and the recorded BMI category. The final analytical file contained 108 unique records with complete data for the core study variables, and every BMI category was concordant with the prespecified cut-off.

Statistical Analysis

Data were entered in Microsoft Excel and analysed using SPSS version 26. Continuous variables were summarised as mean ± standard deviation, while categorical variables were presented as frequency and percentage. Wilson 95% confidence intervals were calculated for the principal prevalence estimates. Pearson chi-square tests were used to examine categorical associations, including hypertension across BMI categories and residence. Expected cell frequencies were reviewed before interpreting Pearson chi-square results. A p-value <0.05 was considered statistically significant

RESULTS

A total of 108 participants were analysed. The mean age was 50.94 ± 8.67 years. Men and women were equally represented (54 each), while 58 (53.7%) participants were from rural areas and 50 (46.3%) from urban areas. Mean duration of diabetes was 7.03 ± 4.42 years. The clinical profile is summarised in Table 1.

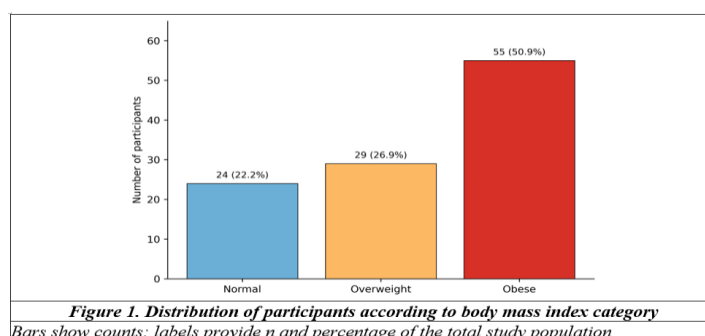
Parameter	Category / statistic	Value
Age (years)	Mean ± SD	50.94 ± 8.67
Sex	Male	54 (50.0%)
	Female	54 (50.0%)
Residence	Rural	58 (53.7%)

	Urban	50 (46.3%)
Education	Illiterate	15 (13.9%)
	Primary	26 (24.1%)
	Secondary	34 (31.5%)
	Graduate	33 (30.6%)
Duration of diabetes (years)	Mean $\pm$ SD	7.03 $\pm$ 4.42
BMI (kg/m ²)	Mean $\pm$ SD	25.80 $\pm$ 3.17
Waist circumference (cm)	Mean $\pm$ SD	93.69 $\pm$ 6.61
Systolic BP (mmHg)	Mean $\pm$ SD	138.78 $\pm$ 14.74
Diastolic BP (mmHg)	Mean $\pm$ SD	86.50 $\pm$ 7.93
HbA1c (%)	Mean $\pm$ SD	7.94 $\pm$ 1.07
Hypertension status	Hypertensive	51 (47.2%)
	Normotensive	57 (52.8%)
Diabetes treatment	Lifestyle only	15 (13.9%)
	OHA	67 (62.0%)
	OHA + insulin	26 (24.1%)

Table 1. Sociodemographic and clinical profile of the study participants (n=108)

The mean BMI was 25.80 $\pm$ 3.17 kg/m². Twenty-four participants (22.2%) had normal BMI, 29 (26.9%) were overweight and 55

(50.9%) were obese (Figure 1). The combined prevalence of overweight or obesity was 77.8% (95% CI 69.1-84.6).

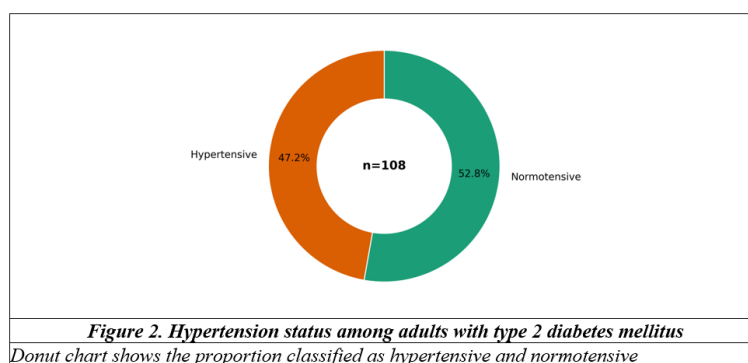


Outcome	n	Prevalence (%)	95% CI
Overweight	29	26.9	19.4-35.9
Obesity	55	50.9	41.6-60.2
Overweight or obesity	84	77.8	69.1-84.6
Hypertension	51	47.2	38.1-56.6

Table 2. Prevalence of overweight, obesity and hypertension

Hypertension was recorded in 51 participants (47.2%; 95% CI 38.1-56.6), while 57 (52.8%) were normotensive (Figure 2). Mean systolic

and diastolic blood pressure were 138.78 $\pm$ 14.74 mmHg and 86.50 $\pm$ 7.93 mmHg, respectively.

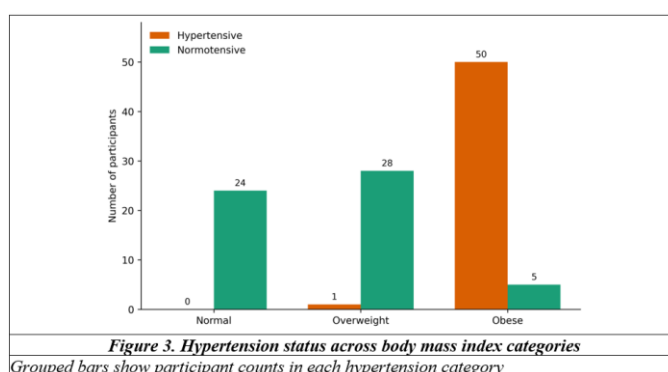


Hypertension showed a marked gradient across BMI categories. It was recorded in 0 of 24 participants with normal BMI, 1 of 29 (3.4%) participants who were overweight, and 50 of 55 (90.9%) participants with obesity. Direct recomputation of the 2 × 3 contingency

table yielded Pearson $\chi^2=85.89$ with 2 degrees of freedom ($p<0.001$). Expected cell counts ranged from 11.33 to 29.03; therefore, the usual Pearson chi-square requirement regarding sparse expected frequencies was satisfied (Table 3 and Figure 3).

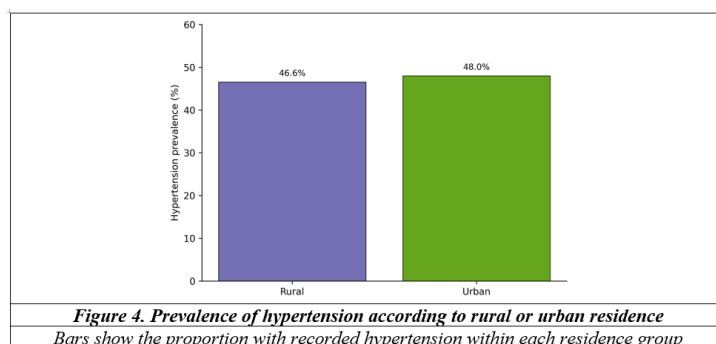
Variable	Category	Hypertensive n (%)	Normotensive n (%)	χ^2	p-value
BMI category	Normal	0 (0.0%)	24 (100.0%)	85.89	<0.001
	Overweight	1 (3.4%)	28 (96.6%)		
	Obese	50 (90.9%)	5 (9.1%)		
Residence	Rural	27 (46.6%)	31 (53.4%)	0.02	0.881
	Urban	24 (48.0%)	26 (52.0%)		

Table 3. Hypertension according to BMI category and place of residence



Hypertension prevalence was comparable between rural and urban participants: 27/58

(46.6%) versus 24/50 (48.0%), respectively ($\chi^2=0.02$, $p=0.881$) (Figure 4).



DISCUSSION

This facility-based cross-sectional study found a substantial clustering of excess body weight and hypertension among adults already living with type 2 diabetes. Nearly four out of five participants were either overweight or obese, half met the BMI criterion for obesity, and almost half had recorded hypertension. These findings matter clinically because diabetes, excess adiposity and hypertension do not operate as isolated conditions; together they increase the long-term burden of cardiovascular and renal complications.

The observed obesity prevalence of 50.9% is high, but it is not unexpected in a diabetes-care population. Indian evidence consistently shows a close relationship between excess adiposity and both diabetes and hypertension. A meta-analysis of Indian observational studies reported a strong pooled association between obesity and hypertension, supporting the biological and epidemiological link between excess adiposity and raised blood pressure.^[8] The present estimate should nevertheless be interpreted as a facility-based prevalence, not as a community prevalence.

The hypertension prevalence of 47.2% is also clinically important. A South Indian study among urban poor reported stage II hypertension in 44.8% of participants with diabetes and found overweight and obesity to be associated with hypertension.^[9] More recently, a large Indian diabetes cohort reported hypertension in 56.8% and obesity in 57.2% of patients, values that broadly frame the magnitude observed in the present study.^[10] Differences between studies are likely to reflect age structure, treatment exposure, case definitions and the type of health-care setting.

Glycaemic control in this cohort also suggests a population requiring continued risk-factor management. Mean HbA1c was 7.94%, close to the mean levels reported in earlier ICMR-INDIAB analyses of people with known diabetes, including approximately 8.2% in Tamil Nadu.^[11] Poorer glycaemic profiles often coexist with obesity, longer diabetes duration and treatment intensification. In the present cohort, 24.1% were receiving oral glucose-lowering agents together with insulin, although the cross-sectional design does not permit inference about treatment effectiveness or disease progression.

Obesity prevalence among Indian adults with diabetes varies considerably across studies. Singh and colleagues reported generalised obesity in 35.1% of newly diagnosed patients with diabetes, whereas larger contemporary clinic-based datasets have reported values exceeding 50%.^[12] Such variation highlights the effect of diagnostic threshold, disease duration, referral pattern and local population characteristics. It also supports the continued use of population-appropriate anthropometric criteria rather than assuming that thresholds derived from Western populations apply uniformly.

The very strong association between BMI category and recorded hypertension in this study deserves a cautious reading. The observed separation between BMI categories was unusually marked, although the Pearson chi-square calculation itself was statistically valid because expected cell frequencies were adequate. The direction of association is consistent with prior Indian evidence linking obesity and hypertension, but its magnitude is likely influenced by the modest sample size and the characteristics of a single facility-based cohort. Nationally representative analyses likewise demonstrate that obesity, diabetes and hypertension cluster together,

but with considerably more heterogeneity than can be captured in a small clinical sample.^[13,14] Accordingly, the present result should be interpreted as a within-sample association requiring replication rather than as an effect estimate that can be generalised to the wider population.

From a Community Medicine perspective, the practical message is straightforward. Diabetes follow-up at primary-care level should not be limited to glycaemic measurement. Weight status, blood pressure and other cardiovascular risk factors need to be assessed together, with appropriate counselling and referral when necessary. Recent ICMR-INDIAB work on metabolic obesity further reinforces the importance of identifying cardiometabolic risk beyond body weight alone.^[15] Newer Indian obesity frameworks similarly emphasise metabolic and functional consequences in addition to BMI, a direction that may strengthen future primary-care studies.^[16]

Limitations

It was conducted in a single primary health-care facility and therefore cannot provide population-representative prevalence estimates. The cross-sectional design precludes temporal or causal inference. Hypertension status was analysed as recorded in the clinical record, and the available file did not include detailed antihypertensive treatment information or repeated blood-pressure measurements. Variables such as diet, physical activity, tobacco use, lipid profile, socioeconomic status and diabetes complications were not available for multivariable modelling. Finally, the sample size was adequate for descriptive estimation but limited for stable subgroup analyses. These constraints should be considered when interpreting the strength of observed associations.

CONCLUSION

Overweight, obesity and hypertension were common among adults with type 2 diabetes mellitus attending the primary health-care facility. More than three-quarters of participants had excess body weight and nearly half had hypertension. Hypertension was concentrated among participants with obesity in this cohort, although the cross-sectional and facility-based design limits causal and population-level interpretation. Routine diabetes care at primary health-care level should therefore incorporate systematic

assessment of body weight and blood pressure alongside glycaemic monitoring.

Source of Funding

Nil.

Conflict of Interest

None declared.

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