Int. J. Adv. Res. in Microbiology and Immunology
Volume 9, Issue 1 - 2026, Pg. No. 1-10
Peer Reviewed & Open Access Journal

Research Article

# Prevalence of Diabetes and Pre-Diabetes Among University Students: A Cross-Sectional Study from Assam Down Town University, India

Hmangte Wendy Kom[1], Jackricky N Sangma[2], Bimun Kumar Chakravarty[3], Tashi Chomzom Sona[4], Phanjoubam Sanjana Devi[5], Nabahunshisha Rynjah[6], Roshni Tamang[7], Baiahunlang Sympli[8], Ribakorshisha Kharshiing[9], Samir Moirangthem[10]

[1,2]Programme of Medical Laboratory Technology, [10]Assistant Professor, Faculty of Allied and Healthcare Sciences, Assam down town University, Panikhaiti, Guwahati, Assam, India
[3,4,5,6,7,8,9]BMLT Students of Allied & Healthcare Sciences, Assam down town University, Sankar Madhav Path, Gandhi Nagar, Panikhaiti, Guwahati, Assam, India

## I N F O

**Corresponding Author:**
Samir Moirangthem, Faculty of Allied and Healthcare Sciences, Assam down town University, Panikhaiti, Guwahati, Assam, India
**E-mail Id:**
samirthem1999@gmail.com
**Orcid Id:**
https://orcid.org/0009-0004-5546-4467
**How to cite this article:**
Kom H W, Sangma J N, Chakravarty B K, Sona T C, Devi P S, Rynjah N, Tamang R, Sympli B, Kharshiing R, Moirangthem S. Prevalence of Diabetes and Pre-Diabetes Among University Students: A Cross-Sectional Study from Assam Down Town University, India. *Int J Adv Res MicroBiol Immunol.* 2026;9(1):1-10.

Date of Submission: 2026-07-16
Date of Acceptance: 2026-08-13

## A B S T R A C T

*Background*: Diabetes mellitus and its precursor state, pre-diabetes, are increasing in prevalence worldwide, including among young adults. University students are exposed to lifestyle factors irregular meals, sedentary behaviour, academic stress, and disturbed sleep that may predispose them to early glucose dysregulation, yet this group is infrequently screened.

*Objective*: To determine the prevalence of diabetes and pre-diabetes among students at Assam down town University, Guwahati, India, using fasting capillary blood glucose measurement.

*Methods*: A cross-sectional study was conducted among 60 students who volunteered following written informed consent. Demographic and lifestyle data were collected using a structured questionnaire. Fasting capillary blood glucose was measured using a calibrated glucometer (Dr. Morepen GlucoOne system) after an overnight fast. Participants were classified as normal (<100 mg/dL), pre-diabetic (100–125 mg/dL), or diabetic (≥126 mg/dL) according to standard fasting glucose cut-offs. Proportions are reported with 95% confidence intervals (Wilson score method).

*Results*: Of the 60 students screened, 36 (60.0%; 95% CI 47.4–71.4%) had normal fasting glucose, 24 (40.0%; 95% CI 28.6–52.6%) were classified as pre-diabetic, and none (0%; 95% CI 0–6.0%) met the fasting glucose threshold for diabetes. The pre-diabetes estimate observed here exceeds recent national Indian benchmarks (ICMR-INDIAB-17: 15.3%), although differences in age group, sampling design, and testing method limit direct comparison.

*Conclusion*: More than a third of the apparently healthy young adults screened in this single-institution study were already in the pre-diabetic range, although the modest sample size produced wide confidence

intervals around this estimate. These preliminary findings support the value of routine glucose screening and lifestyle-focused health promotion on university campuses, and warrant confirmation in larger, multi-institutional studies.

**Keywords**: Diabetes Mellitus, Prediabetic State, Fasting Blood Glucose, Students, Cross-Sectional Studies, India, Glucose Screening, Young Adults

## Introduction

Diabetes mellitus is a chronic metabolic disorder characterised by hyperglycaemia resulting from defective insulin secretion, insulin action, or both, and remains one of the leading non-communicable disease burdens worldwide.[1,4,19,20] The latest global estimates indicate that 11.1% of adults aged 20–79 years, roughly one in nine, are living with diabetes, with more than four in ten unaware of their condition, and projections suggest this will rise to one in eight adults by 2050.[8,26] Pre-diabetes encompassing impaired fasting glucose and impaired glucose tolerance, represents an intermediate, largely reversible stage that substantially raises the risk of progression to type 2 diabetes if unaddressed.[2,3,14]

India carries one of the largest diabetes burdens globally, driven by rapid urbanisation, dietary transition, and declining physical activity.[5,6] Large population-based surveys, including the ICMR-INDIAB study, have documented a high and rising prevalence of both diabetes and pre-diabetes across Indian states.[7,16] The most recent nationwide ICMR-INDIAB-17 report, covering all Indian states and union territories, estimated an overall weighted diabetes prevalence of 11.4% and a pre-diabetes prevalence of 15.3% among adults aged 20 years and above,[21] updating earlier 15-state estimates of 7.3% and 10.3–24.7% (criteria-dependent), respectively.[16] While diabetes has traditionally been regarded as a disease of middle and older age, increasing evidence points to a rising prevalence among adolescents and young adults, attributable to sedentary lifestyles, energy-dense diets, and psychological stress.[9,17] A ten-year ancillary analysis of the STRiDE-I cohort in southern India, for example, documented that confirmed type 2 diabetes prevalence among adults aged 20–39 years nearly doubled, from 4.5% in 2006 to 7.8% in 2016 ($p<0.0001$), a proportionally steeper rise than in older adults over the same period.[23]

University students represent a population of particular interest: student life is commonly associated with irregular meal timing, dependence on processed and fast foods, prolonged sedentary study periods, examination-related stress, and disrupted sleep, all plausible contributors to early insulin resistance and glucose dysregulation.[10,11,12,18] Screening studies in other university settings support this concern: among 740 students at Hail University, Saudi Arabia, 61.9% were classified at intermediate or high risk of type 2 diabetes using the AUSDRISK tool,[24] and among a cohort of medical students in Chennai, India, approximately one-fifth were classified at moderate-to-high diabetes risk using the Indian Diabetes Risk Score (IDRS).[25] However, these studies relied on risk-prediction instruments rather than direct glucose measurement, and campus-based glucose screening data from Indian university settings remain limited. This study aimed to determine the prevalence of diabetes and pre-diabetes among students at Assam Downtown University using fasting capillary blood glucose measurement, to provide baseline biochemical evidence for campus health screening and health-promotion initiatives, and to situate these findings against the current national and international literature.

## Materials and Methods

### Study design and setting

This was a cross-sectional, observational study conducted in the Programme of Medical Laboratory Technology, Faculty of Allied and Healthcare Sciences, Assam down town University, Guwahati, Assam, India. Reporting follows the general structure recommended by the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) statement for cross-sectional studies.[27]

### Study population and sampling

Sixty students of the university, of both sexes, participated in the study by convenience sampling. Students with a pre-existing diagnosis of diabetes and those unable to fast overnight were excluded. A formal a priori sample-size calculation was not performed, and the achieved sample of 60 is discussed as a limitation.

### Ethical considerations

Written informed consent was obtained from every participant prior to enrolment, using a structured consent form describing the study purpose and confirming voluntary participation with the right to withdraw at any time. Institutional ethical approval for the study was obtained from Assam down town University *(AdtU/Ethics/stdnt-lett/2026/133)*. Participant identity was recorded only for internal tracking and is not reported in this manuscript; all data are presented at group level.

### Data collection and glucose measurement

A structured, interviewer-administered questionnaire captured demographic details, family and medical history, and lifestyle factors (exercise frequency, physical activity level, dietary pattern, smoking and alcohol use). Height and weight were recorded and body mass index calculated for researcher use. After an overnight fast, capillary blood glucose was measured by finger-prick sampling using a calibrated glucometer (Dr. Morepen GlucoOne Blood

Glucose Monitoring System). Participants were classified as normal (fasting glucose <100 mg/dL), pre-diabetic (100–125 mg/dL), or diabetic (≥126 mg/dL), consistent with standard fasting glucose diagnostic criteria.[2,3]

Participant names have been removed and replaced with sequential anonymised identifiers (P001–P060) to protect participant confidentiality, consistent with the informed consent obtained. This table reflects the raw screening data underlying Tables 2–6 and Figures 1–6.

**Table 1.Raw Screening Data**

| Participant ID | Age | Gender | Fasting Glucose (mg/dL) | Category |
|---|---|---|---|---|
| P001 | 23 | FEMALE | 90 | NORMAL |
| P002 | 21 | FEMALE | 101 | PRE-DIABETES |
| P003 | 21 | FEMALE | 100 | PRE-DIABETES |
| P004 | 23 | MALE | 98 | NORMAL |
| P005 | 22 | MALE | 100 | PRE-DIABETES |
| P006 | 22 | FEMALE | 100 | PRE-DIABETES |
| P007 | 20 | FEMALE | 102 | PRE-DIABETES |
| P008 | 23 | FEMALE | 102 | PRE-DIABETES |
| P009 | 25 | MALE | 108 | PRE-DIABETES |
| P010 | 20 | FEMALE | 112 | PRE-DIABETES |
| P011 | 22 | FEMALE | 98 | NORMAL |
| P012 | 15 | MALE | 91 | NORMAL |
| P013 | 23 | MALE | 85 | NORMAL |
| P014 | 22 | FEMALE | 109 | PRE-DIABETES |
| P015 | 23 | FEMALE | 99 | NORMAL |
| P016 | 23 | FEMALE | 92 | NORMAL |
| P017 | 21 | MALE | 103 | PRE-DIABETES |
| P018 | 23 | MALE | 109 | PRE-DIABETES |
| P019 | 21 | FEMALE | 101 | PRE-DIABETES |
| P020 | 26 | FEMALE | 102 | PRE-DIABETES |
| P021 | 24 | FEMALE | 95 | NORMAL |
| P022 | 23 | FEMALE | 102 | PRE-DIABETES |
| P023 | 22 | MALE | 85 | NORMAL |
| P024 | 26 | FEMALE | 102 | PRE-DIABETES |
| P025 | 23 | FEMALE | 99 | NORMAL |
| P026 | 24 | FEMALE | 90 | NORMAL |
| P027 | 24 | FEMALE | 84 | NORMAL |
| P028 | 22 | FEMALE | 108 | PRE-DIABETES |
| P029 | 22 | FEMALE | 97 | NORMAL |
| P030 | 22 | FEMALE | 97 | NORMAL |
| P031 | 21 | FEMALE | 108 | PRE-DIABETES |
| P032 | 22 | FEMALE | 111 | PRE-DIABETES |
| P033 | 24 | FEMALE | 87 | NORMAL |
| P034 | 25 | FEMALE | 100 | PRE-DIABETES |
| P035 | 23 | FEMALE | 98 | NORMAL |
| P036 | 24 | MALE | 97 | NORMAL |

| | | | | |
|---|---|---|---|---|
| P037 | 22 | MALE | 82 | NORMAL |
| P038 | 23 | FEMALE | 99 | NORMAL |
| P039 | 22 | FEMALE | 91 | NORMAL |
| P040 | 22 | FEMALE | 88 | NORMAL |
| P041 | 25 | FEMALE | 101 | PRE-DIABETES |
| P042 | 23 | MALE | 87 | NORMAL |
| P043 | 22 | FEMALE | 79 | NORMAL |
| P044 | 21 | FEMALE | 89 | NORMAL |
| P045 | 22 | FEMALE | 82 | NORMAL |
| P046 | 19 | FEMALE | 91 | NORMAL |
| P047 | 20 | FEMALE | 66 | NORMAL |
| P048 | 20 | FEMALE | 90 | NORMAL |
| P049 | 21 | FEMALE | 96 | NORMAL |
| P050 | 21 | FEMALE | 94 | NORMAL |
| P051 | 21 | FEMALE | 92 | NORMAL |
| P052 | 26 | FEMALE | 102 | PRE-DIABETES |
| P053 | 26 | FEMALE | 94 | NORMAL |
| P054 | 23 | MALE | 103 | PRE-DIABETES |
| P055 | 22 | MALE | 96 | NORMAL |
| P056 | 26 | MALE | 96 | NORMAL |
| P057 | 25 | MALE | 102 | PRE-DIABETES |
| P058 | 25 | MALE | 100 | PRE-DIABETES |
| P059 | 24 | MALE | 96 | NORMAL |
| P060 | 23 | FEMALE | 97 | NORMAL |

### Statistical analysis

Category frequencies were expressed as counts and percentages of the total sample (n = 60). A 95% confidence interval was calculated for each proportion using the Wilson score method to reflect estimation precision given the sample size. No between-group inferential comparisons were performed, as the study was descriptive in design. Published national and international prevalence figures were compiled from the literature for narrative, non-inferential comparison; no formal statistical test of difference between this cohort and external studies was performed, as raw external data were not available.

## Results

### Baseline characteristics

Sixty students completed screening (Table 1). The mean age was 22.6 ± 2.0 years (range 15–26 years). Females comprised the majority of the sample, 43 of 60 participants (71.7%), with males accounting for 17 (28.3%), reflecting the gender composition of the enrolling programme rather than a deliberate sampling quota (Table 2).

### Distribution of fasting glucose categories

Table 3 and Figures 1–3 summarise the distribution of fasting glucose categories. The majority of participants, 36 (60.0%; 95% CI 47.4–71.4%), had glucose values within the normal range. Twenty-four participants (40.0%; 95% CI 28.6–52.6%) fell within the pre-diabetic range. No participant met the fasting glucose threshold for diabetes (0%; 95% CI 0–6.0%). Fasting glucose in the normal group averaged 91.3 ± 7.0 mg/dL (range 66–99), and in the pre-diabetic group 103.7 ± 3.9 mg/dL (range 100–112).

### Association with gender

Pre-diabetes was observed in 17 of 43 female participants (39.5%) and 7 of 17 male participants (41.2%) (Table 4, Figure 4). A chi-square test of independence (with Fisher's exact test given the modest cell sizes) found no statistically significant association between gender and glucose category ($\chi 2 = 0.00$, df = 1, p = 1.00; Fisher's exact p = 1.00; odds ratio 1.07, i.e. essentially no difference in odds between genders). This suggests that, within this sample, pre-diabetes was not disproportionately distributed by gender.

### Association with age

Mean age was similar between the normal group (22.3 ± 1.9 years) and the pre-diabetic group (22.9 ± 2.0 years) (Table 5, Figure 5). Because both age distributions departed from normality on the Shapiro-Wilk test (p = 0.0006 and p = 0.022, respectively), the non-parametric Mann-Whitney U test was used in addition to Welch's t-test; neither showed a statistically significant difference in age between glucose categories (Welch t = -1.13, p = 0.26; Mann-Whitney p = 0.59). Age therefore did not distinguish students with pre-diabetes from those with normal fasting glucose in this sample.

### Comparison with published literature

To place these findings in context, Table 6 and Figure 6 compare the pre-diabetes and diabetes estimates from this study with recent national Indian surveys and other university-based screening studies identified in the literature. The pre-diabetes prevalence observed in this cohort (40.0%) was higher than the most recent nationally representative Indian estimate (ICMR-INDIAB-17: 15.3%).[21] and higher than the pan-India real-world HbA1c-based laboratory estimate (22.25%).[22] while no participant met fasting-glucose criteria for diabetes, in contrast to national diabetes estimates of 7.3–11.4%.[16,21] Risk-score-based studies in other university settings reported broadly consistent signals of elevated risk among students, with 61.9% of students at Hail University classified at intermediate-or-higher AUSDRISK risk.[24] and 19.8% of Chennai medical students at moderate-or-higher IDRS risk.[25] though these tools are not directly equivalent to a biochemical pre-diabetes classification.

**Table 2.Baseline demographic characteristics of participants (n = 60)**

| Characteristic | Value | n (%) / Mean ± SD |
|---|---|---|
| Total participants | N | 60 |
| Age (years) | Mean ± SD (range) | 22.6 ± 2.0 (15–26) |
| Gender | Female | 43 (71.7%) |
| | Male | 17 (28.3%) |

**Table 3.Distribution of fasting blood glucose categories among university students (n = 60)**

| Category | n | % | 95% CI |
|---|---|---|---|
| Normal (<100 mg/dL) | 36 | 60.0 | 47.4 - 71.4 |
| Pre-diabetes (100-125 mg/dL) | 24 | 40.0 | 28.6 - 52.6 |
| Diabetes (≥126 mg/dL) | 0 | 0.0 | 0.0 - 6.0 |
| Total | 60 | 100.0 | — |

CI = confidence interval, calculated by the Wilson score method

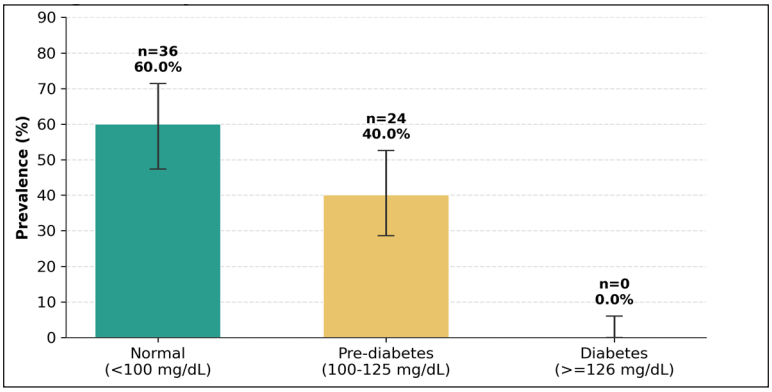


**Figure 1.Distribution of fasting blood glucose categories among university students (n = 60), with 95% CI (Wilson score method)**

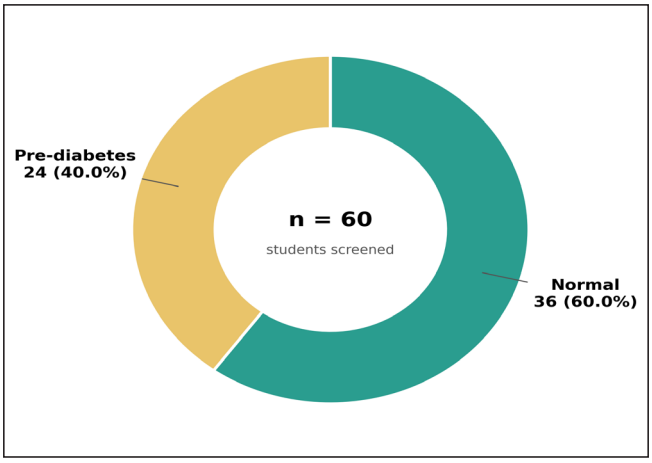


**Figure 2.Proportion of university students by fasting blood glucose category (n = 60)**

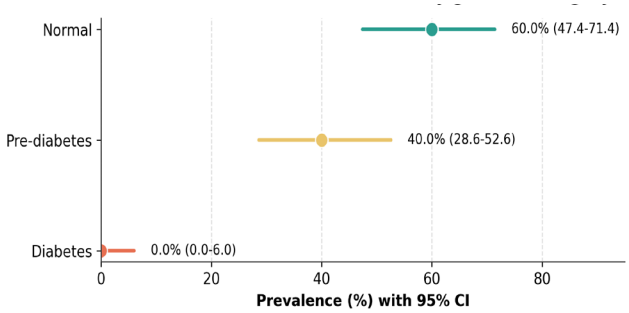


**Figure 3.Point prevalence estimates with 95% confidence intervals (Wilson score method), by glucose category**

**Table 4.Cross-tabulation of gender and fasting glucose category**

| Gender | Normal, n (%) | Pre-diabetes, n (%) | Total |
|---|---|---|---|
| Female | 26 (60.5%) | 17 (39.5%) | 43 |
| Male | 10 (58.8%) | 7 (41.2%) | 17 |
| Total | 36 | 24 | 60 |

Fisher's exact test p = 1.00 (not statistically significant, α = 0.05).

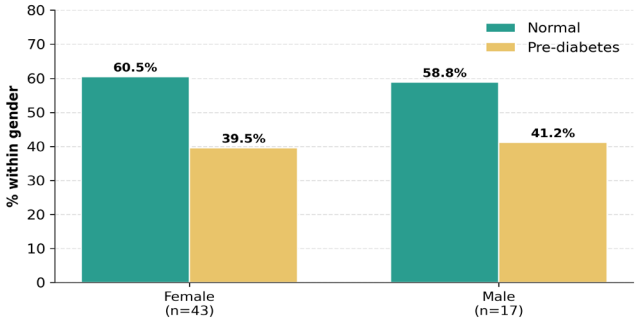


**Figure 4.Glucose category distribution by gender (Fisher's exact p = 1.00)**

**Table 5.Age distribution by fasting glucose category**

| Glucose category | n | Mean age ± SD (years) | Median (IQR) |
|---|---|---|---|
| Normal | 36 | 22.3 ± 1.9 | 22.5 (22.0–23.0) |
| Pre-diabetes | 24 | 22.9 ± 2.0 | 22.5 (21.0–25.0) |

Welch's t-test p = 0.26; Mann-Whitney U test p = 0.59 (neither statistically significant, α = 0.05).

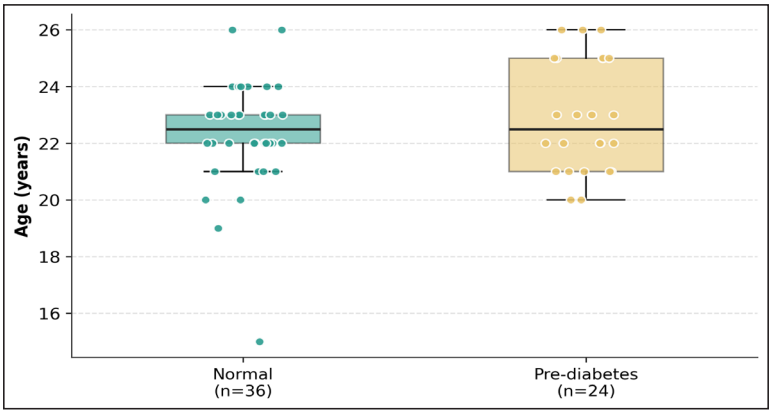


**Figure 5.Age distribution by glucose category (Mann-Whitney U p = 0.59)**

**Table 6.Comparison of prevalence and risk estimates with recent published studies**

| Study | Setting / Population | N | Pre-diabetes / risk finding | Diabetes finding | Comparability notes |
|---|---|---|---|---|---|
| Present study (2026) | University students, Assam down town University, India | 60 | Pre-diabetes: 40.0% (28.6-52.6) | Diabetes: 0.0% (0-6.0) | Single fasting capillary glucose (point-of-care glucometer); convenience sample |
| ICMR INDIAB-17, Anjana et al. 2023 [21] | National, all-India, adults ≥20y | 113,043 | Pre-diabetes: 15.3% (13.9-16.6) | Diabetes: 11.4% (10.2-12.5) | Population-representative, multistage stratified sampling; laboratory glucose |
| ICMR-INDIAB Phase I, Anjana et al. 2017 [16] | National, 15 states, adults ≥20y | 57,117 | Pre-diabetes: 10.3% (WHO) / 24.7% (ADA) | Diabetes: 7.3% | Prevalence is criteria-dependent (WHO vs ADA thresholds) |
| Vora & Kaur, 2024 [22] | Real-world HbA1c laboratory data, pan-India adults | 1,966,449 | Pre-diabetes: 22.25% | Diabetes: 27.18% | Convenience/clinical-referral sample, likely enriched for risk |
| Nanditha et al. (STRiDE-I), 2024 [23] | Adults 20-39y, urban/rural Tamil Nadu | 7,066 (2006) / 9,848 (2016) | Confirmed T2DM: 4.5% (2006) → 7.8% (2016) | p<0.0001 for increase | 10-year trend in young adults; WHO diagnostic criteria |
| Abd El-Razik Siam et al., 2023 [24] | University students, Hail University, Saudi Arabia | 740 | AUSDRISK: 61.9% at intermediate/ high risk | — | Risk-score tool, not a confirmed glucose measurement |
| Rajan & Muthunarayanan, 2023 [25] | Medical students, Chennai, India | Cohort of medical students | IDRS: 19.8% at moderate/high risk (18.9% + 0.9%) | — | Risk-score tool (IDRS), not a confirmed glucose measurement |

Note: studies differ in age range, sampling frame, glycaemic assay, and diagnostic thresholds; figures are presented for narrative comparison only and were not subjected to formal statistical testing against the present cohort.

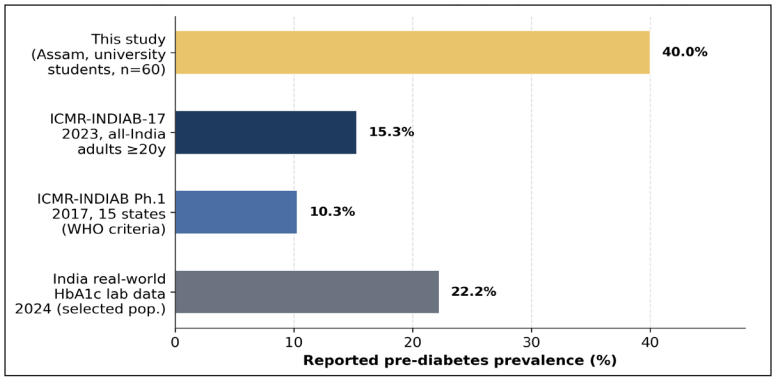


**Figure 6.Pre-diabetes prevalence in this study compared with published Indian studies (different age groups, methods, and populations; see Table 5 for details)**

## Discussion

In this cross-sectional screening of 60 university students, over a two-fifths (40.0%) were classified as pre-diabetic on a single fasting capillary glucose measurement, while no participant met criteria for diabetes. This is consistent with a growing body of evidence describing an increasing burden of pre-diabetes among young, apparently healthy adults, a shift historically unexpected for a condition once considered typical of middle and older age.[9,16,17] The magnitude of the increase documented longitudinally in the STRiDE-I cohort, where confirmed type 2 diabetes prevalence in adults aged 20–39 years rose from 4.5% to 7.8% over just ten years, with a proportionally larger relative increase than in older adults lends further weight to concerns that early glucose dysregulation is becoming more common in younger age groups in India.[23]

The observed pre-diabetes prevalence in this cohort (40.0%) is higher than the most recent nationally representative estimate from ICMR-INDIAB-17 (15.3%).[21] the earlier 15-state ICMR-INDIAB estimate (10.3–24.7%, depending on diagnostic criteria).[16] and the pan-India real-world HbA1c-based estimate (22.25%).[22] Several factors plausibly explain this gap rather than indicating a uniquely high-risk campus population: this cohort was screened using a single point-of-care capillary glucose measurement without confirmatory repeat testing, which is known to inflate apparent pre-diabetes prevalence relative to laboratory-based or repeated testing protocols; the convenience-sampling method may have preferentially enrolled students with a personal or family interest in glucose screening; and the modest sample size (n = 60) produced wide confidence intervals (28.6–52.6%) that overlap appreciably with several of the comparator estimates. The absence of diagnosed diabetes in this cohort is plausibly explained by the young age range typical of a university student population; longer exposure to risk factors is generally required before overt diabetes develops.[9] a pattern also reflected in the consistently lower diabetes prevalence reported among young adults relative to older adults in the STRiDE-I analysis.[23]

Risk-assessment studies in other university settings provide indirect support for concern about metabolic risk in student populations even where glucose was not directly measured. At Hail University, Saudi Arabia, 61.9% of a large student sample were classified at intermediate or high AUSDRISK risk, associated with overweight/obesity, positive family history, and low physical activity.[24] Similarly, a cohort of medical students in Chennai showed that around one-fifth were at moderate-to-high IDRS risk, with tobacco and alcohol use identified as contributing factors.[25] Taken together with the present biochemical findings, this literature suggests that elevated metabolic risk among university students may be a broader, cross-national pattern rather than an isolated local finding, though direct biochemical confirmation remains comparatively rare in this population group.

Plausible contributors to the pre-diabetes prevalence observed here include lifestyle patterns common among students: irregular meal timing, reliance on processed and energy-dense foods, low levels of structured physical activity, examination-related stress, and disrupted sleep.[10,11,18] A family history of diabetes may also contribute via genetic predisposition interacting with these environmental exposures.[13] The questionnaire data collected alongside glucose measurement in this study were not linked to individual biochemical results in the dataset available for this analysis and could not be formally tested against the glucose category. Exploring this association is an important direction for future work rather than a claim made by the present analysis.

Neither gender nor age was significantly associated with glucose category in this cohort (Fisher's exact p = 1.00 for gender; Mann-Whitney p = 0.59 for age). This null finding should be interpreted cautiously rather than as evidence of no true association: with only 17 male participants and 24 pre-diabetic participants overall, the study was underpowered to detect all but a huge effect, and the near-identical proportions of pre-diabetes in females (39.5%) and males (41.2%) may simply reflect the narrow age range of a single-cohort student sample rather than genuine

demographic risk gradients. Larger studies with broader age ranges and more balanced gender representation are needed to properly evaluate these associations; the present results should be read as descriptive rather than as evidence excluding a gender or age effect.

### Strengths and limitations

Strengths of this study include direct biochemical glucose measurement (rather than self-report or risk-score estimation), standard diagnostic classification, calculation of confidence intervals to communicate estimation precision, and explicit comparison against recent national and international literature to contextualise the findings. Limitations include the modest sample size (n = 60), which produced a relatively wide 95% confidence interval around the pre-diabetes estimate (28.6–52.6%) and limits generalisability; the single-institution, convenience-sampled design, which may not represent the wider student population; reliance on a single fasting glucose measurement using a point-of-care glucometer rather than repeated testing, a laboratory-grade analyser, HbA1c, or an oral glucose tolerance test; the lack of linked lifestyle-glucose analysis at the individual level in the dataset available for this manuscript; and the absence of a locally recruited, age-matched, non-student comparison group, which means the elevated pre-diabetes estimate cannot be firmly attributed to student-specific exposures rather than to the diagnostic and sampling factors discussed above. These limitations mean the findings should be regarded as preliminary and hypothesis-generating.

## Conclusion

In this single-institution cross-sectional study, approximately two-thirds of screened university students had normal fasting blood glucose, while just over a third were classified as pre-diabetic; no diabetes was detected. This pre-diabetes estimate exceeds recent national Indian benchmarks, although differences in testing method, sampling design, and confirmatory protocol limit direct comparison. These findings suggest that a meaningful proportion of young, apparently healthy university students may already show early glucose dysregulation, supporting the value of routine campus-based glucose screening and lifestyle-focused health promotion.[15] Larger, multi-institutional studies with linked lifestyle data, confirmatory laboratory testing (including HbA1c or oral glucose tolerance testing), and a matched non-student comparison group are needed to validate and extend these findings.

## Acknowledgements

The authors thank the students who volunteered for screening and questionnaire completion, and the Programme of Medical Laboratory Technology, Faculty of Allied and Healthcare Sciences, Assam down town University, for institutional support.

## Sources of Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors (to be confirmed by authors).

**Conflict of Interest:** None

## Ethical Approval

Written informed consent was obtained from all participants. Institutional ethical clearance details are to be confirmed and inserted by the authors prior to submission.

## Data Availability

The de-identified dataset analysed in this study is available from the corresponding author on reasonable request.

## References

1. World Health Organization. Diabetes [Internet]. Geneva: World Health Organization; 2025 [cited 2026 Jul 15]. Available from: https://www.who.int/news-room/fact-sheets/detail/diabetes
2. American Diabetes Association Professional Practice Committee. Classification and diagnosis of diabetes: Standards of Care in Diabetes—2023. Diabetes Care. 2023;46(Suppl 1):S19-S40. [Google Scholar] [PubMed]
3. Centers for Disease Control and Prevention. Prediabetes: your chance to prevent type 2 diabetes [Internet]. Atlanta (GA): Centers for Disease Control and Prevention; 2024 [cited 2026 Jul 15]. Available from: https://www.cdc.gov/prediabetes/
4. International Diabetes Federation. IDF Diabetes Atlas. 10th ed. Brussels: International Diabetes Federation; 2021. https://idf.org/news-and-resources/resources/idf-diabetes-atlas-2021/
5. World Health Organization. Global report on diabetes. Geneva: World Health Organization; 2016. https://www.who.int/publications/i/item/9789241565257
6. Indian Council of Medical Research. Guidelines for management of type 2 diabetes. New Delhi: Indian Council of Medical Research; 2018. https://medbox.org/document/icmr-guidlines-for-management-of-type-2-diabetes
7. Anjana RM, Pradeepa R, Deepa M, Datta M, Sudha V, Unnikrishnan R, et al.; ICMR-INDIAB Collaborative Study Group. Prevalence of diabetes and prediabetes (impaired fasting glucose and/or impaired glucose tolerance) in urban and rural India: phase I results of the ICMR-INDIAB study. Diabetologia. 2011;54(12):3022-7. [Google Scholar] [PubMed]
8. The Lancet Diabetes & Endocrinology. Diabetes: knowing your risk matters. Lancet Diabetes Endocrinol.

2023;11(12):879. doi:10.1016/S2213-8587(23)00326-1. [PubMed]
9. Chandrupatla SG, Khalid I, Yavagal PC. Diabetes and prediabetes prevalence among young adults in India. Epidemiol Health. 2020;42:e2020049. [Google Scholar] [PubMed]
10. World Health Organization. Healthy diet [Internet]. Geneva: World Health Organization; 2020 [cited 2026 Jul 15]. Available from: https://www.who.int/news-room/fact-sheets/detail/healthy-diet
11. Centers for Disease Control and Prevention. Healthy Schools [Internet]. Atlanta (GA): Centers for Disease Control and Prevention; 2024 [cited 2026 Jul 15]. Available from: https://www.cdc.gov/healthyschools/
12. World Health Organization. Mental health: strengthening our response [Internet]. Geneva: World Health Organization; 2025 [cited 2026 Jul 15]. Available from: https://www.who.int/news-room/fact-sheets/detail/mental-health-strengthening-our-response
13. American Diabetes Association. Diabetes Risk Test [Internet]. Arlington (VA): American Diabetes Association; 2024 [cited 2026 Jul 15]. Available from: https://diabetes.org/risk-test
14. Diabetes Prevention Program Research Group. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. N Engl J Med. 2002;346(6):393-403. [Google Scholar] [PubMed]
15. World Health Organization, United Nations Educational, Scientific and Cultural Organization. Making every school a health-promoting school: global standards and indicators. Geneva: World Health Organization; 2021. https://www.who.int/publications/i/item/9789240025059
16. Anjana RM, Deepa M, Pradeepa R, Mahanta J, Narain K, Das HK, et al.; ICMR-INDIAB Collaborative Study Group. Prevalence of diabetes and prediabetes in 15 states of India: results from the ICMR-INDIAB population-based cross-sectional study. Lancet Diabetes Endocrinol. 2017;5(8):585-96. [Google Scholar] [PubMed]
17. World Health Organization. Obesity and overweight [Internet]. Geneva: World Health Organization; 2024 [cited 2026 Jul 15]. Available from: https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight
18. World Health Organization. WHO guidelines on physical activity and sedentary behaviour. Geneva: World Health Organization; 2020. https://www.who.int/publications/i/item/9789240015128
19. National Library of Medicine. Diabetes [Internet]. Bethesda (MD): MedlinePlus; 2024 [cited 2026 Jul 15]. Available from: https://medlineplus.gov/diabetes.html
20. World Health Organization. Noncommunicable diseases [Internet]. Geneva: World Health Organization; 2023 [cited 2026 Jul 15]. Available from: https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases
21. Anjana RM, Unnikrishnan R, Deepa M, et al. Metabolic non-communicable disease health report of India: the ICMR-INDIAB national cross-sectional study (ICMR-INDIAB-17). Lancet Diabetes Endocrinol. 2023;11(7):474-89. [Google Scholar] [PubMed]
22. Vora H, Kaur P. Prediabetes and diabetes in India: an HbA1c-based epidemiology study. Diabetes Res Clin Pract. 2024;217:111889. [Google Scholar] [PubMed]
23. Nanditha A, Susairaj P, Satheesh K, Raghavan A, Snehalatha C, Ramachandran A. The rising prevalence of type 2 diabetes among youth in southern India: an ancillary analysis of the Secular TRends in DiabEtes in India (STRiDE-I) study. J Diabetes. 2024;16(7):e13576. [Google Scholar] [PubMed]
24. Abd El-Razik Siam BG, Abdou Rizk SM, Mahmoud SKM. The risk of developing type 2 diabetes mellitus among the students of Hail University, Saudi Arabia. Front Public Health. 2023;11:1278103. [Google Scholar] [PubMed]
25. Rajan R, Muthunarayanan L. Diabetes susceptibility assessment using the Indian Diabetes Risk Score: a cross-sectional analytical study among young medical students in Chennai, South India. Cureus. 2023;15(12):e49795. [Google Scholar] [PubMed]
26. International Diabetes Federation. IDF Diabetes Atlas. 11th ed. Brussels: International Diabetes Federation; 2025. https://diabetesatlas.org/resources/idf-diabetes-atlas-2025
27. Von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. The lancet. 2007 Oct 20;370(9596):1453-7. [Google Scholar] [PubMed]