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Prevalance And Risk Factors Of Pre-Diabetes Among Young Adults Aged 19-23

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Abstract: This study looks into the risk factors and prevalence of pre-diabetes in young adults between the ages of 19 and 22. Early detection of pre-diabetic conditions is essential to putting preventive measures into place, as the incidence of diabetes is on the rise globally. In order to gather information on demographics, lifestyle factors, family history, and physiological indicators like blood pressure and blood glucose levels, the study used a cross-sectional survey design with 200 participants. The results show that a sizable portion of participants have symptoms that are in line with pre-diabetic conditions, which are greatly impacted by variables like a sedentary lifestyle, irregular eating patterns, and a family history of diabetes. In order to stop pre-diabetes from developing into type 2 diabetes, the study highlights the significance of early screening, awareness, and lifestyle changes among young adults

***Keywords*:** Pre diabetes, Young adults, Lifestyle factors, Blood glucose, Type 2 diabetes prevention

I. Introduction

Elevated blood glucose levels are a hallmark of diabetes mellitus, a chronic metabolic disease caused by either insufficient insulin production or the body's inefficient use of insulin. Diabetes has become more prevalent worldwide in recent decades, and the World Health Organization (WHO) has identified it as one of the main public health issues of the twenty-first century. In low- and middle-income nations like India, where sedentary lifestyles, rapid urbanization, and dietary changes have greatly exacerbated metabolic disorders, the rising incidence of diabetes is especially concerning.

An estimated 77 million people in India, sometimes known as the "Diabetes Capital of the World," had diabetes as of 2021; by 2045, that number is expected to increase to 134 million. While diagnosing and treating type 2 diabetes in middle-aged and older adults has received a lot of attention, a worrying trend is beginning to emerge: diabetes and pre-diabetes, its precursor state, are increasingly occurring in much younger populations. Blood glucose levels that are higher than normal but not yet high enough to be categorized as diabetes are known as pre-diabetes. Pre-diabetes raises the risk of cardiovascular diseases and other complications and frequently develops into type 2 diabetes if untreated.

The 19–22 age range is a crucial developmental stage during which people frequently form dietary, exercise, and sleep habits that last a lifetime. However, this group frequently adopts unhealthy lifestyle choices as a result of stress related to school, increased screen time, fast food consumption, and a lack of health awareness. Young adults may be at risk for metabolic dysfunction at a young age if these risk factors are combined with a genetic predisposition or a family history of diabetes. Nevertheless, there is still a large research vacuum concerning the early identification of pre-diabetic conditions in young adults in India.

Through easy, long-lasting lifestyle changes, early intervention during the pre-diabetic stage provides a window of opportunity to reverse or delay the progression to type 2 diabetes. The focus of public health initiatives needs to change to include early identification of at-risk individuals and providing them with the information and tools they need to make healthier decisions.

The purpose of this study was to ascertain the prevalence of pre-diabetes in young adults between the ages of 19 and 22 as well as the risk factors that are linked to it, including family history, dietary habits, physical activity levels, and sleep patterns. This study looks at physiological markers (such as blood pressure and blood glucose) as well as self-reported behaviours in an effort to highlight the significance of early screening and the pressing need for young adults-specific health education initiatives.

II. AIM

Using survey data and physiological measurements, the goal is to determine the prevalence of pre-diabetes and the main risk factors linked to it in young adults between the ages of 19 and 22.

III. OBJECTIVE

1. To calculate the percentage of young adults between the ages of 19 and 22 who have pre-diabetic symptoms, such as high blood pressure and blood glucose.
2. To examine how lifestyle factors, such as stress, sleep patterns, physical activity, and food habits, affect the chance of pre-diabetes.
3. To assess how genetic predisposition and family history contribute to an increased risk of pre-diabetic conditions.
4. To gauge the study participants' knowledge of pre-diabetes and preventive measures.
5. To suggest lifestyle changes and education initiatives to lower the risk of pre-diabetes in young adults..

IV. METHODOLOGY

4.1 Study Design and Environment

In order to ascertain the prevalence of pre-diabetes and related risk factors among young adults between the ages of 19 and 23, this study used a cross-sectional study design. Cross-sectional studies are appropriate for determining the prevalence of a disease and investigating correlations between variables at one particular moment in time [1]. The study was carried out in [your city/country] at various educational institutions and online recruitment platforms between [start date] and [end date]. A varied sample representative of the young adult population was guaranteed by this mixed recruitment strategy.

4.2 Participants

Participants had to be between the ages of 19 and 23, able to give informed consent, and free of a history of diabetes or other chronic diseases that impair glucose metabolism in order to be eligible. Pregnancy, diabetes, and any ongoing medical treatment that might alter blood glucose levels were among the exclusion criteria. In a population of young adults who were otherwise healthy, these criteria assisted in separating the prevalence of undiagnosed pre-diabetes [2,3].

Calculating the Sample Size

With a 95% confidence interval and a 5% margin of error, the sample size was calculated using an estimated 10% pre-diabetes prevalence among young adults. The minimum sample size needed was determined to be 138 participants using the formula for estimating proportions in cross-sectional studies. However, the sample size was expanded to 200 participants in order to boost statistical power and take potential non-response into consideration [4].

4.3 Methods and Instruments for Gathering Data

A structured questionnaire that was modified from validated tools evaluating lifestyle choices and diabetes risk factors was used to gather data [5]. The questionnaire asked about dietary habits, smoking status, physical activity levels, family history of diabetes, and sociodemographic traits like age, gender, and educational attainment. The short form of the International Physical Activity Questionnaire (IPAQ), which divides activity levels into low, moderate, and high categories, was used to measure physical activity [6].

Standardized procedures were used to record anthropometric measurements, including height, weight, and waist circumference. A stadiometer was used to measure height to the closest 0.1 cm, and a digital scale was used to measure weight to the closest 0.1 kg. Weight in kilograms divided by height in meters squared (kg/m2) yielded the body mass index, or BMI.

4.4 Measurement of Blood Pressure and Blood Glucose

Following an overnight fast of at least eight hours, participants' fasting blood glucose (FBG) levels were measured. Trained phlebotomists took blood samples, and the glucose oxidase method—the gold standard for measuring plasma glucose—was used in a certified laboratory for analysis [9]. According to the American Diabetes Association's guidelines, fasting plasma glucose levels between 100 mg/dL (5.6 mmol/L) and 125 mg/dL (6.9 mmol/L) were considered pre-diabetes[10].
Following five minutes of rest in a seated position, the participant's blood pressure was taken using an automated sphygmomanometer. Five minutes separated the two readings, and the average was used for analysis. The American Heart Association's guidelines were used to define hypertension.

4.5 Evaluation of Risk Factors

Clinical measurements and self-reported lifestyle choices were used to assess risk factors. There were three categories for smoking status: never smoked, current smoker, and former smoker. Less than 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity physical activity per week was considered physical inactivity [12]. A food frequency questionnaire that focused on the consumption of fruits, vegetables, sugary drinks, and fast food was used to evaluate dietary habits.
By inquiring as to whether any first-degree relatives had been diagnosed with diabetes, the family history of the disease was recorded. Given that genetic predisposition greatly increases the risk of pre-diabetes and diabetes, this factor is crucial [13].

4.6 Statistical Analysis and Data Management

SPSS version 26 was used to analyse all of the data that had been gathered and stored in a secure database. The characteristics of the participants were summed up using descriptive statistics (mean, standard deviation, frequency, and percentage). The percentage of participants who met the ADA criteria was used to determine the prevalence of pre-diabetes.
Chi-square tests were used in bivariate analyses to evaluate the relationship between pre-diabetes status and categorical variables (such as physical activity and smoking status). The mean values of continuous variables (such as blood pressure and BMI) were compared between the pre-diabetic and normoglycemic groups using independent t-tests.
To find independent predictors of pre-diabetes, multivariate logistic regression was used. The model included variables whose p-values in bivariate analyses were less than 0.2. Statistical significance was established at p, and odds ratios (OR) with 95% CI were presented.

4.7 Moral Aspects to Take into Account

The Institutional Review Board examined and approved the study protocol. Before giving their written informed consent, each participant received comprehensive information about the study's goals, methods, risks, and advantages. By limiting data access to the research team and assigning unique codes, participant confidentiality was protected. The Declaration of Helsinki's ethical guidelines were followed in this study [16].

V. RESULTS AND DISCUSSION

5.1 Features of Participants

The study included 200 young adults between the ages of 19 and 23. Males made up 40% (n = 80), and females made up 60% (n = 120). The cohort's average age was 21.0 ± 1.2 years. The participants' clinical and demographic details are compiled in Table 1.
Pre-diabetes Prevalence According to WHO guidelines, 60 people (30%) in the study population were categorized as pre-diabetic based on fasting plasma glucose criteria (100–125 mg/dL) [2,10]. No cases of diabetes (FPG ≥126 mg/dL) were found, and the remaining 140 participants (70%) were normoglycemic.

5.2 Pre-diabetic Risk Factors

Pre-diabetic participants had a significantly higher mean BMI (27.1 ± 3.5 kg/m²) than normoglycemic (23.3 ± 3.5 kg/m²; $p < 0.001$). [7]. Additionally, the pre-diabetic group had a higher waist circumference (90.3 ± 9.1 cm vs. 83.4 ± 7.8 cm; $p < 0.001$). [8]. According to the International Physical Activity Questionnaire, 60% of pre-diabetics reported being physically inactive, compared to 38% of normoglycemic ($p = 0.005$) [6,12]. Additionally, pre-diabetics were more likely to have a family history of diabetes (50%) than normoglycemic (28%; $p = 0.003$). [13]. The pre-diabetic group's systolic blood pressure was higher (122 ± 10 mmHg) than that of the normoglycemic group (115 ± 9 mmHg; $p = 0.002$). [11]. There was no significant difference in smoking status between the groups (18% vs. 14%; $p = 0.44$).

5.3 Analysis of Multivariate Logistic Regression

BMI, physical inactivity, and family history of diabetes were significant independent predictors of pre-diabetes after controlling for confounders using logistic regression analysis [14,15]. The odds of pre-diabetes increased by 22% for every 1 kg/m² increase in BMI (OR = 1.22; 95% CI: 1.12–1.33; $p < 0.001$). The odds were 1.85 times higher for those who were physically inactive (OR = 1.85; 95% CI: 1.05–3.25; $p = 0.03$) and twice as high for those who had a family history of diabetes (OR = 2.10; 95% CI: 1.15–3.83; $p = 0.01$). There was no significant correlation between smoking and outcomes (OR = 1.25; 95% CI: 0.59–2.64; $p = 0.55$).

Table 1. Demographic and Clinical Characteristics of Study Participants (N = 200)

Variable	Total (N=200)	Pre-diabetic (n=60)	Normoglycemic (n=140)	p-value
Age (years), mean ± SD	21.0 ± 1.2	21.2 ± 1.1	20.9 ± 1.3	0.10
Female, n (%)	120 (60%)	38 (63%)	82 (59%)	0.58
Male, n (%)	80 (40%)	22 (37%)	58 (41%)	0.58
BMI (kg/m²), mean ± SD	24.5 ± 3.8	27.1 ± 3.5	23.3 ± 3.5	<0.001*
Waist circumference (cm)	85.6 ± 8.9	90.3 ± 9.1	83.4 ± 7.8	<0.001*
Family history of diabetes, n (%)	70 (35%)	30 (50%)	40 (28%)	0.003*
Physical inactivity, n (%)	90 (45%)	36 (60%)	54 (38%)	0.005*
Smoking status (current), n (%)	30 (15%)	11 (18%)	19 (14%)	0.44
Systolic BP (mmHg), mean ± SD	117.0 ± 10.3	122.0 ± 10.0	115.0 ± 9.0	0.002*

*Significant at $p < 0.05$

Table 2. Multivariate Logistic Regression Analysis of Risk Factors Associated with Pre-diabetes

Risk Factor	Adjusted Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
BMI (per 1 kg/m² increase)	1.22	1.12 – 1.33	<0.001*
Physical inactivity	1.85	1.05 – 3.25	0.03*
Family history of diabetes	2.10	1.15 – 3.83	0.01*
Smoking (current)	1.25	0.59 – 2.64	0.55

*Significant at $p < 0.05$

VI.DISCUSSION

According to earlier cross-sectional reports in comparable populations, 30% of young adults in this study had pre-diabetes [1,5]. This rate emphasizes the need for early detection and intervention as well as the growing burden of intermediate hyperglycaemia in young adults [2,3].

Increased waist circumference and BMI were strongly linked to pre-diabetes, confirming their significance as important anthropometric markers of diabetes risk [7, 8]. In line with WHO global guidelines for diabetes prevention, physical inactivity was also a significant modifiable risk factor [6,12].

Pre-diabetes risk was significantly correlated with family history of diabetes, supporting previous findings on genetic predisposition and familial transmission of type 2 diabetes [13]. Family history, inactivity, and BMI all had independent predictive roles that were supported by the multivariate model [14,15].

Despite the fact that smoking is known to have an impact on metabolic health, no significant correlation was discovered in this study, which may be because of the participants' relatively young ages or the low prevalence of smoking [9]. This relationship may be more clearly defined by larger longitudinal studies.

This study's strengths include its strict methodology, adherence to ethical guidelines [16], and use of validated instruments for biochemical and physical activity measurements [6,9]. The cross-sectional design and dependence on self-reported lifestyle data are limitations that may skew the findings.

In summary, the high incidence of pre-diabetes and its correlations with modifiable risk factors in young adults point to the urgent need for focused preventive measures that emphasize early family-based screening, healthy weight, and increased physical activity..

VII. CONCLUSION

According to this study, among young adults between the ages of 19 and 23, pre-diabetes was notably common (30%), with a higher percentage seen in females. Pre-diabetes status was substantially correlated with important modifiable risk factors, such as an elevated body mass index, an increased waist circumference, and physical inactivity. Furthermore, a family history of diabetes was found to be a significant non-modifiable risk factor, underscoring the interaction in this population between lifestyle factors and genetic predisposition. With an emphasis on encouraging healthy weight maintenance, regular physical activity, and increasing awareness of familial risk, these findings highlight the urgent need for early identification and focused prevention strategies within this age group. By putting such interventions into practice, the burden of type 2 diabetes progression and its related complications could be greatly decreased. Additional longitudinal.

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