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Original Article

Investigating the Lifestyle Habits and Cardiometabolic Health Among Young Adults in Pakistan

Tariq Waseem[1], Wafa Qaiser[2], Somia Iqtadar[3], Muhammad Naeem Afzal[4], Taj Jamshed[5], Rizwan Zafar[6], Samiullah Mumtaz[3], Khalid Mahmood Khan[7], Malik Asif Humayun[8*]

[1]Saleem Memorial Hospital, Lahore, Pakistan.

[2]Al-Aleem Medical College, Lahore, Pakistan.

[3]King Edward Medical University, Lahore, Pakistan.

[4]Fatima Jinnah Medical University, Lahore, Pakistan.

[5]Sharif Medical & Dental College Lahore, Pakistan.

[6]Akhtar Saeed Medical and Dental College, Lahore, Pakistan.

[7]Allama Iqbal Medical College, Lahore, Pakistan.

[8]Milton Keynes University Hospital NHS Foundation Trust, UK.

***Corresponding Author:** Dr. Malik Asif Humayun, Milton Keynes University Hospital NHS Foundation Trust, UK.

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Abstract

Background: In Pakistan, the high prevalence of diabetes necessitates an understanding of its association with lifestyle factors, especially among young adults. This study examines the correlation between lifestyle habits and HbA1c and blood pressure in young adult medical students in Pakistan.

Methods: Conducted from December 2022 to May 2023 across 16 medical colleges, this analytical cross-sectional study involved 1613 students aged 18-25 years. Participants with known diabetes, hypertension, or chronic conditions were excluded. Data collection included socio-demographic characteristics, lifestyle habits, anthropometric measurements, and clinical assessments of blood pressure and HbA1c levels.

Results: Results showed that 44.1% of participants were aged 22-24 years, and 63.4% were female. Over 46% were overweight or obese, and 4.0% had high blood pressure. Lifestyle assessments revealed significant habits such as skipping breakfast (47.5%) and a preference for fast food (17.2%), a sedentary lifestyle with a mean exercise time of 3.0±0.5 hours weekly. Gender differences were significant, with males more prone to diabetes.

Conclusion: The study highlights a notable prevalence of undiagnosed prediabetes (10.9%) and diabetes (0.9%) among young adults in Pakistan, emphasising the importance of targeted interventions and comprehensive nationwide studies to address the rising burden of diabetes and obesity among young adults in Pakistan.

Keywords: *Diabetes mellitus; HbA1c; Lifestyle factors; Young adults*

Introduction

In a global health landscape dominated by discussions and measures aimed at combating communicable diseases, the significance of non-communicable conditions like diabetes and hypertension cannot be overstated. While the COVID-19 pandemic has understandably drawn much attention, the escalating prevalence of diabetes mellitus presents a parallel, pressing concern, verging on epidemic proportions worldwide [1].

According to the International Diabetes Federation, the prevalence of diabetes among 20 to 79-year-olds reached 10.5% in 2021, with a projected increase to 12.2% by 2045, particularly pronounced in middle-income nations [2]. Notably, Pakistan has grappled with a staggering diabetes prevalence of 30.8% in 2021, underlining the urgency of addressing this public health challenge.

Prediabetes, a metabolic intermediary between normoglycemia and diabetes, demands proactive identification and management due to its potential progression to overt diabetes and associated microvascular complications. The definition of prediabetes based on HbA1C levels varies slightly between international expert committees and guidelines, with the ADA recommending a range of 5.7% to 6.4% [3]. Employing the ADA's criteria, we delineate prediabetes in our study population.

The utility of HbA1C testing lies in its ability to reflect average plasma glucose levels over the preceding 2 to 3 months without the need for fasting, rendering it a convenient and reliable diagnostic tool. Moreover, its stability against external influences, coupled with its predictive value for complications such as cardiovascular and renal disorders, underscores its clinical significance [4].

Epidemiological data from the US and Pakistan underscore the widespread prevalence of prediabetes, with associated risk factors including physical inactivity, hypertension, family history of diabetes, and elevated BMI [5,6]. However, comprehensive studies exploring the interplay between lifestyle behaviours, cardiometabolic diseases, and their prevalence among young Pakistani adults remain scarce or yield inconsistent findings.

Our research endeavours to bridge this gap by investigating the prevalence of diabetes and obesity among young adults and adolescents in Pakistan, and exploring the intricate relationship between lifestyle factors and the risk of these conditions [7]. Employing a mixed-methods approach, we integrate quantitative analysis of survey data with qualitative insights gleaned from interviews and focus group discussions. By shedding light on the impact of sedentary behaviours, dietary patterns, and other lifestyle determinants, we aim to inform targeted interventions to curb the burgeoning burden of diabetes and obesity in this vulnerable demographic

Methods

Study Setting

An analytical cross-sectional study was conducted from December 2022 to May 2023. Screening camps were established at 16 medical colleges across Pakistan (see Annexure I), where 1613 medical students volunteered to participate in the study.

Participants included young adults aged 18-25 years, undergraduate medical students of both genders and individuals consenting to and willing to participate in the study.

Individuals younger than 18 years or older than 25 years, those with known diabetes mellitus or hypertension, individuals with chronic medical conditions, those on glucose-lowering drugs for indications other than hyperglycaemia, and individuals taking medications that may increase glycaemic levels, including steroids, were excluded from the study.

Written informed consent was obtained from all participants. Socio-demographic characteristics and lifestyle habits were assessed using a structured pre-tested questionnaire (see Annexure II). Anthropometric measurements, including height (in cm) and weight (in kilograms), were recorded, and body mass index (BMI) was calculated. Blood pressure (BP) was measured by trained healthcare professionals using a digital sphygmomanometer (Omron M3 series) following the protocols of the International Hypertension Society [9]. BP was measured twice, and the average reading was recorded. Blood samples were obtained via pinprick using an automated lancet under aseptic measures. Random blood sugar levels were checked, and samples for HbA1C levels were measured at the Point of Care (POC).

Operational Definitions

- Diabetes Mellitus (DM) was diagnosed in participants exhibiting symptoms such as polyuria and polydipsia along with any one of the following criteria:

- Glycated hemoglobin (HbA1C) ≥ 48 mmol/mol (≥ 6.5%)

- Fasting plasma glucose level ≥ 7.0 mmol/L (126 mg/dL)

- Random blood sugar and plasma glucose ≥ 11.1 mmol/L (200 mg/dL)

- Pre-diabetes was identified when any one of the following criteria was met:

- Hemoglobin A1c (HbA1c) level between 5.7% to 6.4% in the absence of symptoms

- Fasting Blood Glucose between 100-125 mg/dL (IFG)

- Random Blood Glucose between 140-200 mg/dL (IGT)

- Obesity was defined using BMI cutoffs for adult Asian Indians as follows:

- Healthy: BMI 18.5kg/m2- 22.9 kg/m2

- Overweight: BMI between 23 kg/m2 - 24.9 kg/m2

- Obese: BMI of 25kg/m2

- Hypertension (HTN) was suspected when BP readings were recorded above 140 mm Hg systolic and/or above 90 mm Hg diastolic.

Data were analysed using Statistical Package for the Social Sciences (SPSS) version 25. Qualitative variables were presented as percentage frequencies, while numerical variables were expressed as mean and standard deviation. Chi-square tests and correlation analyses were employed to identify associations between variables, with correlation coefficients calculated. A p-value ≤ 0.05 was considered statistically significant.

Results

The demographic and physiological characteristics of the participants are summarised in Table 1. Majority of the participants (44.1%) fell into the age group of >22-24 years, with females comprising 63.4% of the sample. Additionally, the highest proportion of participants (65.1%) were enrolled in public colleges. Among the participants, over 46% were categorised as overweight or obese, 4.0% exhibited high blood pressure, 40.5% had a family history of diabetes, and 0.9% had elevated HbA1C levels.

Exploring lifestyle habits revealed that 47.5% of participants reported skipping breakfast, 17.2% preferred fast-food chains, 6.4% consumed over 1000ml of beverages, and the mean exercise time was 3.0±0.5 hours. Additionally, 80.7% of participants engaged in household tasks, as detailed in Table 2.

Presently no association (p-value >0.05) of BMI, Blood pressure and stress was found with diabetes while a significant difference (p-value <0.05) was found for gender where male are more prone to diabetes as compared to females. Similarly, participants having male gender and a family history of diabetes, particularly a history of diabetes in parents, were identified as significant contributing factors to the observed trends. [Table 3]

According to the diagnostic criteria for diabetes, 14 subjects met the criteria for diabetes. Further investigation revealed that 3 patients were diagnosed with autoimmune diabetes and were treated with insulin, while one subject withdrew consent for further participation in the study. The remaining subjects were managed as Type 2 Diabetes (T2D) cases based on local guidelines. [Table 4]

Table 1. Demographic and Physiologic Characteristics of Students (n=1613).

Characteristics	Category	n	%
Age Groups	18-20 years	258	16
	>20-22 years	545	33.8
	>22-24 years	712	44.1
	>24-25 years	98	6.1
Type of Medical College	Public	1043	65.1
	Private	558	34.9
Body Mass Index	Normal	868	53.8
	Overweight	323	20
	Obese	422	26.2
HbA1c	(mean ± St.d)	5.1±0.6	
	< 5.6 non-diabetic	1423	88.2
	5.7-6.4 pre-diabetic	176	10.9
	> 6.5 diabetic	14	0.9

Table 2. Life Style/Habitual Characteristics of Students (n=1613).

Factor	Category	non-diabetic n=1423		pre-diabetic n=176		Diabetic n=14		P-value
		n	%	n	%	n	%	
Food Preference	Homemade		73	120	68	13	93	0.2
	Restaurant	149	10.5	18	10	1	7	
	Fast food chain	239	17	38	22	0	0	
Frequency of Fast Food	once in month	403	28	35	20	5	36	0.06
	once in week	558	39	71	40	7	50	
	2-3 times a week	462	32.5	70	40	2	14	
Daily Bottled Beverages intake	Zero	644	45	72	41	7	50	0.39
	250-500ml	0	0	0	0	0	0	
	501-1000ml	687	48	95	54	5	36	
	>1000ml	92	6.5	9	5	2	14	
Exercise	1-3 hours/week	1296	91	160	91	14	100	0.5
	3-5 hours/week	127	9	16	9	0	0	
	>5 hours/week	0	0	0	0	0	0	
Walk	1-3 hours/week	80	6	8	4.5	0	0	0.83
	3-5 hours/week	148	10	17	10	2	14	
	>5 hours/week	1195	84	151	86	12	86	
Sitting	1-3 hours/week	10	1	2	1	0	0	0.86
	3-5 hours/week	904	63.5	116	66	8	57	
	>5 hours/week	509	36	58	33	6	43	
Idle time per day	1-3 hours/week	12	1	1	1	0	0	0.59
	3-5 hours/week	488	34	50	28	5	36	
	>5 hours/week	923	65	125	71	9	64	
Note: chi-square applied, $p<0.05$*								

Table 3. Association of Risk factors with Diabetes and Non-diabetic hyperglycaemia.

		non-diabetic n=1423		pre-diabetic n=176		Diabetic n=14		p-value
		n	%	n	%	n	%	
Family H/O Diabetes Mellitus	**Yes**	566	39.8	78	44.3	10	71.4	0.031
	No	857	60.2	98	55.7	4	28.6	
Relationship	**Mother**	168	11.8	26	14.8	4	28.6	0.0001
	Father	297	20.9	35	19.9	1	7.1	
	Both parents	64	4.5	12	6.8	3	21.4	
	Siblings	15	1.1	0	0.0	1	7.1	
	2 Family member's history	17	1.2	6	3.4	0	0.0	
	Mother father siblings	5	0.4	0	0.0	1	7.1	
	None	857	60.2	97	55.1	4	28.6	
Gender	**Male**	492	34.6	89	50.6	10	71.4	0.001
	Female	931	65.4	87	49.4	4	28.6	

Table 4. Subjects with confirmed diagnosis of Diabetes Mellitus.

Name	Fasting blood glucose (mg/dl)	HbA1c Screening (DCCT) %	HbA1c Repeat (DCCT) %	GAD antibodies	Family History	Relationship	Treatment	Current Status
1	92	6.5	5.4	Negative	No	NA	No treatment	Treated as T2D
2	101	6.5	5.6	Negative	No	NA	No treatment	Treated as T2D
3	91	6.7	5.6	Negative	Yes	Mother	Lifestyle	Treated as T2D
4	101	6.7	6.9	Negative	Yes	Mother, Father, sibling	On OHAs+ Lifestyle	Treated as T2D
5	100	6.7	5.8	Negative	Yes	Mother Father	Lifestyle	Treated as T2D
6	98	6.7	7.1	Negative	No	unknown	Lifestyle	Treated as T2D
7	100	7.3	7.5	Negative	Yes	Mother	On OHAs + Lifestyle	Treated as T2D
8	97	7.6	6.9	Negative	Yes	Mother, Father	On OHAs+ Lifestyle	Treated as T2D
9	230	9.5	10	Positive	Yes	Mother	On Insulin	Treated as T1D
10	96	9.8	7.8	Negative	Yes	Father	LifeStyle	Treated as T2D
11	167	11	10.5	Positive	No	No Family history	On Insulin	Treated as T1D
12	335	12.5	11	Positive	Yes	Mother	On Insulin	Treated as T1D
13	260	12.6	10	Negative	Yes	Sibling	On OHAs+ Lifestyle	Treated as T2D
14	435	13. 2	12	Negative	Yes	Mother, Father	Could not be contacted	Treated as T2D

Discussion

The findings of our study contribute to the growing body of evidence highlighting the prevalence of diabetes and prediabetes among young adults, a demographic often overlooked in diabetes research. Our study revealed a significant number of pre-diabetes (10.9%) and diabetes (0.86%) cases among young adults aged 18-24 years enrolled in medical schools nationwide, with a higher prevalence observed in males.

These findings are consistent with previous research indicating a rising trend of diabetes and prediabetes among young adults nationally and globally. [10, 11, 12,13]. The TODAY (Treatment Options for Type 2 Diabetes in Adolescents & Youth) study group has been shown to have a higher incidence of hypertension, dyslipidaemia, and microvascular complications in patients 10-17 years of age suffering from diabetes [14]. Another group from China also reported that patients with early onset diabetes (in age < 40 years) have early development of hypertension and dyslipidaemia that would turn into severe complications with persistent hyperglycaemia accompanying over years [15]. Another review comprising data from high-income countries expressed that younger people living with diabetes have increased mortality, and every decade of earlier diagnosis of diabetes lessens the life expectancy by 3-4 years, compared with if diagnosed at 70 years of age [16]. That raises serious concerns for future health paradigms and economic burdens from national and global perspectives.

Our study not only highlights the prevalence of diabetes and prediabetes among young adults but also delves into the lifestyle choices that may contribute to these alarming statistics, particularly in the context of Pakistan's high burden of cardiometabolic diseases.

In Pakistan, as in many parts of the world, especially neighbouring countries [17] there's a concerning trend among youth towards adopting sedentary lifestyles and unhealthy dietary habits. Factors such as the proliferation of fast-food chains, a preference for sugary beverages, and a decrease in physical activity levels contribute to the rise in obesity and associated cardiometabolic conditions Moreover, socio-cultural norms often prioritize academic or professional pursuits over physical well-being, further exacerbating the problem. The implications of these lifestyle choices are profound and warrant urgent attention.

The absence of a notable link between BMI and diabetes/prediabetes in our study group could stem from various reasons. While BMI is commonly used to gauge obesity due to its simplicity, it falls short in distinguishing between fat and lean mass or assessing body fat distribution, particularly in young adults. Moreover, BMI might not adequately capture central adiposity, which is closely tied to metabolic issues and diabetes risk [18, 19]. This limitation is compounded by the fact that BMI cutoffs defining obesity are based on population averages and may not accurately represent adiposity across all ethnicities. Studies indicate that people of South Asian descent, like Pakistanis, often exhibit higher levels of visceral fat and lower muscle mass compared to Caucasians with similar BMI readings, elevating their susceptibility to metabolic disorders even at lower BMI levels [20]. Consequently, relying solely on BMI may underestimate the true prevalence of obesity-related metabolic conditions in South Asian populations. Additionally, the development of diabetes and prediabetes is influenced by intricate interplays between genetic predisposition, lifestyle choices, and socio-economic factors. While obesity is a known diabetes risk factor, factors like genetic predisposition, dietary habits, physical activity levels, and socioeconomic status also exert significant influences on individual risk. It's plausible that in our study group, these multifaceted factors overshadowed the impact of BMI on diabetes risk, thereby explaining the absence of a significant association.

Furthermore, our study identified a positive family history of diabetes as a significant contributing factor to the development of diabetes among young adults. However, the predictive value of non-invasive diabetes risk scores, which often incorporate parameters of obesity, may be limited in detecting diabetes in individuals with beta cell failure. This highlights the complexity of diabetes risk assessment and the need for more accurate screening tools, particularly in high-risk populations.

The implications of early-onset diabetes are profound, with studies indicating an increased risk of hypertension, dyslipidaemia, and microvascular complications among young individuals with diabetes. Moreover, younger age at diagnosis of diabetes has been associated with decreased life expectancy, emphasizing the importance of early detection and management of diabetes in this population.

Despite the valuable insights provided by our study, certain limitations must be acknowledged. The use of HbA1c as the sole criteria for diagnosis of prediabetes and diabetes may have introduced some degree of misclassification bias. Additionally, BMI may not adequately capture obesity in young adults, suggesting the need for alternative measures of obesity in screening high-risk individuals for diabetes.

With diabetes and hypertension already reaching epidemic proportions in Pakistan, the prevalence of these conditions among young adults is particularly alarming. Not only does this place a significant burden on the healthcare system, but it also threatens the productivity and well-being of future generations.

Conclusion

In conclusion, our study highlights the urgent need for comprehensive nationwide studies to document the prevalence of diabetes and prediabetes among young adults in Pakistan. Moreover, the development of targeted prevention and management strategies tailored to the specific needs of this population is essential to mitigate the growing burden of diabetes and its associated complications.

Conflict of Interest

The authors declare no conflict of interest.

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