



Prevalence of Type 2 Diabetes Mellitus and Pre-Diabetes Using HbA1c

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: Type 2 diabetes mellitus (T2DM) is a group of metabolic diseases depicted by crippled insulin release by the pancreas and insulin resistance of body tissues.

Objectives: The main objective of the study is to analyse the prevalence of type 2 diabetes mellitus and pre-diabetes using HbA1c.

Material and Methods: This cross sectional study was conducted in Islam Medical College Sialkot during 2020 to 2021. A special questionnaire concerning family history and health-related information was filled for all participants by direct interviews with the researchers. People previously diagnosed with diabetes or hemoglobinopathies were ruled out from the study. Blood samples were collected from all subjects using EDTA tubes and centrally analyzed for HbA_{1c}.

Results: The data was collected from 200 patients of both genders. In all, 200 participants were found to be currently diabetic, giving an overall prevalence of current condition to be 24.6% (95% CI 21.90 - 27.49) in the study population. History of disease was reported by 31.5% participants ($P < 0.001$).

Conclusion: It is concluded that adjustments in platelet files are believed to be measurably connected with diabetes and its intricacies. The prevalence of type 2 diabetes and pre-diabetes is much higher than previously thought in Pakistan.

Keywords: Diabetes; prevalence; haemoglobin; EDTA.

1. INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a group of metabolic diseases depicted by crippled insulin release by the pancreas and insulin resistance of body tissues. Persevering hyperglycemia prompts smaller than expected and macrovascular complexities in patients with T2DM; diabetic retinopathy (DR) is the most generally perceived and the specific microangiopathy [1]. 40022 million people encountering it, and its event is rapidly climbing in the middle and low-pay countries. There is an inside and out the world wanted to end the rising in diabetes by 2025. The hyperglycemia, dyslipidemia, and insulin impediment in diabetes causes endothelial and pericyte injury, making it a prothrombotic state [2]. Hyperglycemia is a nature of diabetes which causes an assortment of long stretch fundamental ensnarements [3]. Generally, the harming effects of hyperglycemia are confined into macrovascular bothers (Coronary Artery Disease, Peripheral Arterial Disease, Stroke) and smaller than normal vascular complexities (Diabetic Retinopathy, Diabetic Nephropathy, Diabetic Neuropathy) [4].

The American Diabetes Association (ADA) criteria for the diagnosis of diabetes require either fasting plasma glucose (FPG) or 75 gm OGTT, which is time-consuming, requires fasting and may not always be reproducible. In 2009, the International Expert Committee on diabetes proposed new diagnostic criteria based on glycated haemoglobin (HbA1c), which captures chronic glucose exposure. The proposed diagnostic threshold of 6.5% was based on retinopathy risk at different levels of HbA1c as was the case with FPG and OGTT. This report was followed by a recommendation from the ADA that an HbA1c level of 6.5% be used as the diagnostic cut-off for the diagnoses of diabetes (this has not been validated in Pakistan) [5]. A previous national-level type 2 diabetes survey was conducted in 1999 with a sample size of 5433 using OGTT. In the study described in this paper, we investigated the prevalence of type 2 diabetes (using the HbA1c test) and its distribution across gender, age, rural and urban, education, body mass index (BMI) WHO and Asian cut-offs, family history, smoking and blood pressure among a large sample across Pakistan, aged 20 years and above. A sub sample was tested to explore the diagnostic accuracy of

HbA1c for diagnosis of type 2 diabetes, compared with the 2-hour OGTT [6].

1.1 Objectives

The main objective of the study is to analyse the prevalence of type 2 diabetes mellitus and pre-diabetes using HbA1c.

2. MATERIALS AND METHODS

This cross sectional study was conducted in Islam Medical College Sialkot during 2020 to 2021. The data was collected from both male and female diabetic patients who visited the OPD of the hospital. A special questionnaire concerning family history and health-related information was filled for all participants by direct interviews with the researchers. People previously diagnosed with diabetes or hemoglobinopathies were ruled out from the study. Blood samples were collected from all subjects using EDTA tubes and centrally analyzed for HbA_{1c}. Plasma was also used to analyze FPG and total lipid profile, total cholesterol (TC), triglycerides (TG), high-density lipoprotein (HDL) and low-density lipoprotein (LDL). Blood pressure (BP) and BMI were also measured by the medical staff in the clinics. Body mass index (BMI) in kg/m² was categorized as normal (BMI < 25), overweight (BMI ≥ 25 to < 30) and obese (BMI ≥ 30). The cut-off values for diabetes using FPG was ≥ 126 mg/dL, prediabetes 100–125 mg/dL and normal subjects having FPG < 100 mg/dL.

2.1 Statistical Analysis

The data was collected and analysed by using SPSS version 19. All the values were expressed in mean and standard deviation.

3. RESULTS

The data was collected from 200 patients of both genders. There were 80 males and 120 females. The mean age of the patients was 45.65 ± 10.21 years. In all, 200 participants were found to be currently diabetic, giving an overall frequency of current condition to be 24.6% (95% CI 21.90 - 27.49) in the study population. History of disease was reported by 31.5% participants (*P* < 0.001).

In our study, microvascular complications were present in 385 (77%) patients (Table 2).

Table 1. Distribution of participants according to disease

Status	Total (%)	P-value
Diabetic	24.6	<0.001
Type-2	32	<0.001
Non diabetic	68.5	<0.001

Table 2. Characterizes the microvascular complications in diabetes

HbA1c	Patients	Percentage
<8.0%	19	16
>8.0%	96	84
Total	115	100

Table 3. Differentiates patients based on HbA1c. Patients without microvascular complications

Duration of Diabetes	No. of patients	Percentage
< 5 years	80	70
> 5 years	35	30
Total	115	100

Table 4. Comparison of platelet indices in two study groups

Platelet index	Normal range	S.D	t	P
MPV (fL)	8.6-15.5 fL	1.63	12.47	0.0001
PDW (fL)	9.0-14 fL	3.15	9.82	0.0001
PCT (%)	0.22-0.24%	0.056	3.21	0.0001

95 (83%) patients of the 115 patients without microvascular confusions of had HbA1c < 7.0 (Table 2). 80 (70%) patients of the 115 patients without microvascular entanglements had term < 5 years (Table 3).

4. DISCUSSION

The main pathogenesis prompting microvascular harm is that hyperglycemia harms narrow endothelial cells in the retina, mesangial cells in the renal glomeruli and Schwann cells of the fringe [7].

Similarly, microvascular irritates emerges considering naughtiness inside these endothelial cells [8]. Current confirmation sponsorships direct association among hypertension and poor glycemic control with microvascular disorders as additionally found in our investigation. These are named as free danger factors for microvascular illness improvement. Age, glycated hemoglobin, term of diabetes, and serum oily oils are other danger factors equivalently smoking, weight, veritable inertia [9].

WHO experts have accepted HbA1c as a diagnostic tool provided quality assurance tests are in place and there are no conditions present,

which preclude its accurate measurement. The New Zealand Society for the study of diabetes and the Australian Diabetes Society have already endorsed HbA1c as a test for the diagnosis of diabetes [10]. Recently, a prevalence study done in Korea concluded that FBG testing results in underestimation of diabetes and prediabetes. This study suggested the use of standardised HbA1c as a diagnostic tool for diagnosis of type 2 diabetes [11].

We found that HbA1c had a good sensitivity and specificity level for diagnoses of diabetes compared with the OGTT. HbA1c has the advantage of being a simple test and less time-consuming, making it an ideal test for community surveys in our populations. In Pakistan, as there is no effective primary care (general/family practice) structure most of the population does not undergo primary screening for diabetes. Sometimes as the diagnosis is not made, people may present to tertiary care with complications [12].

5. CONCLUSION

It is concluded that adjustments in HbA1c are believed to be measurably connected with

diabetes and its intricacies. The prevalence of type 2 diabetes and prediabetes is much higher than previously thought in Pakistan. Comprehensive strategies need to be developed to incorporate screening, prevention and treatment of type 2 diabetes at community level. HbA1c is an applicable test in community settings in middle-income and low-income countries and it has a good correlation with 2-hour OGTT.

CONSENT AND ETHICAL APPROVAL

As per international standard or university standard guideline Patient's consent and ethical approval has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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