

ASSESSING THE AWARENESS OF PREDIABETES AND ITS RISK FACTORS AMONG MEDICAL STUDENTS

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Abstract

Introduction: Prediabetes is a condition where blood glucose levels are elevated but not yet high enough to be classified as diabetes. It is typically identified through impaired fasting glucose (IFG) or impaired glucose tolerance (IGT), with specific blood sugar thresholds.

Methodology

A cross-sectional study was conducted between October 29 and November 26, 2024, involving medical students from the 2nd to 5th years. Data was gathered through a semi-structured questionnaire distributed via Google Forms. Statistical analysis was performed using SPSS software, and the results were expressed in percentages.

Results

Among the 213 respondents, the majority were in their 2nd year (42.7%) and aged between 20-25 years (61.5%), with a slightly higher proportion of males (53.1%). Most respondents were Muslim (53.1%) and from India (69%). While many students were aware of prediabetes (168 participants), only 53 had attended extra classes on the topic. Knowledge of prediabetes improved as students advanced in their studies. Fifth-year students demonstrated the best understanding of key topics, such as HbA1c levels (66.7%) and prediabetes complications (89.9%). Second-year students had a solid grasp of prediabetes, while third-year students showed relatively less knowledge.

Conclusion

This study reveals that medical students possess general knowledge about prediabetes, its risk factors, and symptoms, but there are areas that require improvement. Although many students were familiar with the definition of prediabetes, few had participated in additional educational sessions on the subject. Awareness of risk factors, such as gestational diabetes, was moderate, and some students were unaware that prediabetes can be asymptomatic. Clinical knowledge tended to improve with academic progression, with older students exhibiting a stronger understanding of diagnostic criteria and complications. Younger students, particularly those in the second and third years, had less comprehensive knowledge. These results emphasize the need for enhanced education, especially for students in the earlier years of their medical studies.

Key words: Prediabetes, Hypertension, medical students, JASU

ОЦЕНКА ОСВЕДОМЛЕННОСТИ О ПРЕДИАБЕТЕ И ЕГО ФАКТОРАХ РИСКА СРЕДИ СТУДЕНТОВ-МЕДИКОВ

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Аннотация

Введение. Предиабет — это состояние, при котором уровень глюкозы в крови повышен, но еще недостаточно высок, чтобы его можно было классифицировать как диабет.

Обычно его определяют по нарушенной глюкозе натощак (НГН) или нарушенной толерантности к глюкозе (НТГ) с определенными пороговыми значениями уровня сахара в крови.

Методология

поперечное исследование проводилось в период с 29 октября по 26 ноября 2024 года с участием студентов-медиков 2–5 курсов. Данные собирались с помощью полуструктурированной анкеты, распространяемой через Google Forms. Статистический анализ проводился с использованием программного обеспечения SPSS, а результаты выражались в процентах.

Результаты

среди 213 респондентов большинство были на 2-м курсе (42,7%) и в возрасте от 20 до 25 лет (61,5%), с немного большей долей мужчин (53,1%). Большинство респондентов были мусульманами (53,1%) и выходцами из Индии (69%). Хотя многие студенты знали о преддиабете (168 участников), только 53 посещали дополнительные занятия по этой теме. Знания о преддиабете улучшались по мере того, как студенты продвигались в учебе. Студенты пятого курса продемонстрировали лучшее понимание ключевых тем, таких как уровни HbA1c (66,7%) и осложнения преддиабета (89,9%). Студенты второго курса имели прочное понимание преддиабета, в то время как студенты третьего курса показали относительно меньшие знания.

Вывод

Это исследование показывает, что студенты-медики обладают общими знаниями о преддиабете, его факторах риска и симптомах, но есть области, которые требуют улучшения. Хотя многие студенты были знакомы с определением преддиабета, немногие участвовали в дополнительных образовательных сессиях по этой теме. Осведомленность о факторах риска, таких как гестационный диабет, была умеренной, и некоторые студенты не знали, что преддиабет может протекать бессимптомно. Клинические знания, как правило, улучшались с академическим прогрессом, при этом старшие студенты демонстрировали более глубокое понимание диагностических критериев и осложнений. Младшие студенты, особенно на втором и третьем курсах, имели менее всесторонние знания. Эти результаты подчеркивают необходимость улучшенного образования, особенно для студентов на ранних этапах их медицинского обучения.

Ключевые слова: преддиабет, гипертония, студенты-медики, JASU

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Introduction

The term 'pre-diabetes' refers to a situation where the blood glucose levels are higher than normal, but not high enough to warrant a diagnosis of diabetes. It is an intermediate stage used to describe a person with impaired blood glucose tolerance levels of fasting between 100 and 126 mg/dl of blood or whose 2-hour post-prandial blood glucose was between 140 and 200 mg/dl [1]. Prediabetes is associated with obesity (especially abdominal or visceral obesity), dyslipidemia with high triglycerides and/or low HDL cholesterol, and hypertension

[2]. Prediabetes consists of two entities viz. impaired fasting glucose (IFG) and impaired glucose tolerance (IGT). IGT tends to be characterized by insulin resistance in muscle and decreased glucose uptake, while IFG is generally driven by insulin resistance in the liver and excess hepatic glucose production [3]. There is limited overlap between IGT and IFG; only 20–25% of people with IGT have IFG, and 30–45% of individuals with IFG have IGT. The diagnostic criteria for diabetes and prediabetes are summarized in Table 1 [4]. According to National Diabetes Statistics Report of Centers for Disease Control and Prevention 97.6 million people aged 18 years or older have prediabetes (38.0% of the adult U.S. population) and 27.2 million people aged 65 years or older (48.8%) have prediabetes [5]. The pathophysiologic defects underlying prediabetes include insulin resistance, β -cell dysfunction, increased lipolysis, inflammation, suboptimal incretin effect, and hepatic glucose overproduction. These metabolic derangements associated with concomitant obesity cause endothelial vasodilator and fibrinolytic dysfunction, leading to increased risk of macrovascular and macrovascular complications like Stroke, endothelial dysfunction, peripheral vascular disease, myocardial infarction, congestive heart failure, pro-inflammatory cytokines. [6-9]. Risk factors include obesity, family history of diabetes mellitus, gestational diabetes, polycystic ovarian syndrome, and certain ethnic backgrounds, along with dyslipidemia and hypertension. Symptoms are often absent, but some individuals may experience increased appetite or thirst, weight changes, weakness, fatigue, sweating, blurry vision, bleeding gum and non-healing wounds [10]. Prediabetes represents the tip of the iceberg if untreated; prediabetes can lead to cardiovascular changes such as fatty depositions in coronary arteries and cells of heart. Other complications include diabetic retinopathy, neuropathy and nephropathy. Patients with IGT \pm IFG need strict Lifestyle modification. For treatment pharmacotherapy approach with metformin plus low-dose pioglitazone is an option. In high risk IGT individuals long-acting GLP-1 analogue use as well as diet plus exercise May be another option. Each component of this approach is effective in type 2 DM prevention and turning IGT back to normal [11]. Surgical measures such as bariatric surgery have been found to be beneficial in preventing T2DM in obesity and prediabetes [12-16]

• Table 1. Diagnostic criteria for diabetes and prediabetes

Parameters	Normoglycemia (mg/dl)		Prediabetes(mg/dl)		Diabetes
	WHO	ADA	WHO	ADA	
FPG	<110	<100	110-125(IFG)	100-125(IFG)	≥ 126
2-h PG	< 140		140-199 (IGT)		≥ 200
HbA1c	< 5.7%		5.7-6.4%		$\geq 6.5\%$
Random plasma glucose*					≥ 200 (with symptoms of diabetes)

Individuals with random plasma glucose between 140-199mg/dl are recommended to undergo OGTT WHO - World Health Organization; ADA-American Diabetes Association; IFG - Impaired Fasting Glucose; IGT - Impaired Glucose tolerance; FPG - Fasting Plasma Glucose; 2-h PG-2 hour post load Glucose test (oral glucose tolerance test) plasma glucose; HbA1c – Glycosylated Hemoglobin

Source: ICMR guidelines for management of type 2 diabetes. 2018.

Methodology

This cross-sectional study utilized a semi-structured questionnaire administered to medical undergraduate students from the 2nd to 5th year at Jalalabad State University named after B. Osmonov in Jalalabad, Kyrgyzstan. The questionnaire was distributed via Google Forms, and students were requested to complete and submit their responses. The study was conducted from October 29, 2024, to November 26, 2024. The study population comprised medical students from the 2nd to 5th year who agreed to participate, resulting in a sample size of 213 students. Inclusion criteria were all consenting medical students from the 2nd to 5th year, while those who did not consent were excluded. Statistical analysis will be performed using SPSS (Statistical Package for the Social Sciences) software.

Results

Socio demographic information of respondents

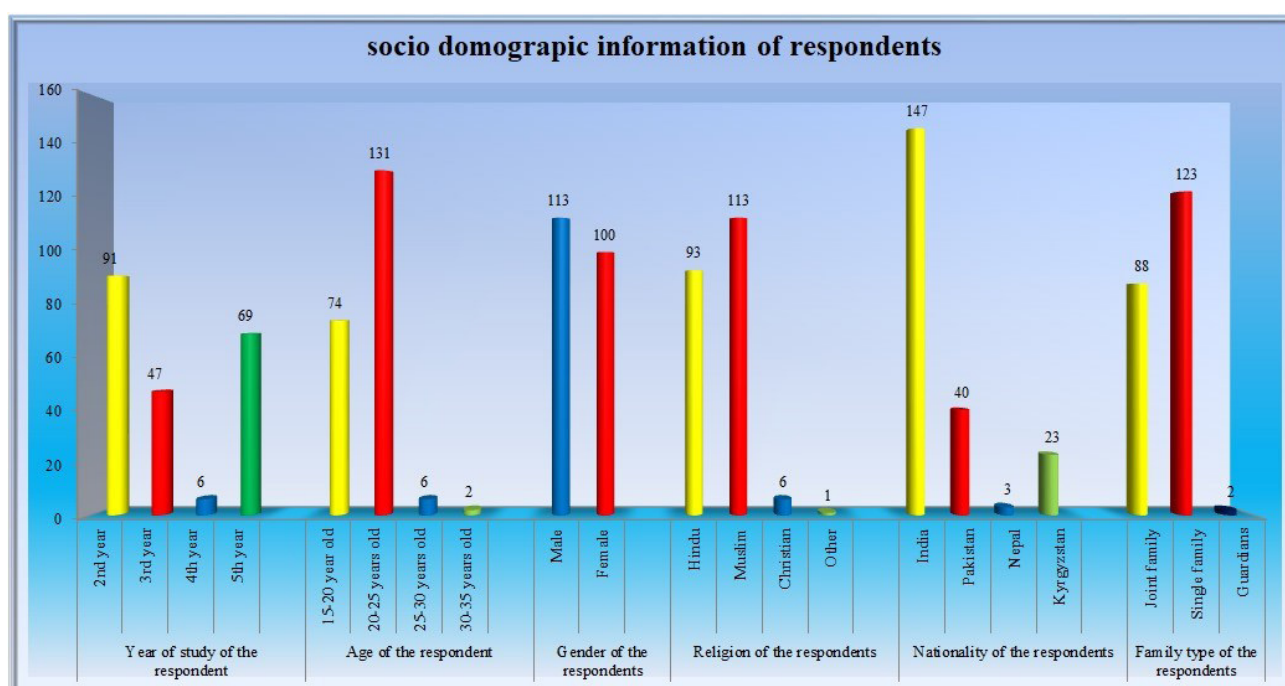


Fig.1. Distribution of respondents according to their socio demographic information

The socio-demographic characteristics of the 213 respondents provide insight into their backgrounds and diversity. Regarding the year of study, the majority of respondents were in their 2nd year (42.7%), followed by 5th-year students (32.4%), 3rd-year students (22.1%), and a small proportion in their 4th year (2.8%). The age distribution indicates that most respondents were between 20-25 years old (61.5%), with 34.7% aged 15-20 years, and smaller percentages in the 25-30 years (2.8%) and 30-35 years (0.9%) age brackets. Gender-wise, males constituted a slight majority at 53.1%, while females made up 46.9%. In terms of religion, the respondents were predominantly Muslim (53.1%), followed by Hindus (43.7%), Christians (2.8%), and others (0.5%). Nationality data reveals that a significant proportion were from India (69.0%), with smaller groups from Pakistan (18.8%), Kyrgyzstan (10.8%), and Nepal (1.4%). Lastly, most respondents lived in single-family households (57.7%), while 41.3% belonged to joint families, and a very small percentage (0.9%) lived with guardians. This diverse demographic data provides a solid foundation for analyzing the respondents' perspectives and behaviors in the context of the study.

Preclinical knowledge of respondents

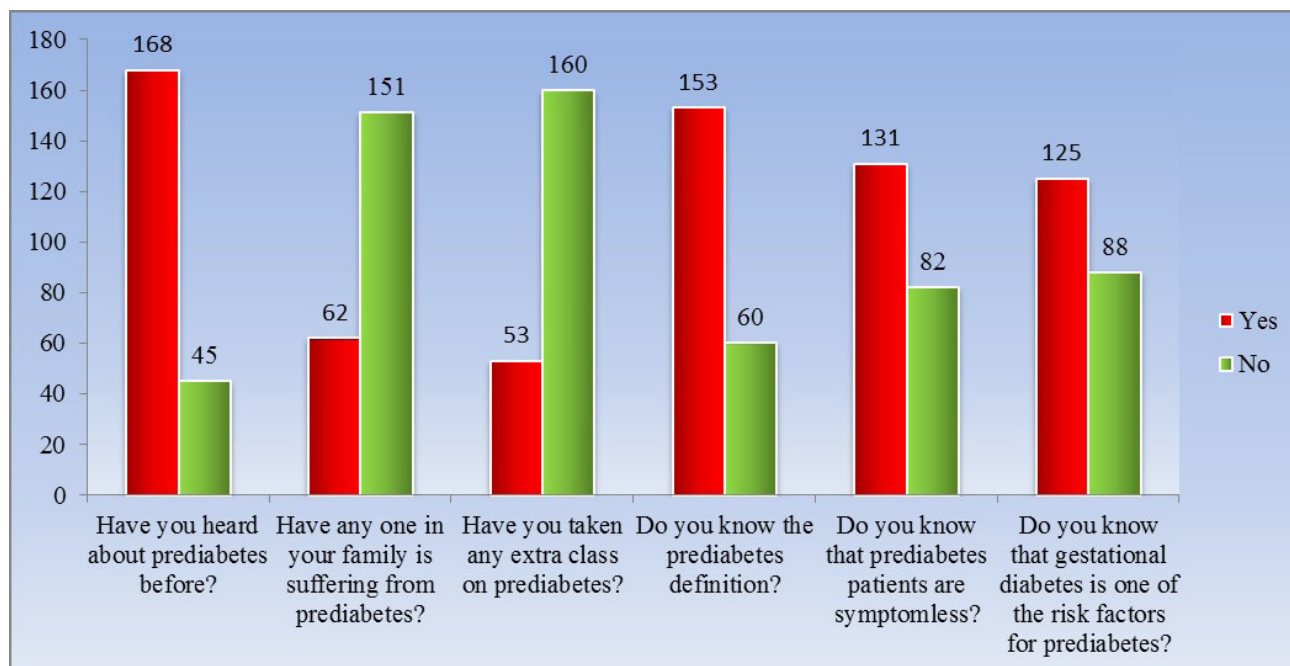


Fig.2. Distribution of respondents according to their answer to the pre-clinical question

A significant proportion of respondents were aware of prediabetes (168 respondents) and its definition (153 respondents). However, only few participants reported having taken extra classes on prediabetes (53 respondents). There is also a gap in understanding that prediabetic patients can be asymptomatic, with only 82 respondents acknowledging this. Awareness of gestational diabetes as a risk factor for prediabetes was moderate (125 respondents).

Clinical knowledge of respondents

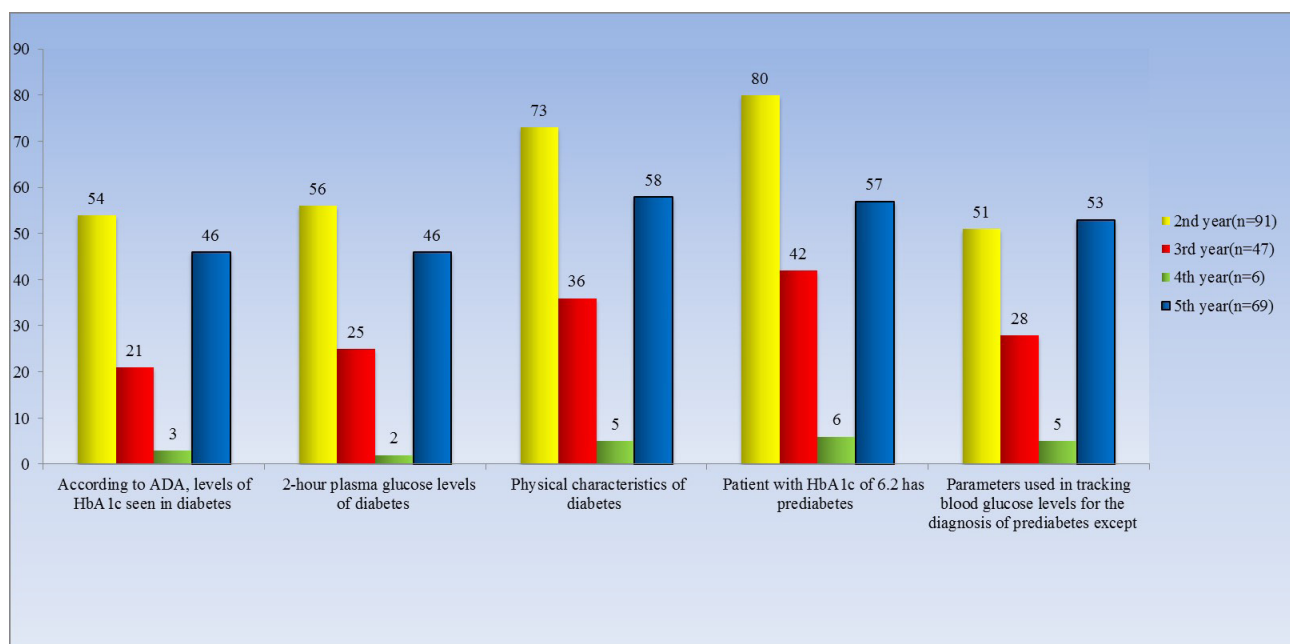


Fig.3.1.a Frequency of Participants Correctly Answering Prediabetes and Diabetes Clinical Knowledge Questions, by year in Medical School

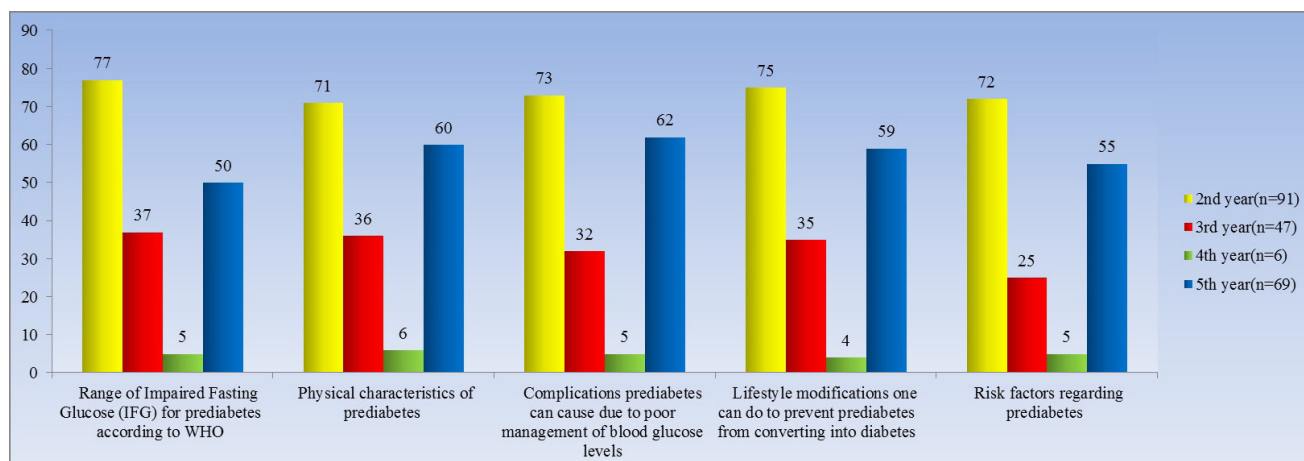


Fig.3.1.b Frequency of Participants Correctly Answering Prediabetes and Diabetes Clinical Knowledge Questions, by year in Medical School

The year-wise analysis of clinical knowledge revealed progressive improvement as students advanced through medical school. Fifth-year students exhibited the highest understanding in most areas, including HbA1c levels for diabetes (66.7%), 2-hour plasma glucose levels (66.7%), physical characteristics of diabetes (84%), and blood glucose tracking parameters (76.8%). They also demonstrated the strongest awareness of prediabetes characteristics (86.9%) and complications of poor management (89.9%). Second-year students showed strong awareness in specific areas, such as HbA1c thresholds for prediabetes (87.9%), impaired fasting glucose (IFG) ranges (84.6%), and risk factors for prediabetes (79.1%). However, they had lower overall knowledge compared to higher years. Third-year students scored lowest in key areas like HbA1c levels (44.7%) and risk factors for prediabetes (53.2%), while the small sample size of fourth-year students (n=6) limited conclusive results for this group. Across all years, knowledge of lifestyle modifications remained consistently high ($\geq 75\%$). These findings highlight the need for targeted interventions to address knowledge gaps, particularly among lower-year students.

Discussion

The current cross-sectional study has found important deficiencies in medical students regarding their knowledge in the screening, diagnosis and treatment of prediabetes. It has come to light that majority of them were following the ADA and WHO guidelines for the same. We have not found statistical significance between students of various academic years regarding their knowledge on prediabetes. Literatures addressing the knowledge and existing practices of physicians regarding the diagnosis, screening and management of prediabetes, both local and international domains. Genetic inheritance, women with positive history of gestational diabetes, sedentary lifestyle and obesity are some of the predisposing factors of prediabetes and an individual is supposed to revert back to normal before it can result in diabetes and its impending complications in the body [10]. Majority of the participants were able to choose sedentary lifestyle and obesity as risk factors. According to ADA, the concern for prediabetes should arise at a BMI of more than 25 kg/m²: with 23kg/m² being the threshold for Asian Americans, correlating with the overweight status [23]. Prediabetes or intermediate hyperglycemia is mostly asymptomatic until diagnosed by laboratory methods. The laboratory parameters used are HbA1C, IFG, IGT and 2hPG. For prediabetes, with HbA1C levels being 5.7 and 6.5%; IFG levels between 110-125 mg/dl and IGT between 140-199

mg/dl [4]. Majority of the participants were able to differentiate between Normoglycemia, intermediate hyperglycemia and diabetes through comparative analysis. In certain cases, prediabetes can be accompanied by symptoms such as blurring of vision, fatigue, increased appetite and delayed healing of cuts and wounds [10]. Complications of prediabetes, due to poor management of blood glucose levels include atherosclerotic changes in blood vessels, decreased nerve conduction velocity due to impaired axon transport, albumin permeability through the glomerular basement membrane and filtration slits due to podocyte injury, aneurysm of retinal vasculature resulting in retinal detachment [1]. Hyperglycemia-related microvascular complications, including retinopathy [21], neuropathy [20] and nephropathy [22], are frequently present among individuals with prediabetes. Students were informed about the complications but not much on its pathophysiology. Early and timely interventions in the management of prediabetes include lifestyle modifications such as a calorie and lipid deficit diet, lean protein and fiber-rich diet, regular exercise, effective weight loss of about 5-10% of body weight and administration of Metformin for patients requiring treatment. Metformin is a cheap and readily available medication which has proven benefit in preventing diabetes in the high-risk group [24]. Metformin is seldom used in daily practice, despite the ADA's recommendation to use it for prediabetes treatment. In 2010–2012, only 3.7% of prediabetes patients with United Healthcare insurance (one the largest private insurers in the United States) were prescribed the medication. In the 2013–2014 NHANES, metformin use among those with self-reported prediabetes was reported in only 8% of US adults [19]. These are the common interventions one can do to prevent or delay the development of prediabetes and its not so anticipated outcome. Regarding lifestyle modifications, majority of the students opted for regular exercise and dietary modifications such as low carb, low lipid diets. There are certain limitations to our study. Our study barely touches upon the perspective of the community because our sample is a representation of the population of medical students of Jalal-Abad University. The lack of information on prediabetes amongst the community is a limitation. Majority of the students when asked about prediabetes, called it "borderline diabetes". They were able to identify the predisposing factors, parametric levels, complications and lifestyle modifications of prediabetes. However, students were not able to identify the one factor that differentiates prediabetes from diabetes. Besides the parametric levels used in diagnosis, the factor which is of paramount importance is that prediabetes can be reversed, is timely and effective intervention in lifestyle are made, whereas diabetes once diagnosed cannot be reversed but only managed.

Conclusion

This study shows that medical students in general, have knowledge on prediabetes, its risk factors and symptoms but there were areas which needed improvement. Many students were familiar with the definition of prediabetes, but only a few had extra education on the concept. Knowledge about risk factors, like gestational diabetes, was moderate, and few students didn't know that prediabetes can be without symptoms. Clinical knowledge improved as students moved through medical school. Older students had a better understanding of key information like diagnostic criteria and complications, while younger students, especially second and third-year students, knew less about these domains.

Recommendation

This study suggests the need for better education, especially for students in earlier years, to ensure all future doctors are well-prepared to manage and prevent prediabetes.

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