

## Knowledge and perceptions about Pre-diabetes amongst doctors, medical students, and patients in a tertiary care hospital of Islamabad

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### Abstract

**Objective:** To explore the knowledge and perceptions about pre-diabetes screening and management amongst physicians, final year medical students and patients.

**Method:** The cross-sectional observational study was conducted at Shifa International Hospital, Shifa Foundation Clinic and Shifa College of Medicine, Islamabad, Pakistan, from November 2017 to February 2018. A structured questionnaire was used to assess doctors' and final year medical students' knowledge about screening and management of pre-diabetes. A group of patients were also interviewed about pre-diabetes awareness and their primary resources for health-related information. Data was analysed using SPSS 23.

**Results:** Of the 267 participants, there were 85(32%) doctors, 82(31%) medical students and 100(37%) patients. Only 61(71.8%), 44(51.7%) and 34(39.8%) physicians and 53(64.6%), 30(36.5%) and 26(31.6%) students could accurately identify impaired fasting blood glucose, glycated haemoglobin and impaired glucose tolerance criteria for pre-diabetes, respectively. Regarding risk factors for pre-diabetes screening, ethnicity, cardiovascular diseases and gestational diabetes were identified by 8(9.4%), 6(7.1%) and 9(10.6%) physicians and 10(12.2%), 6(7.3%) and 15(18.3%) students, respectively. There was no statistically significant relation of correct identification of pre-diabetes criteria with specialties, designations and years of experience post-qualification ( $p > 0.5$ ). Only 3(3%) patients were aware of pre-diabetes or borderline diabetes.

**Conclusion:** Knowledge and perception of doctors, medical students and patients about pre-diabetes was found to be deficient. Efforts are required to reinforce its identification and management at all levels.

**Keywords:** Pre-diabetes, Prevention, Lifestyle, Risk factors. (JPMA 69: 527; 2019)

### Introduction

Pre-diabetes is an asymptomatic condition characterised by blood sugar levels which are above normal but below diabetic ranges. According to American Diabetes Association (ADA), the criteria for the diagnosis of pre-diabetes includes impaired glucose tolerance (IGT) level between 140 and 199mg/dl or impaired fasting glucose (IFG) between 100 and 125 mg/dl or glycated haemoglobin (HbA1c) between 5.7% and 6.4%.<sup>1</sup> According to International Diabetes Federation (IDF), Pakistan stands eighth amongst the top 10 countries with highest IGT prevalence. In 2017, 8.3 million people aged 20-79 years were having IGT and it is expected that the number will increase to 16.7 million in 2045.<sup>2</sup> Timely diagnosis of pre-diabetes is essential, as 70% of pre-

diabetic patients will eventually develop diabetes.<sup>3</sup> This condition is itself linked with early nephropathy, cardiovascular diseases, cardiac autonomic instability and various other disorders.<sup>4-8</sup> Interventions at the level of pre-diabetes are essential, as, if managed timely, they can result in 58% risk reduction for diabetes development.<sup>9,10</sup>

According to ADA, candidates for pre-diabetes screening are similar to those for diabetes. Screening in adults should be considered for individuals of 45 years or above and overweight or obese (body mass index [BMI]  $> 25 \text{ kg/m}^2$  or  $> 23 \text{ kg/m}^2$  in Asian Americans) adults at any age, who have one or more risk factors identified for pre-diabetes.<sup>1</sup> The management of pre-diabetes consists of lifestyle interventions, including behaviour modification and counselling, dietary therapy, moderate physical activity, smoking cessation and psychosocial support. These patients also need the screening and

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treatment for modifiable cardiac risk factors. Studies demonstrate that for pre-diabetic patients, the most significant determinant of risk reduction is weight reduction and 7% weight loss is required in six months to achieve this benefit. So far, metformin is considered the only safe and cost-effective medicine<sup>11</sup> and should be opted for higher risk patients younger than 65 years and who have BMI of more than 35kg/m<sup>2</sup> or increasing HbA1C despite lifestyle modification or women with a history of gestational diabetes mellitus (GDM). These patients should be followed at least every year.<sup>1</sup> Interventions at the level of pre-diabetes have a proven, cost-effective value.<sup>12</sup> However, these benefits can only be achieved if healthcare providers have adequate knowledge and evidence-based information for identification and management of pre-diabetes.<sup>13</sup> Despite extensive research being done internationally, the healthcare system in Pakistan has sadly ignored this critical condition. We do not have much data about pre-diabetes prevalence in Pakistan, although our South Asian ethnicity puts us at a higher risk.<sup>14</sup> It becomes more important when we find sedentary lifestyles, changing dietary patterns and lack of awareness contributing to increasing risk of obesity in our population.<sup>15</sup>

It is crucial to consider the role of preventive medicine because of the massive financial burden posed by chronic diseases such as diabetes for a developing country like Pakistan. Any intervention for pre-diabetes at the level of both the healthcare personnel and community requires an initial assessment to understand the magnitude of the problem. The evaluation of the knowledge and practices of healthcare-related personnel for pre-diabetes and public awareness of pre-diabetes is a logical starting point for this need assessment, before any interventions can be planned at the medical education or community level. The current study, which, to our knowledge, is the first of its kind, was planned to explore the knowledge and perceptions about pre-diabetes screening and management amongst physicians, final year medical students and patients.

## Subjects and Methods

The cross-sectional, observational study was conducted at Shifa International Hospital (SIH), Shifa College of Medicine (SCM) and Shifa Foundation Clinic (SFC), Islamabad, Pakistan, from November 2017 to February

2018, and comprised physicians working in Medicine and allied departments and medical students. Using World Health Organisation (WHO) sample size calculator formula;

$$n = \frac{z_{1-\frac{\alpha}{2}}^2 P (1 - P) N}{d^2 (N - 1) + z_{1-\frac{\alpha}{2}}^2 P (1 - P) N}$$

(n= sample size; d= margin of error; N= population size; and P= anticipated population proportion, which was taken as 0.5 for survey)<sup>16</sup>, and keeping 95% confidence interval (CI) and 6% margin of error, the sample size was calculated.<sup>17</sup> Sample size for patients was not estimated and they were enrolled from Medicine and allied outdoor clinics as representative of the general community irrespective of their illnesses. Approval was taken from the institutional ethics committee. The questionnaire was administered by fourth-year medical students who had been trained regarding pre-diabetes. The survey was administered to all the subjects after briefly explaining the study purpose and taking written consents, through convenience sampling. Among the physicians, there were practising doctors in Internal Medicine and allied departments like Gastroenterology, Neurology, Emergency, Intensive Care Unit (ICU) etc. Those from Diagnostic Imaging and Surgical departments were excluded.

The questionnaire contained questions related to screening, diagnosis, and management of pre-diabetes. The questions were derived from ADA 2017 guidelines for pre-diabetes.<sup>1</sup> The survey for physicians and students were similar, but, for patients, it was modified to exclude technical terms, and translated to Urdu language which is commonly spoken by the community. We piloted the survey with a group of 6 students/physicians for clarity of questions.

The questionnaire for doctors and students obtained information about the designation, specialty and, where applicable, work experience since medical graduation (MBBS). Candidates were asked to give criteria for IFG, HbA1C, and IGT for pre-diabetes diagnosis. Questions regarding screening and management were open-ended, and participants were asked to write what they believed were high-risk factors in candidates for screening and necessary interventions required for pre-diabetes management. We asked about the most important determinant of risk reduction, pharmacotherapy and

time to follow up with these patients. The questionnaire was kept open-ended to encourage spontaneous recall and avoid bias from prompts such as a list of options for risk factors.

We asked patients about their awareness regarding pre-diabetes; its screening, health risks and complications. We also questioned them about their literacy status and the main source of information for health-related issues.

Data was analysed using SPSS 23 and frequencies and percentages were calculated. Binary logistic regression was performed to ascertain the effects of specialties, designations and years of experience post-MBBS on the likelihood of correct answers for impaired fasting glucose (IFG), HbA1C, and IGT.

## Results

The questionnaire was administered to 100 physicians, 100 medical students and 100 patients. The questionnaire was completed and returned by 85(85%) doctors, 82(82%) students and 100(100%) patients. The mean age for students was  $23.4 \pm 0.60$  years; 43(52.4%) were males; and 39(47.6%) were females. Overall, 54(65.9%) students were following ADA guidelines.

The mean age of physicians was  $27.8 \pm 5.1$  years; 46(54.1%) were males; and 39(45.9%) were females. Their mean work experience post-MBBS was  $3.9 \pm 4.1$  years, and 56 (65.9%) were following ADA guidelines.

Amongst the physicians, there were 31(36.5%) house officers, 37(43.5%) fellowship trainees of Medicine and allied departments, and 4(4.7%) medical officers. There were 13(15.3%) fellows, consultants, and specialists. Besides, 59(69.4%) participants belonged to Internal Medicine whereas 26(30.6 %) belonged to allied departments.

Physicians and students' responses about pre-diabetes diagnostic criteria were noted and only 4(4.7%) participants explicitly mentioned that the screening should start at BMI of 25 kg/m<sup>2</sup> (Tables 1-2).

Their responses to queries related to pre-diabetes management were also noted, showing 36(43.9%) students and 38(44.7%) physicians were unaware of indications for metformin use in pre-diabetic patients (Table 3).

Application of Binary Logistic Regression analysis did not show any statistically significant relation of correct

identification of IFG, HbA1C and IGT with specialties, designations and years of experience post-MBBS ( $p > 0.5$ ).

The mean age of patients was  $43 \pm 15.9$  years; 53(53%) were males; and 47(47%) were females. Overall, 54(54%) patients were from SIH, and 46 (46%) were from SFC. Of them, 53(53%) patients had studied up to more than 12 years of formal education, while 8(8%) were uneducated. Patients were relying more on television 21(21%) and doctors 23(23%) for health-related information. Only 3(3%) patients were aware of pre-diabetes or borderline diabetes.

**Table-1:** Responses for criteria for pre-diabetes screening.

Criteria for pre-diabetes Screening	Physicians n=85 (%)		
	PG Trainees n=72 (84.7 %)	Fellows, Consultants, Specialists n=13 (15.2%)	Students n= 82 (%)
<b>IFG (mg/dl)</b>			
100-125	48 (56.6%)	13 (15.2%)	53 (64.6%)
< 100	10 (11.7 %)	0	16 (19.5%)
> 125	9 (10.53%)	0	5 (6.09%)
Don't Know	5 (5.85%)	0	8 (9.7%)
<b>HbA1C (%)</b>			
5.7 to 6.4	34 (40%)	10 (11.7%)	30 (36.5%)
<5.7	13 (15.2%)	2 (2.3%)	22 (26.8%)
>6.4	15 (17.55%)	0	10 (12.1%)
Don't Know	10 (11.7%)	1 (1.17%)	20 (24.3%)
<b>IGT (mg/dl)</b>			
140 to 199	27 (31.6%)	7 (8.2%)	26 (31.6%)
< 140	10 (11.7%)	2 (2.3%)	11 (13.4%)
>199	9 (10.5%)	0	10 (12.1%)
Don't Know	26 (30.4%)	4 (4.7%)	35 (42.6%)

PG: Post-graduate, IFG: Impaired fasting glucose, HbA1c: Glycated haemoglobin, IGT: Impaired glucose tolerance.

**Table-2:** Responses to risk factors for pre-diabetes screening.

Risk factors	Physicians * n=85 (%)	Students n=82 (%)
Age > 45 years	28 (32.9%)	37 (45%)
BMI >25kg/m <sup>2</sup> / Obesity	60 (70.6%)	66 (80.5%)
Family history	50(58.8%)	55 (67.1%)
History of GDM	9(10.6%)	15 (18.3%)
Hypertension	26 (30.6%)	41 (50%)
Dyslipidaemia	21 (24.7%)	30 (36.6%)
History of CVD	6 (7.1%)	6 (7.3%)
High risk ethnicity	8 (9.4%)	10 (12.2%)
Sedentary life style	32 (37.6%)	38 (46.3%)
Others (PCOD, Medicines etc.)	13 (15.3%)	21 (25.6%)

\*Combined PG trainees, Fellows, Consultants and Specialists., BMI: Body mass index, GDM: Gestational diabetes mellitus, CVD: Cardiovascular disease, PCOD: Polycystic ovarian disease

**Table-3:** Responses for pre-diabetes management.

<b>Listed Interventions required for Pre-diabetes management</b>						
	Life style	Physical activity	Dietary therapy	Smoking cessation	Behaviour modification	Screen and modify CVD risks
Student	41 (50%)	50 (61%)	50 (61%)	11 (13.4%)	4 (4.9%)	0 (0%)
Physicians*	46 (54.1%)	46 (54.1%)	49(57.6%)	10 (11.8%)	1(1.2%)	0 (0%)
<b>Identified Weight reduction is the biggest determinant of risk reduction for progression to diabetes.</b>						
Student	49 (59.8%)					
Physicians*	48 (56.5%)					
<b>Identified Weight reduction required in first 6 months to achieve risk reduction</b>						
Student	40 (48.8%)					
Physicians*	35 (41.2%)					
<b>Identified Metformin as the first line pharmacotherapy for Pre-diabetes</b>						
Student	61 (74.4%)					
Physicians*	59 (69.4%)					
<b>Identified patients who qualify for metformin</b>						
	< 60 years	BMI > 35 kg/m <sup>2</sup> (Increased BMI/Obesity)	Women with prior gestational diabetes	Increasing HbA1c despite life style modification		
Student	5 (6.1%)	37 (45.1%)	3 (3.7%)	14 (17.1%)		
Physicians*	0 (0%)	31 (36.5%)	0 (0%)	30 (35.3%)		
<b>Listed follow-up visits of patients with Pre-diabetes</b>						
	< 1 year	1 year				
Student	39 (47.6%)	23 (28%)				
Physicians*	48 (56.5%)	18 (21.2%)				

Physicians\* n=85 (%), students n=82 (%), \*Combined PG Trainees, Fellows, Consultants and Specialists.

## Discussion

The current study found important deficiencies in medical students as well as in physicians at various stages of their profession regarding knowledge for screening, diagnosing and management of pre-diabetes. Although the majority of students and physicians were following the ADA guidelines for diabetes,<sup>1</sup> there were significant gaps in knowledge of evidence-based recommendations for most aspects of pre-diabetes. We did not find any statistical significance between students, postgraduate trainees and practising physicians regarding their knowledge of pre-diabetes screening. The over- and under-estimation of values for pre-diabetes detection seen in the study may have its own implications and should be explored. We did not find any local literature addressing knowledge and existing practices of physicians regarding diagnosis, screening and management of pre-diabetes, and even international research on this subject is limited.<sup>13,18</sup> Interventions for addressing this deficiency will be needed at multiple levels including undergraduate curriculum and continuous medical education for physicians to reinforce the practical consequences of the ADA pre-diabetes recommendations.

Students were generally better informed about risks

factors for pre-diabetes screening. Majority of the participants mentioned obesity as a risk factor for screening. According to ADA, the concern for pre-diabetes should arise at BMI of more than 25kg/m<sup>2</sup> and even at 23kg/m<sup>2</sup> for Asian Americans,<sup>1</sup> which correlates with overweight status. Regarding other risk factors, very few participants gave importance to ethnicity as a risk factor for pre-diabetes. Pakistan has great diversity of different ethnic groups, however, unfortunately we are ignorant of health risks associated with them due to the scarcity of local studies focusing on ethnicity. Similarly, most of the participants failed to identify cardiovascular diseases (CVD) as risk factors for pre-diabetes screening and, likewise, no one considered interventions related to CVD as a part of management of pre-diabetes.<sup>5,6</sup> This is of significant concern if we consider the burden of CVD in our population, which puts them at risk for developing diabetes. Identification at the pre-diabetes stage may delay and even prevent the onset of diabetes and associated microvascular complications in such patients. A study from Karachi also demonstrated that our patients with pre-diabetes had the higher frequency of cardiovascular risk factors.<sup>19</sup> Women with history of gestational diabetes are more prone to develop diabetes,<sup>20</sup>

hence they are important candidates for lifestyle modification and metformin use, but our participants had poor knowledge regarding this risk factor.

The two major aspects of management of pre-diabetes -- effective weight loss and timely prescription of metformin for patients who qualify for treatment - were noted correctly by about half of the study participants. According to ADA, supporting pre-diabetes patients for successful behavioural change and a healthy lifestyle is as important as in diabetes. Interventions at the level of pre-diabetes require lifestyle modification, which includes dietary changes and exercise.<sup>21</sup> However, even for participants who were knowledgeable, we cannot be sure if this knowledge translates to practical application of evidence-based recommendations about exercise protocols and diet planning as most were unaware of internationally recommended standards for weight reduction to achieve risk reduction. There is literature supporting the effectiveness of formal behavioural weight-loss programmes in preventing and delaying the onset of diabetes.<sup>22</sup> Unfortunately, these are almost non-existent in Pakistan which puts an added burden on individual healthcare providers to be the primary source of information, guidance and support for patients for weight reduction and underscores the need for educating healthcare providers concerning management options for pre-diabetes.

The ADA guidelines added recommendation for metformin use in 2007.<sup>9</sup> Only about a third of the participants knew the ADA directions for starting metformin, and even their knowledge was incomplete. Metformin is a cheap and readily available medication which has proven benefit in preventing diabetes in the high-risk group.<sup>9</sup> It may be useful to look at and address barriers to prescribing metformin, one of which is incomplete knowledge of evidence-based ADA guidelines to prevent diabetes as shown in our study. Future studies need to look at other obstacles such as clinician bias and scepticism of guidelines and unwillingness to change past practices to get a better understanding and plan interventions for pre-diabetes.

Our study barely touches upon the perspective of the community because our sample is probably the only representative of the population residing in and around Islamabad, which is one of the better-provided areas of Pakistan. As high as 97% of our patients had never heard of the term "pre-diabetes". They were unaware that a

condition exists between being diabetic and a normal healthy individual, and, if dealt properly, one can prevent or delay diabetes. More than 50% of our patients were well educated being graduate or post-graduate, but this unfamiliarity while residing in the developed city of Islamabad and periphery is alarming. According to an interviewer statement, "We had difficulty in explaining the concepts of pre-diabetes to the patients, even belonging to educated class and more so to those belonging to lower socioeconomic status." Majority of patients were relying on TV and doctors for health-related information, which dictates the importance of media and doctors for health awareness.<sup>23</sup> To date, there is no serious governmental efforts or any public or private partnering to address the rising incidence of diabetes in Pakistan.

There are several limitations to our study. The survey was conducted with students and physicians belonging to a single private academic medical institution, where healthcare providers are practising in a tertiary care setting, so the findings may not be generalisable. The real primary care setting, where general practitioners are the main healthcare providers for the community, would provide more representative data. Furthermore, the small number of patients surveyed only gives us a glimpse of the enormity of the problem. Our strengths include the high response rate for all categories of respondents and a comprehensive survey addressing all aspects related to ADA guidelines on pre-diabetes. Additionally, the open-ended questions without prompts allowed for more spontaneous responses. The lack of studies on knowledge of healthcare providers about pre-diabetes also adds strength to our findings.

## Conclusion

Risk stratification and intervention at pre-diabetes stage are of crucial importance for preventing diabetes. Increasing awareness of public regarding pre-diabetes screening and educating healthcare providers on screening guidelines, diagnostic criteria and management options for pre-diabetes can bring us one step closer to checking the diabetes epidemic in Pakistan.

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