

# Assessment of Pharmacy Students Knowledge Regarding Diabetes Mellitus and its Prevention

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## ABSTRACT

**Objectives:** The aim of this study is to assess the knowledge of Pharmacy students about diabetes mellitus and its prevention and to identify the factors that affect the disease. **Methods:** A pre-tested questionnaire assessing the knowledge of diabetes mellitus was administered to the students of MM College of Pharmacy to investigate the general understanding of diabetes mellitus. The questions were planned so as to be answered through a Likert type three grade scale. Data was collected and analysed by different statistical methods. **Results:** Data of 330 students of Pharmacy College (112 females and 228 males) were included in this study. Almost all of them (100%) described diabetes as a high blood sugar, about 72% of the students identified frequent hunger 72%, frequent thirst 70% and 68% identified poor wound healing as the main symptoms of the disease. 52% of students reported that they have a family history of diabetes. 76% of students evaluated that high blood pressure, 72% said kidney problem etc, are the complications associated with diabetes. 251 students marked HbA<sub>1c</sub> as a test to check diabetes mellitus. 211 (64%) students think that cure of diabetes is possible.

No significant differences were observed in the health behaviour of participants with or without a family history of DM. **Conclusion:** It was found that students had an adequate knowledge and attitudes about diabetes mellitus. However, there is a need for further enhancement in knowledge and attitudes about diabetes mellitus prevention strategies and complications.

**Key words:** Diabetes mellitus, Knowledge, Pharmacy students, Prevention, Treatment.

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## INTRODUCTION

Diabetes has become a global pandemic and threat for world health due to demographic variations and cultural differences of societies supplemented by aging phenomena.<sup>1</sup> The youth are the future of a country and are considered dynamic human capital that plays a vital role in nation-building. If students adopt sedentary lifestyles and are inclined to fast food and irregular eating habits, then there is a lot of probability of suffering from being overweight, obese and, consequently, type 2 diabetes mellitus (T2DM) at a young age. The incidence of T2DM has tremendously increased globally in the last 20-30 years. It is basically due to changes in people's lifestyle by introducing fast foods, carbonated and energy drinks and reduced energy expenditure by manual hard work or regular exercise.<sup>2</sup>

There are estimated 72.96 million cases of diabetes in adult population of India. Global health organization has declared India as the "Diabetic Capital". The prevalence in urban areas ranges between 10.9% and 14.2%, whereas, prevalence in rural areas was 3.0-7.8% among population aged 20 years and above with a much higher prevalence among individuals aged over 50 years.<sup>3</sup>

Diabetes mellitus is an endocrinological and metabolic disorder with an increasing global prevalence and incidence.<sup>4</sup> High blood glucose levels are symptomatic of diabetes mellitus as consequences of inadequate pancreatic insulin secretion or poor insulin-directed mobilization of glucose by target cells.<sup>5</sup>

Diabetes exposes people to both physical (cardiovascular diseases, neuropathy, diabetic foot, stroke, etc.) and psychological complications (depression and emotional distress); it also has a direct impact on several social aspects and, more generally, on daily life (due to glycaemic control and changes in dietary habits and in lifestyle).<sup>6</sup>

The impact of the disease and of treatment on all chronic patients' quality of life (QOL) and lifestyle is a key concern for both the patients themselves and their physicians.<sup>7</sup>

Diabetes education is an essential component of diabetes management and its importance has been emphasized in various guidelines. Knowledge regarding the disease is essential to manage it appropriately. Several studies have document knowledge about diabetes mellitus DM.<sup>8,9</sup>

Accordingly, it is essential that the knowledge gain by people will definitely helpful for them as well as for the society. Properly knowledgeable empowered young people can help in decreasing severe complications and unnecessary disabilities resulting from diabetes; provide assist and encouragement for human beings dwelling with diabetes. Students need to have up-to-date and evidence-based knowledge about diabetes mellitus. In addition, the students need to understand the complication of diabetes, risk factors and consequences resulting from defect in management and lack of early detection of diabetes. Therefore, the current study aimed to assess the knowledge and attitudes of pharmacy students regarding DM among pharmacy students. The study result may

help academicians to understand pharmacy student's strength and weaknesses and draw a road map for improvement<sup>10</sup>.

## MATERIALS AND METHODS

### Study Design

A cross sectional observational study was conducted using a pre-tested, self-administered, structured questionnaire on 330 students for 6 months from October 2020 to April 2021, to assess the knowledge of Pharmacy students regarding diabetes mellitus and, its prevention. The protocol of the study was approved by Institutional Ethics Committee (IEC) at Maharishi Markandeshwar Institute of Medical Sciences and Research (MMIMSR), Mullana having ethical clearance number: 1875.

Students who were willing to complete the questionnaire were selected on the basis of inclusion and exclusion criteria. Explanations were given about the objectives of the study and how to complete the questionnaire. Participation was anonymous and voluntary, and verbal consent was acquired from each participant. All the study participants were assured full confidentiality of the data collected. The validity of the questionnaire's content was tested through a review process with professors in the subject and Health care professionals of Medicine department. The statements in the questionnaire were assessed by the panel to ensure that they covered the study's objectives.

A questionnaire was specially designed which was used to evaluate socio-demographic data (age, gender, course), knowledge assessment, reducing risk, general knowledge, prevention etc. The participants were required to answer the questionnaire using 'Yes', 'No', or 'Don't Know'. The questionnaire was divided into the following seven sections: 1) socio-demographic characteristics—including age, sex, age, and education level; 2) students' medical history—including a personal and family history of DM. 3) knowledge of DM—symptoms, complications, including reducing risk factors; 4) Preventions and treatment. Finally, the results were analysed using descriptive statistical methods and reported to concerned departments.

**Study site:** The study was carried out in M. M. College of Pharmacy of Maharishi Markandeshwar (Deemed to be University), Mullana, Ambala, Haryana.

**Inclusion criteria:** Students of age group 19-25 years of M M. College of Pharmacy and students willing to participate are included in the study.

**Exclusion criteria:** Students above 25 years of age and of medical background students. Also, the students who are not willing to participate.

### Statistical Analysis

Descriptive statistics were applied using Microsoft Excel. Data were analyzed using descriptive statistics. Continuous variables were expressed as mean with standard deviation (SD).

## RESULTS

### Demographic Characteristics

The participants of this study were surveyed for age, gender, and educational level. A total of 330 students completed questionnaires. Table 1 shows that the majority of the sample was male (N=218, 66%), and regarding the age group of the participants, 70% (N= 231, of age criteria 19-22 old), and 30% participants were of age group 23-25 years (N=99). Additionally, 50% (N= 166) of the participants were students of B. Pharmacy, while 6% (N=23) were students of M. Pharm and rest were the students of Pharm. D which were approx. 44% (N= 141). The data regarding the Demographic Characters are shown in Table 1

On assessing the knowledge of participants 52% students responded that they have family history of diabetes mellitus while 44% disagreed with

**Table 1: Demographic characteristics of the sample.**

		Frequency	Percentage
Sex	Male	218	66%
	Female	112	34%
Age	19-22	231	70%
	23-25	99	30%
Education Level	B. Pharm	166	50%
	M. Pharm	23	6%
	Pharm. D	141	44%

\*The majority of the sample was male (N=218)

it. Approximately, 266 of the sample sizes responded that there is need of regular check-up for the diabetes patients. Table 2 show participants' general knowledge of DM, including Symptoms, Complication and Diagnosis.

Different sign and symptoms are associated with diabetes mellitus, responses are recorded as increased thirst (70%), weight gain (68%), weight loss (57%), increased hunger (72%) and SD value is 24. Different complications are being associated with diabetes such as high blood pressure, kidney problem, and thyroid problem etc.<sup>11,12</sup> Students responded 76% for high blood pressure, and 38% responses were recorded for asthma as a complication. Diabetes patient usually suffer from allergic reactions SD value was found to be 5.

Diabetes causes many risk problems to the human being, such as, vision problem, scaly patches on skin etc. to reduce this risk different test can be performed to check the blood sugar level, i.e. FBS, RBS, HbA<sub>1c</sub> etc. on questioning regarding this test, 76 % students agreed for HbA<sub>1c</sub>, while 14% disagreed, whereas, out of 330 students, only 205 students think that blood test is the only test to evaluate the increased or decreased blood sugar level. Only 183 students think that blood and urine testing are equally good for the testing of blood sugar level.<sup>13</sup>

Diabetes causes long term effect on different body organs. Knowledge Assessment of Pharmacy students related to DM is given in Table 3 was done on the basis of different questions regarding different types of diabetes, long term effect of diabetes on organs, healing time of diabetes etc. the mean was found to be 33 while SD was found to be 18 ranging from 12-22.<sup>12</sup>

Different factors affect the onset of diabetes mellitus in the population, such as, obesity, heredity, smoking, alcohol intake etc. on questioning about the different factors affecting the diabetes mellitus, out of 330 students 78% students responded agreed for nutrition deficiency factor.<sup>11,14</sup> According to student's knowledge about diabetes mellitus 75% and 82 % students think that smoking and alcohol consumption are major factor affecting the diabetes mellitus onset. Population suffering from high blood pressure are more prone to cause diabetes mellitus; approx. 75% students agreed that high blood pressure can lead to diabetes mellitus while 19% students disagreed, Knowledge of factors affecting DM among Pharmacy students is shown in Table 4.

Different ways to reduce blood glucose level are by walking, jogging, swimming, aerobic dance and weight lifting. On questioning students related to reducing glucose level 57% responded that walking help in reducing glucose level, 43% think that jogging reduces, 31% responded for swimming. Health experts say running can be particularly beneficial for controlling diabetes as well as reducing the risk of developing the condition in the first place<sup>15</sup>. Knowledge of Prevention and Treatment of DM among Pharmacy students is shown in Table 5. There are different ways to cure diabetes either by taking insulin injection subcutaneously

**Table 2: General Knowledge of Diabetes mellitus, Symptoms, Complication and Diagnosis of Pharmacy students.**

Knowledge of Symptoms, Complication and Diagnosis of Diabetes mellitus (N)						
Questions	N	Level of agreement in N {%}			MEAN	SD
		YES	NO	DON'T KNOW		
<b>What are the Symptoms of Diabetes mellitus</b>						
Increased thirst	330	230 (70%)	68 (20%)	32 (10%)	33	23
Weight gain	330	222 (68%)	65 (19%)	43 (13%)	33	21
Weight loss	330	189 (57%)	94 (28%)	47 (15%)	33	15
Increased hunger	330	238 (72%)	62 (19%)	30 (9%)	33	24
Is wound healing will be delayed in diabetes?	330	225 (68%)	64 (20%)	39 (12%)	33	22
Is infections are super added in diabetes?	330	182 (55%)	90 (27%)	58 (18%)	33	14
Should diabetes patient have received diet counselling?	330	216 (66%)	67 (20%)	47 (14%)	33	20
<b>Knowledge of Complication of Diabetes mellitus</b>						
High blood pressure	330	250 (76%)	60 (18%)	20 (6%)	33	26
Kidney problem	330	238 (72%)	56 (17%)	36 (11%)	33	24
Thyroid problem	330	180 (55%)	89 (27%)	61 (18%)	33	13
Vision problem	330	197 (60%)	91 (27%)	42 (13%)	33	17
Asthma	330	126 (38%)	126 (38%)	78 (24%)	33	6
Cardiac problem	330	197 (60%)	81 (25%)	52 (16%)	33	16
Obesity	330	240 (73%)	74 (22%)	16 (5%)	33	25
Allergic reaction	330	136 (42%)	103 (31%)	91 (28%)	33	5
Eye check up	330	201 (61%)	89 (27%)	40 (12%)	33	18
Scaly patches	330	172 (52%)	98 (29%)	60 (18%)	33	12
Gum problem	330	139 (42%)	99 (30%)	92 (28%)	33	6
<b>Knowledge of Diagnosis of Diabetes mellitus</b>						
<b>What are types of tests done to check blood glucose level?</b>						
HbA <sub>1c</sub>	330	251 (76%)	47 (14%)	32 (10%)	33	26
FBS	330	232 (71%)	64 (19%)	34 (10%)	33	23
RBS	330	229 (70%)	62 (18%)	39 (12%)	33	22
RFT	330	173 (52%)	111 (34%)	46 (14%)	33	14
LFT	330	165 (50%)	108 (32%)	57 (17%)	33	12
<b>Which best method is used to test blood glucose?</b>						
Urine testing	330	172 (52%)	91 (27%)	67 (20%)	33	12
Blood testing	330	205 (62%)	75 (22%)	50 (15%)	33	18
Both are equally good	330	183 (55%)	78 (24%)	69 (21%)	33	14

\*In the given Table the no of participants(N) showing General Knowledge of Diabetes Mellitus, Symptoms, Complication and Diagnosis of Pharmacy students

or by taking medication or by administering both.<sup>16</sup> In our study 68% participants recorded that insulin is the form to treat diabetes. Different medications are being prescribed to treat DM such as, metformin, Glimepiride, Glipizide etc. On surveying about medication 85% response were recorded for metformin, 78% for Glimepiride, 70% for Glipizide and 45% was reported for both fluconazole and rabeprazole as a treatment for diabetes mellitus.

## DISCUSSION

This study explores the knowledge of pharmacy students in Tertiary education about DM and its prevention. The prevalence of diabetes mellitus has been increasing even in younger ages, including children and teenagers. By increasing physical activities, changing diet and

improving lifestyle approximately, 80% of diabetes mellitus type 2 cases can be prevented.<sup>17</sup>

Based on the above result, it seems that students' education is satisfactory in terms of knowledge and prevention of diabetes mellitus.

It is important to gather information about the knowledge, attitudes and practices of people with diabetes to develop effective health education and diabetes control awareness programs. We surveyed the students to assess their knowledge about diabetes mellitus and its prevention. A questionnaire was prepared with total 36 questions, which was further divided in different sections. Table 1 represents total of 330 students of M M College of Pharmacy (66% male and 34% female) with age group 19-22 (70%) while rest 30% were from age group 23-25 years were included in final analysis.

**Table 3: Knowledge Assessment of Pharmacy students related to Diabetes mellitus.**

Knowledge variable Questions	N	Level of agreement in N [%]			MEAN	SD
		YES	NO	DON'T KNOW		
Caloric intake increase the predisposition for diabetes?	330	202 (62%)	82 (25%)	46 (14%)	33	18
Is diabetes be cured with diet, exercise and medication?	330	211 (64%)	95 (29%)	24 (7%)	33	20
Is prediabetic as reversible?	330	194 (59%)	73 (22%)	63 (19%)	33	16
<b>Knowledge of Long-term damage of Diabetes mellitus</b>						
Liver	330	190 (58%)	84 (25%)	56 (17%)	33	15
Kidney	330	237 (72%)	52 (15%)	41 (12%)	33	24
Heart	330	217 (66%)	74 (22%)	39 (12%)	33	20
Eyes	330	207 (63%)	87 (26%)	36 (11%)	33	19
Nerves	330	189 (58%)	81 (24%)	60 (18%)	33	15
Gestational diabetes	330	221 (67%)	67 (20%)	42 (13%)	33	21
Slow healing	330	228 (69%)	65 (19%)	37 (11%)	33	22
Onset of new diabetes	330	181 (55%)	100 (30%)	49 (15%)	33	14
Transmissible disease	330	110 (33%)	189 (57%)	31 (9%)	33	17
Exercise regularly	330	210 (64%)	102 (31%)	18 (5%)	33	21
Rise of infection	330	222 (68%)	73 (22%)	35 (11%)	33	21
<b>Measurement of Insulin and ranges of Blood sugar level</b>						
Units	330	249 (76%)	49 (15%)	32 (10%)	33	26
MI	330	152 (46%)	108 (32%)	70 (21%)	33	9
DI	330	140 (42%)	105 (32%)	85 (26%)	33	6
RBS normal range	330	171 (52%)	80 (24%)	80 (24%)	33	12
FBS normal range	330	149 (45%)	108 (32%)	73 ((22%)	33	8
HbA <sub>1c</sub> normal range	330	15 (5%)	163 (49%)	152 (46%)	33	18

\*Knowledge of Long-term damage of DM and Insulin Dose and ranges of Blood sugar level are shown in given Table

**Table 4: Knowledge of factors affecting Diabetes mellitus among Pharmacy students.**

Factors	Yes (%)	No (%)	Don't know (%)
Nutrition	78	14	8
Smoking	75	18	7
Alcohol	82	13	5
Obesity	85	12	3
Heredity	68	21	11
High blood pressure	75	19	6
Lack of physical exercise	79	17	4
Cholesterol level	74	22	4

\*In the given table the result has been shown in percentage (%) of participants

Knowledge assessment is an important criterion to evaluate the knowledge of the students. The mean barrier score was found to be 33%. Out of 330 students, 266 students evaluate that there is need for regular check-up for diabetes patient. Some people experience weight change when they suffer from DM, i.e. weight gain or weight loss. 68% of the sample size reported that DM leads to weight gain instead 19% did not agreed, while 57% of students think that diabetes leads to weight loss. SD value is calculated to be 15.

The sign and symptoms of diabetes are disregarded by many people because of the chronic progression of the disease as discussed in Table 2.

People do not consider this as a serious problem because unlike many other diseases the consequences of hyperglycaemia are not manifested immediately. Several questions were asked about the symptoms related to diabetes mellitus; approx. 70% students think they have knowledge about different symptoms occurring in diabetes.<sup>18</sup>

Diabetes may lead to microvascular and macrovascular complications associated with it which can cause long term effect on human body, such as, high blood pressure, kidney problem, thyroid problem, asthma etc. In Table 2 mean was calculated to be 33% {SD= 26%} for the variable high blood pressure. Out of 330 students, 136 students agreed that diabetes has a risk of allergic reaction.

Diabetes causes many risk problems to the human being, such as, vision problem, scaly patches on skin etc. To reduce this risk about DM, different test can be performed to check the blood sugar level, i.e. FBS, RBS, HbA<sub>1c</sub> etc., on questioning regarding this test, 76 % students agreed for HbA<sub>1c</sub>, while 14% disagreed, SD value found out for FBS is 23 and for RBS is 22 (mean=33), whereas, out of 330 students, only 205 students think that blood test is the only test to evaluate the increased or decreased blood sugar level. Only 183 students think that blood and urine testing are equally good for the testing of blood sugar level.<sup>19</sup>

Patients with DM2 generally are put on a 1500 to 1800 calorie diet per day to promote weight loss and then the maintenance of ideal body weight. However; this may vary depending on the person's age, sex, activity level, current weight and body style. On examination of the knowledge of students SD value was found to be 18. Diabetes is not completely curable, but it can be treated by taking medications, doing physical activities etc. 64% students assessed their knowledge as diabetes is cur-



**Table 5: Knowledge of Prevention and Treatment of Diabetes mellitus among Pharmacy students.**

Knowledge variable	N	Level of agreement in N {%			Mean	SD
Questions		Yes	No	Don't know		
<b>Which Food that make high blood sugar?</b>						
Nuts	330	207 (63%)	87 (26%)	36 (11%)	33	19
Water	330	198 (60%)	58 (30%)	34 (10%)	33	18
Pizza	330	220 (67%)	74 (22%)	36 (11%)	33	21
Cereal	330	188 (57%)	66 (20%)	76 (23%)	33	15
<b>Which Exercise that decrease glucose level?</b>						
Walking	330	186 (57%)	144 (43%)	0	33	21
Jogging	330	143 (43 %)	187 (57%)	0	33	21
Swimming	330	102 (31%)	228 (69%)	0	33	24
Aerobic dance	330	143 (44%)	187 (56%)	0	33	21
Weight lifting	330	103 (31%)	227 (69%)	0	33	14
Need of insulin	330	181 (55%)	138 (42%)	12 (3%)	33	19
Insulin form	330	223 (68%)	82 (25%)	25 (8%)	33	22
Medicines-						
Metformin	330	278 (85%)	40 (12%)	12 (4%)	33	31
Glimepiride	330	256 (78%)	52 (16%)	22 (7%)	33	27
Glipizide	330	232 (70%)	55 (17%)	43 (13%)	33	23
Fluconazole	330	148 (45%)	128 (38%)	54 (16%)	33	11
Rabeprazole	330	147 (45%)	126 (38%)	58 (18%)	33	10
<b>What is route of administration of insulin ?</b>						
IV	330	206 (63%)	86 (26%)	38 (12%)	33	19
IM	330	176 (53%)	108 (33%)	46 (14%)	33	14
SC	330	232 (70%)	47 (14%)	51 (15%)	33	23
Oral	330	162 (49%)	83 (25%)	85 (26%)	33	10

\*In the given table percentage of students have given response in Yes, No and Don't Know about Knowledge of Prevention and Treatment of DM

able, and 7% evaluated as “no” diabetes is not curable. The knowledge of students was checked on the basis of different questions as shown in Table 4, regarding different types of diabetes, long term effect of diabetes on organs, healing time of diabetes etc. the mean was found to be 33 while SD was found to be 18 ranging from 12-22.” Abrasions and wounds in diabetic patients heal slowly”, in which 69% of the sample responded correctly. Recognition of risk factors for diabetes mellitus is vital for primary and secondary disease prevention. Obesity is the most well-known risk factor in the sample (85% of the sample reported yes).<sup>20</sup> Obesity and physical inactivity are both independent risk factors for DM2. Therefore, physical activity plays an important role in diabetes mellitus. SD value was analysed to be 28 (mean=33).

There are different ways to cure diabetes either by taking insulin injection subcutaneously or by taking medication or by administering both. In our study 68% participants recorded that insulin is the form to treat diabetes. Different medications are being prescribed to treat DM such as, metformin, Glimepiride, Glipizide etc. On surveying about medication 85% response were recorded for metformin, 78% for Glimepiride, 70% for Glipizide and 45% was reported for both fluconazole and rabeprazole as a treatment for diabetes mellitus.

Different ways to reduce blood glucose level are by walking, jogging, swimming, aerobic dance and weight lifting. On questioning students related to reducing glucose level 57% responded that walking help in reducing glucose level, 43% think that jogging reduces, 31% responded

for swimming. Health experts say running can be particularly beneficial for controlling diabetes as well as reducing the risk of developing the condition in the first place.

An important limitation in this research is that the sample is small (330students). Another limitation is the use of self-reported data and the assumption that participants responded honestly and accurately. In our study, which shows that more than 75% of the students had good knowledge about DM, and more efforts should be made to increase it, as students don't actively seek out this information themselves.

## CONCLUSION

In conclusion, it was found that knowledge towards diabetes mellitus was positive. A right approach to diabetes can reduce morbidity, mortality and the burden of costs among diabetics, it is important to gather information about the knowledge, attitudes and practices of people with diabetes to develop effective health education and diabetes control awareness programs; during survey it was found that students lack knowledge about complications and how to prevent diabetes mellitus. Approximately half of the participants reported that diabetes as curable and a transmissible disease, which is incorrect statement, diabetes is not transmissible. For this reason, it would be beneficial the educational system to focus not only on educational methods and knowledge transfer processes, but also on methods of awareness, interaction and experiential approach to health issues. The findings of our study highlight the need

to create awareness amongst students to learn about diseases. However, there is need for enhancement in knowledge and attitude about diabetes and its prevention.

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## CONFLICT OF INTEREST

The authors declare no Conflict of interest

## ABBREVIATIONS

**DM:** Diabetes Mellitus; **T2DM:** Type-2 Diabetes Mellitus; **FBS:** Fasting Blood Sugar; **RBS:** Random Blood Sugar; **HbA<sub>1c</sub>:** Glycated Haemoglobin; **SD:** Standard Deviation; **IEC:** Institutional Ethics Committee.

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