Assessment of knowledge, attitude and practice of Pakistani population about the risk factors, causes, complications and management of diabetes mellitus

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Abstract

Objective: To compare the knowledge, attitude and practice regarding diabetes mellitus among diabetics and non-diabetics.

Methods: The cross-sectional study was conducted at the Government College University, Faisalabad, Pakistan, from December 2017 to April 2018, and comprised subjects recruited randomly from different cities of Punjab, Pakistan. Data was collected using a predesigned structured questionnaire regarding socio-demographic characteristics, general knowledge about diabetes, perception regarding indication, risk factors, diagnosis, and complications, and practices followed for treatment and management of diabetes.

Results: Of the 2,000 subjects, 972(48.6%) had family history of diabetes, 1338(66.9%) were living in urban areas, 1068(53.4%) were university graduates, 804(40.2%) were employed and 1152(57.6%) belonged to socio-economically balanced families. Composite knowledge score was significantly associated with age and socio-economic status ($p<0.05$). A highly significant association was observed regarding family history ($p<0.001$), level of education ($p<0.0001$) and occupation ($p<0.001$) with composite knowledge score.

Conclusion: The knowledge level about diabetes was seen to be average.

Keywords: Complications of diabetes mellitus, Diabetes knowledge, Management of diabetes mellitus, Pakistani population, Questionnaire. (JPMA 71: 286; 2021)

DOI: https://doi.org/10.47391/JPMA.434

Introduction

According to the International Diabetes Federation (IDF) edition 8th, there were 451 million people living with diabetes mellitus (DM) globally in 2017 and this figure was expected to rise up to 693 million in 2045.[1] Growing urbanisation, sedentary lifestyle, consumption of high caloric food and stressful lifestyle have led to an increase in the prevalence of metabolic disorder exclusively DM.[2] Pakistan is the 6th most populous country in the world, with a population of 207.7 million according to the 6th census conducted in 2017. In South Asia, Pakistan is 2nd behind India with 74.05 million diabetics. Recently, diabetic prevalence survey of Pakistan, conducted by Hayatabad Medical Complex, Peshawar, estimated that about 35.5 million people were living with diabetes, which is approximately 17% of total population of Pakistan.[3] About 63.6% of Pakistani population lives in rural areas and has relatively low knowledge about the treatment and management of DM.[4]

Good knowledge is a prerequisite for good health, early diagnosis, prevention and better management of diseases like DM.[5]

There is an immediate need to educate people for better control of DM in Pakistan.[4,6,7] The current study was planned to investigate the knowledge, attitude and practice of general population regarding prevention, treatment and management of DM and its-associated completions.

Subjects and Methods

The cross-sectional study was conducted at the Government College University, Faisalabad (GCU-F), Pakistan, from December 2017 to April 2018, and comprised subjects from different cities of Punjab, Pakistan. Analysis was conducted at the GCU-F Department of Pharmaceutical Chemistry and the Department of Pharmacy at the University of Agriculture, Faisalabad.

After approval from the institutional ethics review committee, the sample size was calculated using Raosoft calculator[8] while keeping margin of error 5% with 95% confidence interval for minimum population of 20,000. The outcome factor (response distribution) used for sample size estimation was 50%. The bulk of the sample was raised from four Lahore, Faisalabad, Gujranwala and Multan, while the rest were enrolled from Jhang, Nankana Sahib, Rahim Yar Khan, Shaikhupura, Sialkot, Toba Tek

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Annexure: Questionnaire.

1. Socio-demographic characteristics.

Age: _____ Years
Sex: Male [ ] Female [ ]
Education:_____
Weight: _____ Kgs
Height: _____ feet _____ inches
Where do you live? District:_____, City [ ] Village [ ]
Marital status: Married [ ] Not married [ ] Never married [ ]
Divorced [ ] Widowed [ ]
Smoking: Current smoker [ ], Past smoker [ ], Nonsmoker [ ]
Family history of diabetes: Yes [ ] No [ ]
Occupation: Employed [ ], Business man [ ], Unemployed [ ], Retired [ ], Housewives [ ], Students [ ], Laborers [ ], Farmer [ ]
Socio-economic condition:
I. Insufficient funds all or most the time
II. Insufficient funds some of the time
III. Balance
IV. Sufficient funds most of the time

2. General education about diabetes mellitus.

Q # 1: Do you know what diabetes is
(i) Increased sugar levels in blood
(ii) Increased production of glucose
(iii) Increased lipid profiles in blood
(iv) All of above options
(v) Do not know exactly
Q # 2: Do you have diabetes mellitus?
Yes [ ] No [ ]
Q # 3: With reference to question # 2, if the answer is yes then how long do you have diabetes mellitus?
Years [ ]
Q # 4: With reference to question # 2, if the answer is no, then in your family, does anyone has DM?
Yes [ ] No [ ]
Q # 5: With reference to question # 4, if the answer is yes, then what is blood relation with diabetic patient
_____
Q # 6: With reference to question 2, if the answer is yes, then which type of diabetes do you have?
Type 1 [ ] Type 2 [ ]
Q # 7: With reference to question 2, if the answer is no, then do you know how many types of DM.
One [ ] Two [ ] Three [ ] Not know [ ]
Q # 8: Do you know what the difference between T1DM and T2DM is?
Yes [ ] No [ ]
Q # 9: Do you know what target blood sugar level is?
Fasting_____ Random_____

Q # 10: Do you know what hypoglycemia is?
Yes [ ] No [ ]
Q # 11: If the answer of question # 10 is yes, what are the symptoms of hypoglycemia?
I. Vertigo Yes [ ] No [ ]
II. Light headedness Yes [ ] No [ ]
III. Weakness Yes [ ] No [ ]
IV. Fainting Yes [ ] No [ ]
Q # 12: How do you know about the information for DM (Tick the relevant one).
I. Television/ radio Yes [ ] No [ ]
II. Newspaper Yes [ ] No [ ]
III. Doctors/ health professionals Yes [ ] No [ ]
IV. Friends Yes [ ] No [ ]
V. Relatives Yes [ ] No [ ]
VI. Journals and magazines Yes [ ] No [ ]
VII. Internet Yes [ ] No [ ]
Q # 13: Do you know diabetes is a genetic disease?
Yes [ ] No [ ] Do not sure [ ]
Q # 14: Do you think diabetes is a hereditary disease?
Yes [ ] No [ ] Do not sure [ ]
Q # 15: Do you personally know anyone who has diabetes?
Yes [ ] No [ ]
Q # 16: If the answer of above question is yes, what is your relationship with them
I. Father Yes [ ] No [ ]
II. Mother Yes [ ] No [ ]
III. Sibling Yes [ ] No [ ]
IV. Maternal relatives Yes [ ] No [ ]
V. Paternal relatives Yes [ ] No [ ]
Q # 17: Do you think eating too many sweets increases the risk of DM?
Yes [ ] No [ ] Do not sure [ ]
Q # 18: Do you think having overweight increases the risk of DM?
Yes [ ] No [ ] Do not sure [ ]
Q # 19: Being diabetic patient, did you ever feel which one of the following complications
I. Increase in weight Yes [ ] No [ ]
II. Decrease in weight Yes [ ] No [ ]
III. Delayed healing of the wounds Yes [ ] No [ ]
IV. Vision problems Yes [ ] No [ ]
V. Tingling sensation in fingers and hands Yes [ ] No [ ]

3. Symptoms of diabetes mellitus.

Q # 20: Do you know about the indications of diabetes mellitus?
Yes [ ] No [ ]
Q # 21: With reference to question 20, if the answer is yes, what are the major indications of DM?
I. Increase in thirst Yes [ ] No [ ]
II. Dry mouth Yes [ ] No [ ]
III. Decrease in appetite Yes [ ] No [ ]
IV. Frequent urination Yes [ ] No [ ]
V. Morning headache Yes [ ] No [ ]
VI. High blood glucose Yes [ ] No [ ]
VII. Excessive sweating Yes [ ] No [ ]
VIII. Non healing wounds Yes [ ] No [ ]
IX. Drinking excess water Yes [ ] No [ ]
X. Loss of sensation of hands and feet Yes [ ] No [ ]
XI. Reduced vision Yes [ ] No [ ]
Q # 22: Do you think diabetic patients can live healthy life?
Yes [ ] No [ ]
Q # 23: With reference to question # 22, if the answer is yes, then how can they live healthy life
I. Start on insulin and eat everything. Yes [ ] No [ ]
II. Take herbal medicine and get cured. Yes [ ] No [ ]
III. Take allopathic medicine and get cured. Yes [ ] No [ ]
IV. Take vegetables and fruits and enjoy healthy life. Yes [ ] No [ ]
V. Change your life-style and eat special diet. Yes [ ] No [ ]

4. Treatment of diabetes mellitus with medicines.

Q # 24: If you have T2DM, which type of medicines do you use frequently?
(i) Allopathic medicines (ii) Homeopathic medicines
(iii) Herbal medicines (iv) Diet-based medicines

Q # 25: With reference to question # 24, if you use allopathic medicines, what are the names of those medicines?

_____

_____

Q # 26: With reference to question # 24, if you use homeopathic medicines, what are the names of those medicines?

_____

_____

Q # 27: With reference to question # 24, if you use herbal medicines, what are the names of those medicines?

_____

_____

Q # 28: Do you know that diet-based medicines are effective to treat T2DM

Yes [ ] No [ ]

Q # 29: If the answer of question # 28 is yes and you are a diabetic patient, have you ever used diet-based medicines to treat T2DM

Yes [ ] No [ ]

Q # 30: If the answer of question # 28 is yes, which type of diet-based medicines have you ever used?

_____

_____

Q # 31: If you are diabetic patient, did your doctor ever advise you to change your life-style?

Yes [ ] No [ ]

Q # 32: If the answer of question # 31 is yes, did you act upon his/her advise?

Yes [ ] No [ ]

5. Management of diabetes mellitus.

Q # 33: If you are diabetic patient, then do you know which type of food you should take in your routine life?

I. Vegetables and fruits	Yes [ ]	No [ ]	Do not know [ ]
II. Meat	Yes [ ]	No [ ]	Do not know [ ]
III. Bakery items	Yes [ ]	No [ ]	Do not know [ ]
IV. Juices and soft drinks	Yes [ ]	No [ ]	Do not know [ ]
V. Avoid sweets or chocolates	Yes [ ]	No [ ]	Do not know [ ]
VI. Should not do fasting	Yes [ ]	No [ ]	Do not know [ ]
VII. Fast food/BBQ	Yes [ ]	No [ ]	Do not know [ ]
VIII. Special diet	Yes [ ]	No [ ]	Do not know [ ]

Q # 34: Do you think that diet and lifestyle modifications are important factors in reducing problems associated with diabetes mellitus?

Yes [ ] No [ ] Do not know [ ]

Q # 35: Do you think the control of your blood glucose levels is an important factor in reducing complications of diabetes mellitus?

Yes [ ] No [ ] Do not know [ ]

Q # 36: Do you feel that you have sufficient knowledge about the management of your diabetic condition?

Yes [ ] No [ ]

Q # 37: Do you perform regular sugar monitoring after being diagnosed with diabetes mellitus?

Yes [ ] No [ ]

Q # 38: Do you think diabetes can be prevented by regular exercise

Yes [ ] No [ ] Do not sure [ ]

Q # 39: Do you think diabetes can be controlled by reducing the intake of carbohydrates?

Yes [ ] No [ ] Do not sure [ ]

Q # 40: Do you think diabetes can be controlled by reducing the intake of sweets?

Yes [ ] No [ ] Do not sure [ ]

Q # 41: Do you think diabetes can be prevented by quitting the smoking?

Yes [ ] No [ ] Do not sure [ ]

6. Complications associated with diabetes mellitus.

Q # 42: Do you know what the complications of DM are?

Yes [ ] No [ ]

Q # 43: If the answer of question # 48 is yes, what are those complications?

I. Diabetes-associated kidney disease.	Yes [ ]	No [ ]	Not sure [ ]
II. Diabetes-associated heart diseases.	Yes [ ]	No [ ]	Not sure [ ]
III. Diabetes-associated eye diseases.	Yes [ ]	No [ ]	Not sure [ ]
IV. Diabetes-associated brain diseases.	Yes [ ]	No [ ]	Not sure [ ]
V. Diabetes-associated foot diseases.	Yes [ ]	No [ ]	Not sure [ ]
VI. Diabetes-associated organ diseases.	Yes [ ]	No [ ]	Not sure [ ]

Q # 44: Do you have any of the above complications

Yes [ ] No [ ]

Q # 45: When do you visit the doctor to know about the above mentioned complications?

I. Frequently.	Yes [ ]	No [ ]	Not sure [ ]
II. After 3-6 months.	Yes [ ]	No [ ]	Not sure [ ]
III. Never visited.	Yes [ ]	No [ ]	Not sure [ ]

Q # 46: Do you know what are the main indications of diabetes-associated kidney disease

I. Excessive excretion of micro-albumin from the urine. Yes [ ] No [ ]

Q # 47: Do you know what are the main indications of diabetes-associated eye disease

I. Eye weakness	Yes [ ]	No [ ]	Not sure [ ]
II. Pain in eyes	Yes [ ]	No [ ]	Not sure [ ]
III. Blurred vision	Yes [ ]	No [ ]	Not sure [ ]
IV. Redness in eyes	Yes [ ]	No [ ]	Not sure [ ]

Q # 48: Do you know what the complications of diabetic foot disease are?

I. Wounds in foot	Yes [ ]	No [ ]	Not sure [ ]
II. Amputations in foot	Yes [ ]	No [ ]	Not sure [ ]
III. Decreased sensation in foot.	Yes [ ]	No [ ]	Not sure [ ]
IV. Delayed wound healing.	Yes [ ]	No [ ]	Not sure [ ]

Q # 49: How to avoid the diabetic foot disease

Yes [ ] No [ ] Not sure [ ]

I. Regular examination of foot	Yes [ ]	No [ ]	Not sure [ ]
II. Keep foot clean	Yes [ ]	No [ ]	Not sure [ ]
III. Do not walk without wearing shoes	Yes [ ]	No [ ]	Not sure [ ]
IV. Keep your shoes neat and clean.	Yes [ ]	No [ ]	Not sure [ ]

Q # 50: Do you know what are the main reasons for diabetes-associated heart diseases

I. Persistently high blood pressure	Yes [ ]	No [ ]	Not sure [ ]
II. Smoking	Yes [ ]	No [ ]	Not sure [ ]
III. Being overweight	Yes [ ]	No [ ]	Not sure [ ]
IV. Dyslipidemia	Yes [ ]	No [ ]	Not sure [ ]

Q # 51: Do you know how to prevent the diabetes-associated heart diseases?

I. Control of blood glucose	Yes [ ]	No [ ]	Not sure [ ]
II. Quit smoking	Yes [ ]	No [ ]	Not sure [ ]
III. Control of blood pressure	Yes [ ]	No [ ]	Not sure [ ]
IV. Quit alcohol drinking	Yes [ ]	No [ ]	Not sure [ ]
V. Regular exercise	Yes [ ]	No [ ]	Not sure [ ]

7. Reasons for pathogenesis of DM.

Q # 52: Do you think diabetes is a communicable disease?

Yes [ ] No [ ] Do not sure [ ]

Q # 53: Do you think diabetes is curable?

Yes [ ] No [ ] Do not sure [ ]

Q # 54: What do you know about the knowledge of risk factors that may cause DM?

I. Old-age is a risk for diabetes	Yes [ ]	No [ ]
II. Having a diabetic relative is a risk for diabetes	Yes [ ]	No [ ]
III. Overweight people tend to have diabetes	Yes [ ]	No [ ]
IV. Overweight children are at risk of diabetes	Yes [ ]	No [ ]

V. Pregnant women are at risk of diabetes Yes [ ] No [ ]
VI. People who eat fatty food are at risk of diabetes Yes [ ] No [ ]
Q # 55: Do you think, diabetes is a:
I. Communicable disease Yes [ ] No [ ] Do not know [ ]
II. Non-communicable disease Yes [ ] No [ ] Do not know [ ]
III. Infectious disease Yes [ ] No [ ] Do not know [ ]
IV. Non-infectious disease Yes [ ] No [ ] Do not know [ ]
V. None of the above Yes [ ] No [ ] Do not know [ ]

8. Tests for diagnosis of DM (Only diabetic patients address these questions).
Q # 56: Do you know how to measure diabetes?
Yes [ ] No [ ] Do not know [ ]
Q # 57: Do you know how to test the fasting blood glucose (FBG)
Yes [ ] No [ ]
Q # 58: If the answer of question # 52 is yes, then when FBG test should be performed
I. Any time Yes [ ] No [ ]
II. In morning Yes [ ] No [ ]
III. Afternoon Yes [ ] No [ ]
IV. Evening Yes [ ] No [ ]
Q # 59: If the answer of question # 52 is yes, then to do FBG, how long you should not take food.
I. 4 hours Yes [ ] No [ ]
II. 6 hours Yes [ ] No [ ]
III. 8 hours Yes [ ] No [ ]
Q # 60: Do you know how to test the random blood glucose (RBG)
Yes [ ] No [ ]
Q # 61: If the answer of question # 55 is yes, then when RBG test should be performed
V. Any time Yes [ ] No [ ]
VI. In morning Yes [ ] No [ ]
VII. Afternoon Yes [ ] No [ ]
VIII. Evening Yes [ ] No [ ]
Q # 62: For RBG test, is it necessary to remain hunger?
Yes [ ] No [ ]
Q # 63: Do you know what is oral glucose tolerance test (OGTT)
Yes [ ] No [ ]
Q # 64: If the answer of question # 69 is yes, then to do OGTT, how long you should not take food.
IV. 4 hours Yes [ ] No [ ]
V. 6 hours Yes [ ] No [ ]
VI. 8 hours Yes [ ] No [ ]

9. Who should test him/herself for the diagnosis of DM.
Q # 65: Which one of the followings should do the test for the diagnosis of DM?
I. Those having the symptoms of DM.
Yes [ ] No [ ] Do not mandatory [ ]
II. Those having age more than 45 years.
Yes [ ] No [ ] Do not mandatory [ ]
III. Those having age less than 45 years, but having very less body weight.
Yes [ ] No [ ] Do not mandatory [ ]
IV. Those having age less than 45 years, but having over weight.
Yes [ ] No [ ] Do not mandatory [ ]
V. Those having family history of DM.
Yes [ ] No [ ] Do not mandatory [ ]
VI. Those women having history of gestational diabetes.
Yes [ ] No [ ] Do not mandatory [ ]
VII. Those having hypertension.
Yes [ ] No [ ] Do not mandatory [ ]
VIII. Those having hyperlipidemia.
Yes [ ] No [ ] Do not mandatory [ ]

Singh and Vehari. The sample was raised using random sampling strategy to minimise any kind of bias from among both diabetics and non-diabetics in the community aged ≥18 of either gender. Those with severe behavioural, mental illness, cardiovascular, kidney and liver disorders were excluded, and so were those not willing to participate or not able to understand even local languages and those who had attended a diabetes awareness programme previously.

Literature was reviewed to develop a structured questionnaire for data collection.[9] The questionnaire was in English language. Trained research assistants translated the questionnaire into the native language for those who were not able to understand the English language. The questionnaire was first tested on a small sample (n=10) and was reviewed subsequently.

The questionnaire was validated by a panel of health care professionals comprising diabetologist, physician, hospital pharmacists and community pharmacists. Content validation was done to make sure that there was no ambiguity in the questionnaire and all questions were appropriate for the study. On the basis of panel reviews, alterations were carried out with respect to structure and arrangement of questions. A pilot study was conducted by employing diabetics and non-diabetics (n=25). A test-retest method was used, and the same participants were asked to fill the same questionnaire after a 10-day interval.

The final questionnaire contained 86 questions divided into 6 sections. Research assistants were trained to interview the subjects. The questionnaire was filled up by the assistants, and the respondents were given sufficient time to answer the questions, with each interview lasting approximately 25-30 minutes.

General knowledge of the subjects was assessed in line with literature.[9] Under the domain, 19 questions were asked (Annexure). Categorical responses were "yes" or "no", with each "yes" given a score of 1 and each "no" given a score of 0. The maximum score for general knowledge domain was 19. The Knowledge score (KS) had four grades; up to 25% "poor", 50% was considered "average", 75% "good" and 100% was considered "excellent".

Socio-demographic characteristics included age, gender, marital status, education, diabetes history, income status and occupation were also noted.

Socio-demographic characteristics were analysed using simple descriptive statistics in Microsoft Excel Sheet.

Continuous data was expressed as mean ± standard deviation (SD) and continuous data as frequencies and percentages. Normality of data was tested using Kolmogorov-Smirnov test. Data were transferred to GraphPad Prism 5 software 5.01, and student t-test was performed. P<0.05 was considered statistically significant.

Results

Of the 2000 subjects, 377(18.85%) each were enrolled from Lahore, Faisalabad, Gujranwala and Multan, while the remaining 492(24.6%) belonged to the other smaller cities. Also, 894(44.7%) were diabetics and 1106(55.3%) were non-diabetics, and 1014(50.7%) were males and 986(49.3%) were females. The overall mean age was 38.8±16.3 years; 1212(60.6%) were married; 972(48.6%) had family history of DM; 1338(66.9%) were living in urban areas; 1068(53.4%) were university graduates; 1608(80.4%) were non-smokers; 804(40.2%) were employed; and 1152(57.6%) belonged to socio-economically balanced families (Table-1).

Of the total, 1260(63%) participants knew the definition of

Table-1: Socio-demographic characteristics of study participants (n=2000).

Variable	Category	Diabetic Participants		Non-Diabetic Participants		Total Participants
		Male n (%)	Female n (%)	Male n (%)	Female n (%)	n (%)
Age (year)	≤25	30 (1.5)	18 (0.9)	270 (13.5)	354 (17.7)	672 (33.6)
	26-35	48 (2.4)	48 (2.4)	66 (3.3)	66 (3.3)	228 (11.4)
	36-45	138 (6.9)	90 (4.5)	66 (3.3)	120 (6)	414 (20.7)
	46-55	168 (8.4)	114 (5.7)	60 (3)	60 (3)	402 (20.1)
	≥56	144 (7.2)	96 (4.8)	24 (1.2)	20 (1)	284 (14.2)
Diabetic history	With family history	378 (18.9)	234 (11.7)	162 (8.1)	198 (9.9)	972 (48.6)
	No family history	144 (7.2)	138 (6.9)	318 (15.9)	428 (21.4)	1028 (51.4)
Residence	Rural	126 (6.3)	96 (4.8)	114 (5.7)	102 (5.1)	438 (21.9)
	Urban	336 (16.8)	210 (10.5)	348 (17.4)	444 (22.2)	1338 (66.9)
	Not answered	66 (3.3)	62 (3.1)	54 (2.7)	42 (2.1)	224 (11.2)
Education	Illiterate	24 (1.2)	54 (2.7)	6 (0.3)	18 (0.9)	102 (5.1)
	Primary education	36 (1.8)	36 (1.8)	18 (0.9)	12 (0.6)	102 (5.1)
	Secondary education	114 (5.7)	84 (4.2)	78 (3.9)	108 (5.4)	384 (19.2)
	H. Secondary education	66 (3.3)	36 (1.8)	66 (3.3)	84 (4.2)	252 (12.6)
	Grad/Postgrad	270 (13.5)	126 (6.3)	306 (15.3)	366 (18.3)	1068 (53.4)
	Not answered	18 (0.9)	30 (1.5)	8 (0.4)	36 (1.8)	92 (4.6)
Marital status	Married	486 (24.3)	312 (15.6)	168 (8.4)	246 (12.3)	1212 (60.6)
	Not married	42 (2.1)	18 (0.9)	294 (14.7)	384 (19.2)	738 (36.9)
	Widowed	-	18 (0.09)	-	14 (0.7)	32 (1.6)
	Not answered	6 (0.3)	12 (0.6)	-	-	18 (0.9)
Smoking status	Current smoker	108 (5.4)	18 (0.9)	96 (4.8)	-	222 (11.1)
	Past smoker	156 (7.8)	12 (0.6)	16 (0.3)	12 (0.6)	196 (9.8)
	Non-smoker	324 (16.2)	324 (16.2)	360 (18)	600 (30)	1608 (80.4)
	Not answered	12 (0.6)	24 (1.2)	12 (0.8)	24 (1.2)	72 (3.6)
Occupation	Unemployed	12 (0.6)	42 (2.1)	19 (0.95)	72 (3.6)	144 (7.2)
	Employed	216 (10.8)	48 (2.4)	120 (0.6)	90 (4.5)	474 (23.7)
	Businessman	144 (7.2)	-	60 (0.3)	-	204 (10.2)
	Retired	66 (3.3)	-	6 (0.3)	-	72 (3.6)
	Housewife	-	246 (12.3)	-	186 (9.3)	432 (21.6)
	Student	12 (0.6)	-	228 (11.4)	276 (13.8)	516 (25.8)
	Labour	30 (1.5)	-	12 (0.6)	-	42 (2.1)
	Farmer	54 (2.7)	-	30 (1.5)	-	84 (4.2)
	Not answered	12 (0.6)	10 (0.5)	6 (0.3)	-	28 (1.4)
Income status	Insufficient MT	24 (1.2)	12 (0.5)	6 (0.3)	12 (0.6)	54 (2.7)
	Insufficient ST	42 (2.1)	30 (1.5)	42 (2.1)	42 (2.1)	156 (7.8)
	Balanced	324 (16.2)	228 (11.4)	282 (14.1)	318 (15.9)	1152 (57.6)
	Sufficient MT	108 (5.4)	72 (3.6)	114 (5.7)	162 (8.1)	456 (22.8)
	Not answered	30 (1.5)	24 (1.2)	36 (1.8)	90 (4.5)	180 (9.0)

MT: Most of the time; ST: Some of the time.

Table-2: General knowledge of diabetes mellitus (DM) by socio-demographic characteristics.

Variable	Category	General knowledge about DM				
		Poor (25%) n (%)	Average (50%) n (%)	Good (75%) n (%)	Excellent (100%) n (%)	p-value
Gender	Male	56 (2.8)	444 (22.2)	283 (14.1)	202 (10.1)	<0.05
	Female	119 (5.9)	396 (19.8)	339 (16.9)	161 (8)	
Age (year)	≤40	138 (6.9)	445 (22.2)	201 (10)	298 (14.9)	<0.05
	≥40	43 (2.1)	390 (19.5)	343 (17.1)	141 (7)	
Diabetic history	With family history	36 (1.8)	370 (18.5)	202 (10.1)	357 (17.8)	<0.001
	No family history	110 (5.5)	504 (25.2)	283 (14.1)	138 (6.9)	
Education	Illiterate	30 (1.5)	108 (5.4)	19 (0.9)	21 (1)	<0.0001
	Secondary School Certificate	62 (3.1)	288 (14.4)	128 (6.4)	98 (4.9)	
	Higher Secondary School Certificate	17 (0.8)	114 (5.7)	63 (3.1)	59 (2.9)	
	Graduation or above	15 (0.7)	312 (16)	122 (6.1)	544 (27.2)	
Marital status	Married	84 (4.2)	528 (26)	365 (18.2)	278 (13.9)	>0.05
	Not married	82 (4.1)	336 (17)	119 (5.9)	208 (10.4)	
Occupation	Unemployed	126 (6.3)	546 (27)	338 (16.9)	161 (8)	<0.001
	Employed	40 (2)	306 (15.3)	65 (3.2)	418 (20.9)	
Socio-economic status	Insufficient	12 (0.6)	126 (6.3)	64 (3.2)	17 (0.8)	<0.05
	Balanced	151 (7.5)	516 (25.8)	158 (7.9)	404 (20.2)	
	Sufficient	138 (6.9)	132 (6.6)	117 (5.8)	165 (8.2)	

Statistical analysis: two-tailed unpaired student's t-test was used to compare columns. Level of significance: probability value ($p < 0.05$) was considered significant.

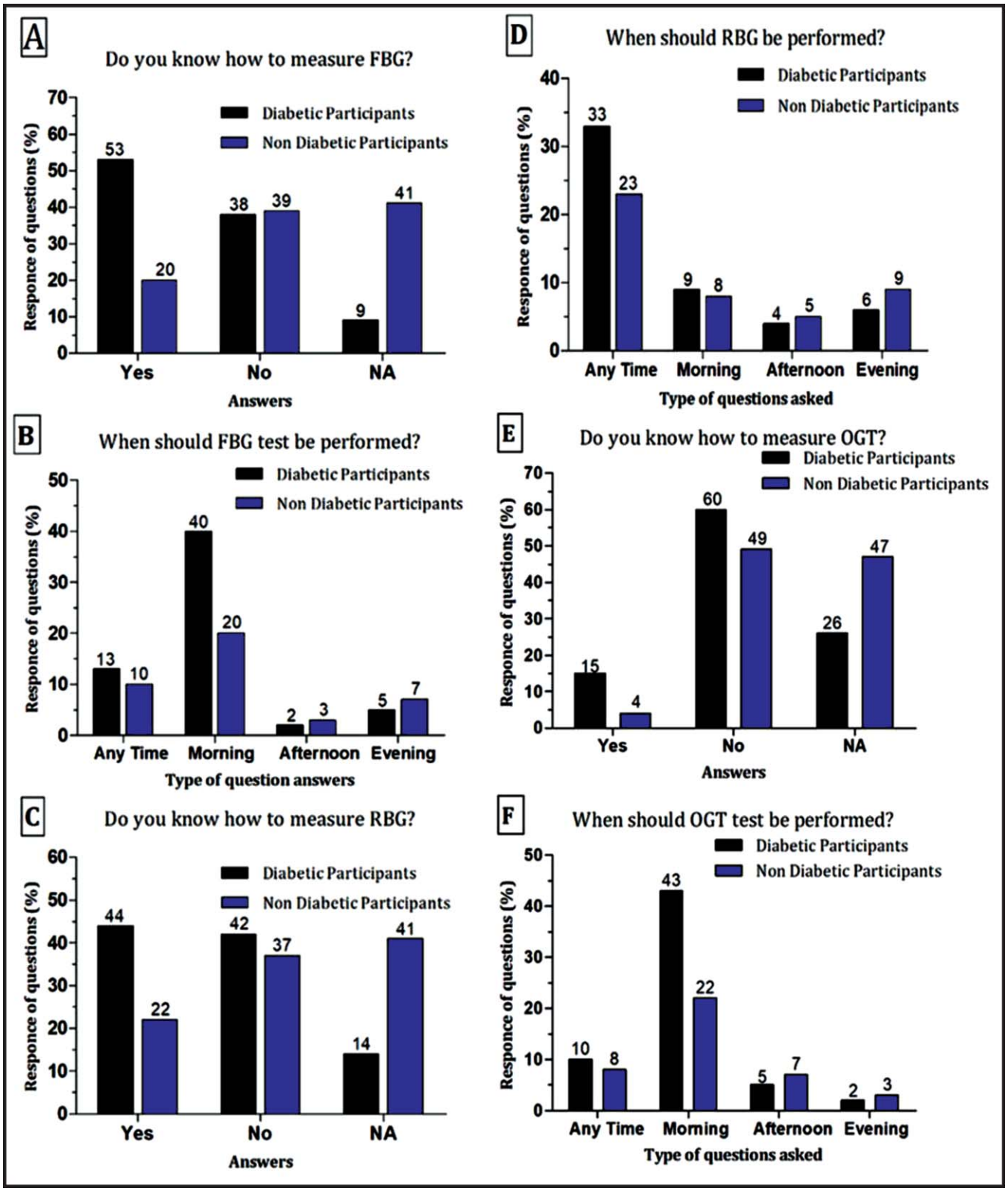
Table-3: General knowledge of participants belonging to different cities (n=2000).

Parameters	Cities				
	Lahore n (%)	Multan n (%)	Faisalabad n (%)	Gujranwala n (%)	Other cities n (%)
Total participants	377 (18.8)	377 (18.8)	377 (18.8)	377 (18.8)	492 (24.6)
Excellent KS (%)	98 (26)	97 (25.7)	111 (29.4)	82 (21.7)	67 (13.6)
Good KS (%)	136 (36)	106 (28)	108 (28.6)	53 (14)	122 (24.8)
Average KS (%)	109 (28.9)	130 (34.4)	143 (37.9)	204 (54.1)	254 (51.6)
Poor KS (%)	34 (9)	44 (11.6)	15 (4)	38 (10)	49 (10)

KS: Knowledge score.

Table-4: Percentage knowledge score of patients regarding symptoms and indications of diabetes mellitus (DM) and prevention of DM-associated complications.

Variables	Percentage knowledge score of diabetic patients (n=894)					
	Zero n (%)	Poor (25%) n (%)	Average (50%) n (%)	Good (75%) n (%)	Excellent (100%) n (%)	NA n (%)
Indications of DM	-	96 (10.7)	132 (14.7)	270 (30.2)	342 (38.2)	54 (6)
Indications of DM-associated complications						
Kidney diseases	102 (11.4)	228 (25.5)	96 (10.7)	108 (12)	270 (30.2)	90 (10)
Eye diseases	66 (7.3)	120 (13.4)	162 (18.1)	150 (16.7)	342 (38.2)	54 (6)
Heart diseases	78 (8.7)	174 (19.4)	114 (12.7)	156 (17.4)	288 (32.2)	84 (9.3)
Foot diseases	78 (8.7)	108 (12)	120 (13.4)	174 (19.4)	336 (37.5)	78 (8.7)
Prevention of DM-associated complications						
Kidney diseases	54 (6)	186 (20.8)	162 (18.1)	102 (11.4)	306 (34.2)	84 (9.3)
Eye diseases	102 (11.4)	120 (13.4)	108 (12)	54 (6)	372 (41.6)	138 (15.4)
Heart diseases	78 (8.7)	108 (12)	36 (4)	42 (4.6)	552 (61.7)	78 (8.7)
Foot diseases	78 (8.7)	126 (14)	36 (4)	108 (12)	480 (53.6)	66 (7.3)



NA: Not answered, FBG: Fasting blood glucose, RBG: Random blood glucose, OGT: Oral glucose tolerance.

Figure-1: Knowledge of study participants about FBG, RBG and OGT test for DM.

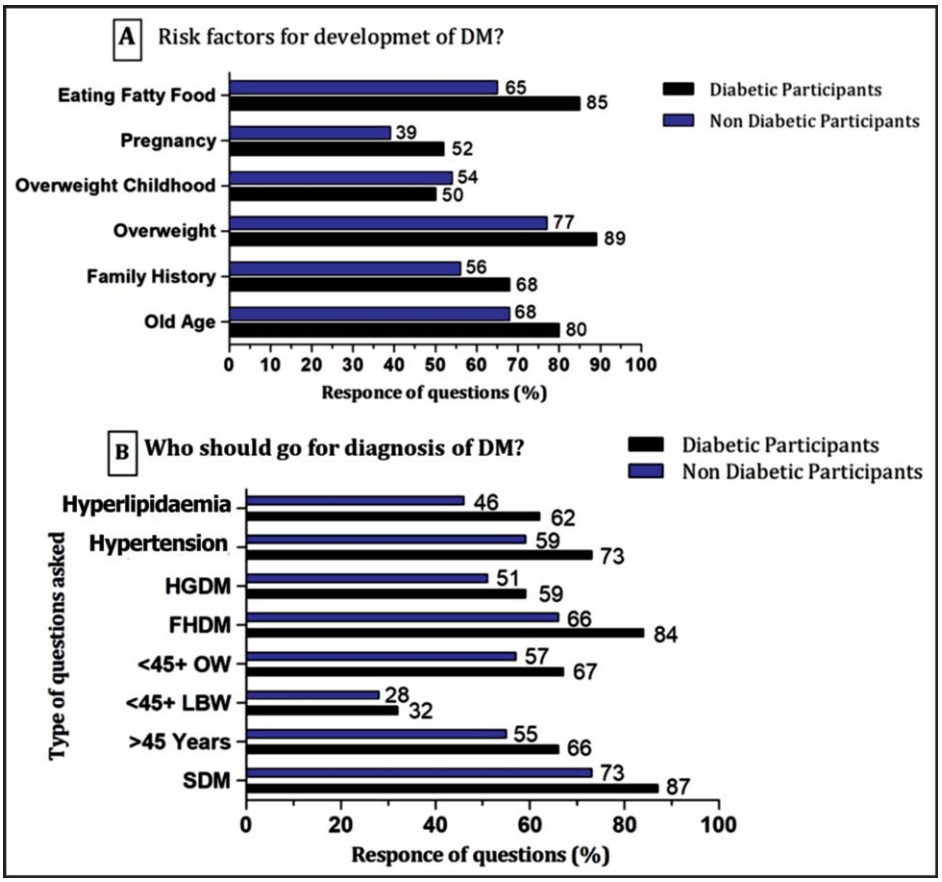
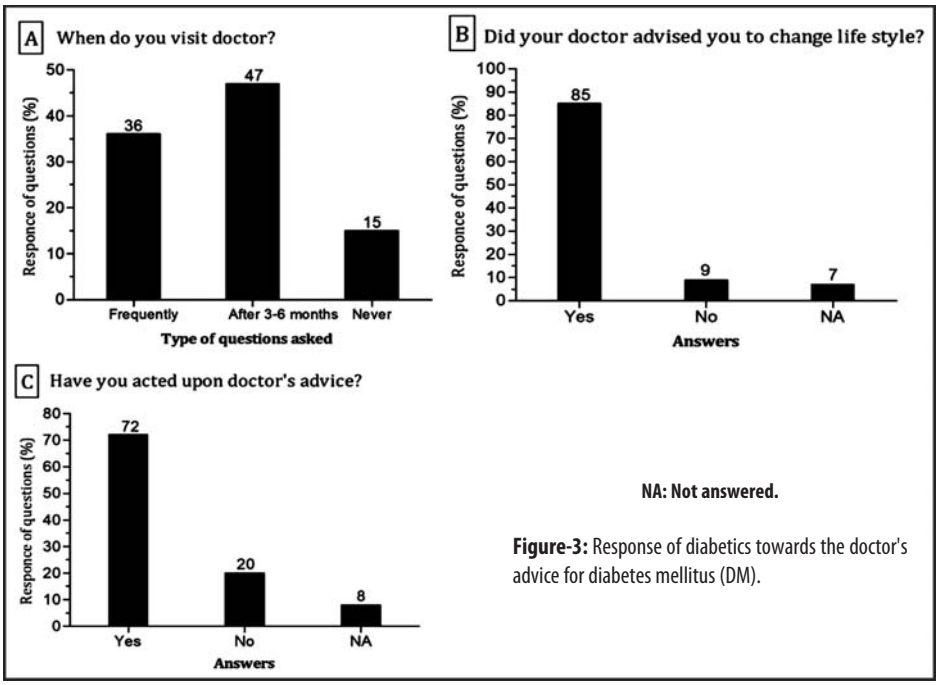


Figure-2: Attitude of study participants towards risk factors (A) and diagnosis (B) of diabetes mellitus (DM). HGDM: History of Gestational Diabetes, FHDM: Family History of Diabetes Mellitus, OW: Over Weight, LBW: Low Body Weight, SDM: Symptoms of Diabetes Mellitus



NA: Not answered.

Figure-3: Response of diabetics towards the doctor's advice for diabetes mellitus (DM).

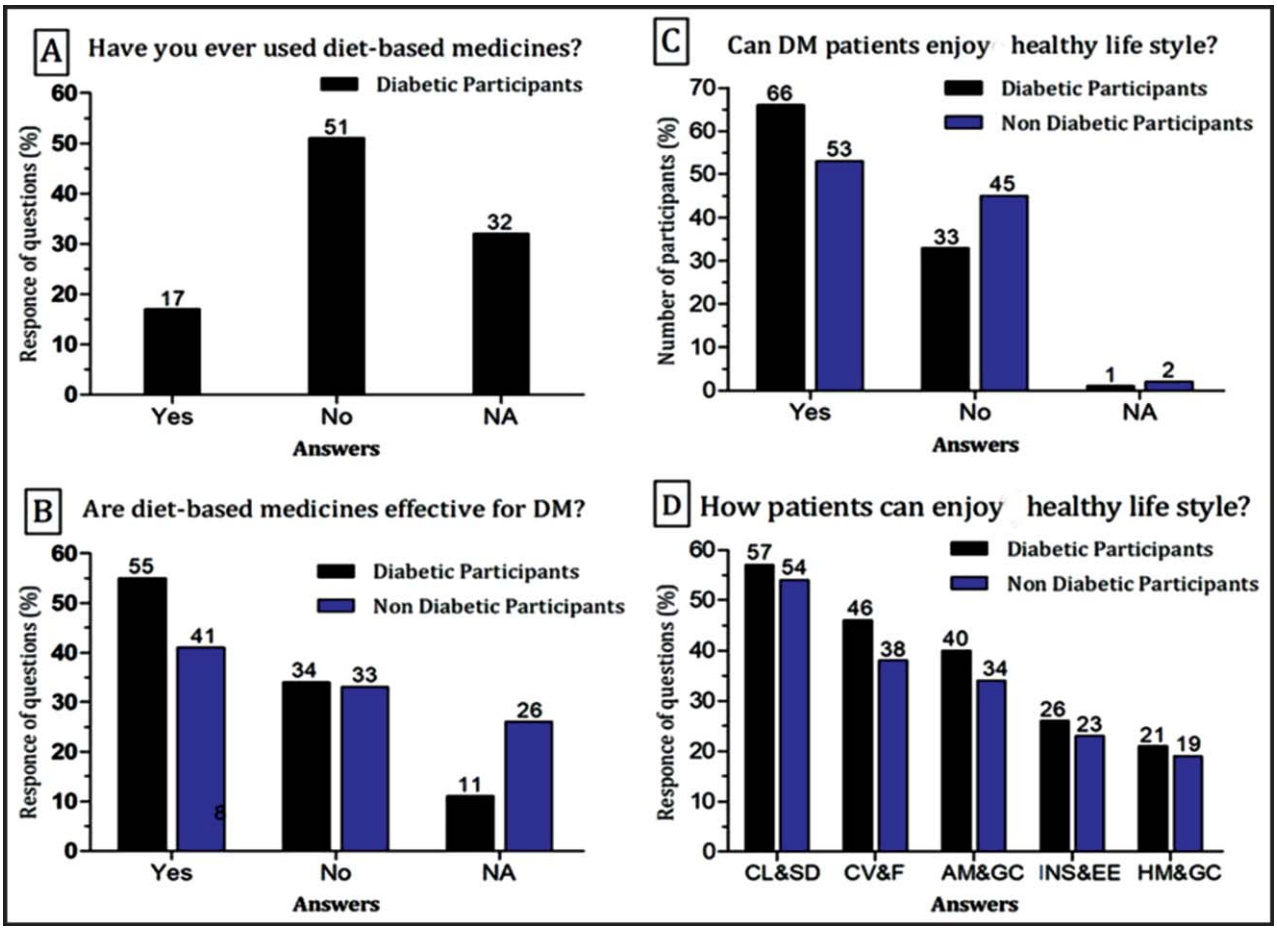
DM, and 1560(78%) answered correctly about DM symptoms of DM. Among the male participants, 56(3%), 444(22%), 283(14%) and 202(10%) had poor, average, good and excellent composite KS respectively, while the corresponding numbers for female participants were 119(6%), 396(20%), 339(17%) and 161(8%). KS had highly significant association with family history ($p<0.001$), higher education ($p<0.0001$) and employment ($p<0.001$), while it had significant association with age and socio-economic status ($p<0.05$). Gender and marital status had no significant association ($p>0.05$) with KS (Table-2). Participants belonging to the major cities had comparatively good KS compared to the smaller cities (Table-3).

Further, 96(11%) participants had poor knowledge about DM indications, 132(15%) had average, 270(30%) good and 342(38) had excellent (>75%) knowledge. Also, 270(30%) participants had excellent KS regarding indications of DM-associated kidney diseases, 342(38%) eye diseases, 288(32%) heart diseases and 336(38%) foot diseases. Likewise, 306(34%) participants had excellent KS about prevention of DM-associated kidney diseases, 372(42%) eye diseases, 552(62%) heart disease and 480(54%) foot diseases (Table-4).

Regarding perception about DM diagnosis, diabetics scored better than non-diabetics (Figure-1).

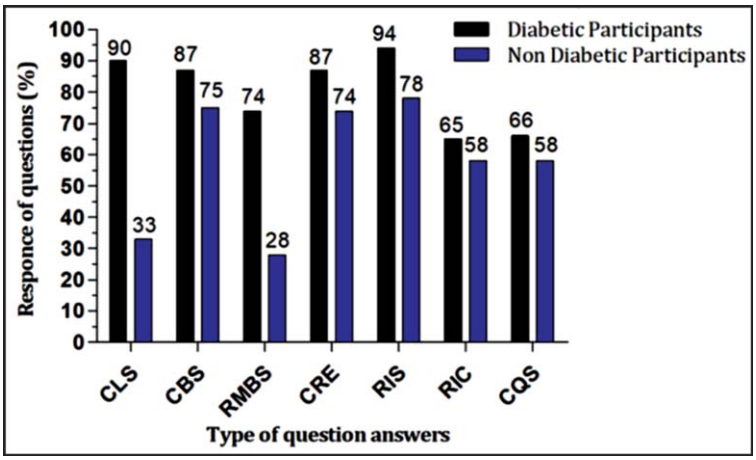
Likewise, the difference of knowledge among diabetic and non-diabetic participants about DM risk factors was statistically significant (Figure-2-A).

The participants were asked



NA: Not answered, CL&SD; Vhange of lifestyle & selected diet, CV&F: Consume vegetables & fruits, AM&GC: Allopathic medicines & get cured, INS&EE: Insulin & eat everything; HM&GC: Homeopathic medicines & get cured.

Figure-4: Study participants' practice and perception towards the management of diabetes mellitus (DM).



CLS: Changing lifestyle, CBS: Controlling blood sugar, RMBS: Regularly monitoring blood sugar, CRE: Controlling by regular exercise, RIS: Reducing intake of sweets, RIC: Reducing intake of carbohydrates, CQS: Controlled by quitting smoking, SDM: Symptoms of diabetes mellitus, LBW: Less body weight, OW: Overweight, FHDM: Family history of diabetes mellitus, HGDM: History of gestational diabetes mellitus.

Figure-5: Various treatment options for diabetes mellitus (DM).

who should go for a DM diagnosis, and the difference in responses between diabetics and non-diabetics was not significant (Figure-2-B).

Of the total, 720(36%) subjects had visited the doctor once per month (frequently), 940(47%) had visited at least once in the preceding six months, and 300(15%) had never visited the doctor after DM diagnosis; 1700(85%) said their doctors had advised them to change lifestyle; and 1440(72%) of them acted upon doctor's advice (Figure-3).

Attitude towards various medicinal options were also explored (Figure-4), and the same was the case with lifestyle modification options (Figure-5). Difference between perception about DM management between diabetics and non-diabetics was statistically significant ($p<0.05$).

Discussion

Better knowledge of DM leads to better treatment and management of DM. In Pakistan, very few reports have emphasised the need to organise educational programmes for better DM management.[7,10] In the current study, 51% of participants had average general knowledge. Similarly, Islam et al. reported that 45.6%, 37.7% and 16.7% participants had shown good, average and poor knowledge of DM.[11] Results of the current study are consistent with results reported elsewhere from different developing countries.[7,12-14] Additionally, in a study, knowledge level was higher among diabetics than non-diabetics, because of regular visits to the doctor.[15] It was found that participants mostly gained knowledge from friends, relatives and healthcare professionals.

Different studies have investigated that higher education, income and residence strongly affect knowledge.[14-16] Better knowledge and self-care practices e.g., changing lifestyle, healthy diet and exercise, are associated with a healthy lifestyle.[5,17] A survey conducted in West Bengal, India, showed that 80.9% diabetics and 76.1% non-diabetics thought that healthy and selected diet led to a healthy lifestyle.[15]

A study conducted in Karachi showed that 97.7% participants were using allopathic medicine and only 2.3% were using homoeopathic medicines for DM (18). A study conducted in Ethiopia, 57.3% participants responded that insulin can be used for DM treatment.[14] A study from Bangladesh reported that the participants showed average attitude about prevention and management of DM. In several studies from developing countries, 56% in Ethiopia,[14] 31.8% in Oman,[19] 18% to 55.9% participants in Pakistan,[6,20] 62.1% in Saudi Arabia,[21] and 72% participants in the United Arab Emirates (UAE)[17] had poor attitude towards DM treatment, and our results are in line with literature.

It is obvious that lack of knowledge makes DM condition worse. A study from Dhaka, Bangladesh, reported that an overwhelming majority (70% and 72%) of participants responded that increasing physical activity and reduced carbohydrate intake is a good choice to control DM.[22] Another study from Pakistan showed that study participants thought that DM can be managed by diet (3.3%), exercise (0.7%), medication (5.3%) and diet + exercise + medication (3.3%).[23] A study conducted in Bangladesh revealed average knowledge that DM can be managed and prevented by controlling diet (77%), taking medicine (88%), regular exercise (73%), eating less (76%), planned diet (69%), weight reduction (43%) and physical activity (31%).[15]

Several studies had reported that knowledge about pathogenesis and risk factors of DM is poor among people in developing countries.[11,13,18] Less than half of study participants believed that excessive intake of sweet foods causes DM and only 50% merely knew about nutrition and food.[24] Another study revealed that the participants thought that lack of insulin (53.7%), impaired insulin production (6.9%), increased sugar consumption (43.5%), hereditary (51.5%), lack of physical activity (17.9%), mental stress (26.8%) and being overweight (18.25%) are risk factors for DM.[15] Another study also reported very low perception of study participants regarding DM causes that were food habit (19.8%), genetic (18.6%), lack of physical activity (24.6%), obesity (9.1%), medication (2.7%) and high blood sugar (1.9%).[11]

It has been reported that rural inhabitants had poor knowledge of risk factors. The study participants had responded that obesity, being overweight (30.1%), eating more food (9.6%), hypertension (5.8%), family history of type 2 DM (3.2%) and reduced physical activity (2.6%) may be possible risk factors.[25] A cross-sectional study in a north western Ethiopian town showed that less than half the participants had responded that DM-associated complications included brain disease (47.5%), hypertension (37.9%), blindness (35.3%), amputation of a limb (33.2%), and kidney diseases (29.3%).[14] Koley et al. showed that the participants did not have adequate knowledge and thought that poor wound healing (48.1%), foot ulcer (23.1%), loss of vision (36%), kidney failure (31.6%), heart failure (16%), stroke (6.2%) and amputation (6.1%) were the complications associated with DM.[15] In the current study, knowledge of the participants about the prevention of DM-associated complications was also poor. A population-based study from Bangladesh showed that more than half (53%) of the diabetic participants had never got their blood sugar level checked.[13] In the current study, the participants had shown little knowledge regarding when and how to measure fasting blood glucose (FBG), random blood glucose (RBG), and oral glucose tolerance (OGT) tests.

The current study has some potential limitations. First, the sample size was not large enough, so the results cannot be generalised to the entire population of Punjab. Secondly, there was no follow-up as study participants were from different cities, and it was very difficult to get the information again over an extended period followed by an intervention of diabetic educational programme.

Conclusion

The knowledge level was found to be average or below-average about DM risk factors, causes and complications,

indicating the need to improve knowledge levels. The possible reasons behind average knowledge and poor attitude were low literacy rate, rural residence and lack of interest in self-care practices like physical activity.

Disclaimer: None.

Conflict of Interest: None.

Source of Funding: The Higher Education Commission (HEC) of Pakistan (5661/Punjab/NRPU/R&D/HEC/2016 and 6429/Punjab/NRPU/R&D/HEC/2016).

References

1. Cho N, Shaw J, Karuranga S, Huang Y, da Rocha Fernandes J, Ohlrogge A, et al. IDF Diabetes Atlas: Global estimates of diabetes prevalence for 2017 and projections for 2045. Diabetes Res Clin Pract. 2018;138:271-81.
2. Hu FB. Globalization of diabetes: the role of diet, lifestyle, and genes. Diabetes care. 2011;34:1249-57.
3. Aamir AH, Ul-Haq Z, Mahar SA, Qureshi FM, Ahmad I, Jawa A, et al. Diabetes Prevalence Survey of Pakistan (DPS-PAK): prevalence of type 2 diabetes mellitus and prediabetes using HbA1c: a population-based survey from Pakistan. BMJ open. 2019;9:e025300.
4. Masood I, Saleem A, Hassan A, Zia A, Khan AT. Evaluation of diabetes awareness among general population of Bahawalpur, Pakistan. Primary care diabetes. 2016;10:3-9.
5. Saleh F, Mumu SJ, Ara F, Ali L, Hossain S, Ahmed KR. Knowledge, attitude and practice of type 2 diabetic patients regarding obesity: study in a tertiary care hospital in Bangladesh. J Public Health Africa. 2012;3.
6. Gul N. Knowledge, attitudes and practices of type 2 diabetic patients. J Ayub Med Coll Abbottabad. 2010;22:128-31.
7. Badruddin N, Basit A, Hydrie MZI, Hakeem R. Knowledge, attitude and practices of patients visiting a diabetes care unit. Pak J Nutrition. 2002;1:99-102.
8. Raosoft. [cited 2019 March 1]. http://www.raosoft.com/samplesize.html.
9. Saleh F, Ara F, Afnan F. Assessment of Gap between Knowledge and Practices among Type 2 Diabetes Mellitus Patients at a Tertiary-Care Hospital in Bangladesh. Adv Public Health. 2016;2016.
10. Shera A, Jawad F, Basit A. Diabetes related knowledge, attitude and practices of family physicians in Pakistan. J Pak Med Assoc. 2002;52:465-70
11. Islam SMS, Niessen LW, Seissler J, Ferrari U, Biswas T, Islam A, et al. Diabetes knowledge and glycemic control among patients with type 2 diabetes in Bangladesh. Springerplus. 2015;4:284.
12. Saeed H, Saleem Z, Naeem R, Shahzadi I, Islam M. Impact of health literacy on diabetes outcomes: a cross-sectional study from Lahore, Pakistan. Public health. 2018;156:8-14.
13. Islam FMA, Chakrabarti R, Dirani M, Islam MT, Ormsby G, Wahab M, et al. Knowledge, attitudes and practice of diabetes in rural Bangladesh: the Bangladesh Population based Diabetes and Eye Study (BPDES). PLoS One. 2014;9:e110368.
14. Asmamaw A, Asres G, Negese D, Fekadu A, Assefa G. Knowledge and attitude about diabetes mellitus and its associated factors among people in Debre Tabor town, Northwest Ethiopia: cross sectional study. Science. 2015;3:199-209.
15. Koley M, Saha S, Arya JS, Choubey G, Ghosh S, Chattopadhyay R, et al. Knowledge, Attitude, and Practice Related to Diabetes Mellitus Among Diabetics and Nondiabetics Visiting Homeopathic Hospitals in West Bengal, India. J Evidence-based Complement Altern Med 2016;21:39-47.
16. Al Bimani ZS, Khan SA, David P. Evaluation of T2DM related knowledge and practices of Omani patients. Saudi Pharmaceutical J. 2015;23:22-7.
17. Al-Maskari F, El-Sadig M, Al-Kaabi JM, Afandi B, Nagelkerke N, Yeatts KB. Knowledge, attitude and practices of diabetic patients in the United Arab Emirates. PloS one. 2013;8:e52857.
18. Anwer I, Shahzad A, Nanji K, Haider F, Ahmad MM. Diabetes mellitus-knowledge, management and complications: survey report from Faisalabad-Pakistan. Middle East J Fam Med. 2017;15:7-12.
19. Khandekar R, Al Harby S, Al Harthy H, Al Lawatti J. Knowledge, attitude and practice regarding eye complications and care among Omani persons with diabetes-A cross sectional study. Oman J Ophthalmol. 2010;3:60.
20. Memon MS, Shaikh SA, Shaikh AR, Fahim MF, Mumtaz SN, Ahmed N. An assessment of knowledge, attitude and practices (KAP) towards diabetes and diabetic retinopathy in a suburban town of Karachi. Pak J Med Sci. 2015;31:183.
21. Al-Mulla AH, Al-Thafar AK, Hussain MAA-S, Ali SI, Al-Dossary SK. Knowledge, attitude and practice toward diabetic retinopathy and retinal examination among diabetic population in Al-Hasa Region, Saudi Arabia: A cross-sectional study. Age. 2017;35:24.2.
22. Siddique MKB, Islam SMS, Banik PC, Rawal LB. Diabetes knowledge and utilization of healthcare services among patients with type 2 diabetes mellitus in Dhaka, Bangladesh. BMC Health Serv Res. 2017;17:586.
23. Ulvi O, Chaudhary RY, Ali T, Alvi RA, Khan M, Khan M, et al. Investigating the awareness level about diabetes mellitus and associated factors in Tarlai (rural Islamabad). J Pak Med Assoc. 2009;59:798-801.
24. Jabbar A, Ebrahim M, Mahmood K. Standard of knowledge about their disease among patients with diabetes in Karachi, Pakistan. J Pak Med Assoc.. 2001;51:216.
25. Binh T, Phuong P, Nhung B. Knowledge and associated factors towards type 2 diabetes among a rural population in the Red River Delta region, Vietnam. Rural Remote Health. 2015;15:3275.