

## Predictors of Awareness and Management Practices of Diabetes among Rural Dwellers of Sindh

Abdul Haseeb<sup>1</sup>, Muhammad Bilal<sup>2</sup>, Waqas Ahmed Farooqui<sup>2</sup>, Hala Soomro<sup>3</sup>, Muhammad Ahad Sher Khan<sup>2</sup>, Khushboo Nusrat<sup>2</sup>, Muhammad Saad<sup>3</sup>, Azka Shabbir<sup>4</sup>, Mohammad Hussham Arshad<sup>1</sup>, Hana Raza<sup>5</sup>, Syeda Maria Ahmad Zaidi<sup>6</sup>, Omaira Anis Bhatti<sup>7</sup>, Fatima Imtiaz Shaikh<sup>6</sup>, Syed Muhammad Shujaiddin<sup>7</sup>, Kainat Islam<sup>8</sup>, Mina Naseem Niazi<sup>6</sup> & Umair Arshad Malik<sup>1</sup>

<sup>1</sup> Aga Khan University Hospital, Karachi, Pakistan

<sup>2</sup> Dow University of Health Sciences, Karachi, Pakistan

<sup>3</sup> Ziauddin University and Hospital, Karachi, Pakistan

<sup>4</sup> Karachi Medical and Dental College, Karachi, Pakistan

<sup>5</sup> Nixor College, Karachi, Pakistan

<sup>6</sup> Karachi Grammar school, Karachi, Pakistan

<sup>7</sup> The Lyceum, Karachi, Pakistan

<sup>8</sup> Cedar College, Karachi, Pakistan

Correspondence: Muhammad Bilal, Dow University of Health Sciences, Karachi, Pakistan, A/215, Block: 5, Gulshan-e-Iqbal, Karachi, Pakistan. Tel: 92-324-222-0872. E-mail: bilalmemon\_744@hotmail.com.

Received: December 21, 2015 Accepted: January 25, 2016 Online Published: September 22, 2016

doi:10.5539/gjhs.v9n5p55

URL: <http://dx.doi.org/10.5539/gjhs.v9n5p55>

### Abstract

**Introduction:** The most substantial method of control for the spread of DM, is the spreading of knowledge and information regarding DM and its complications. Therefore, the objective of this study was to investigate and evaluate the level of knowledge, awareness and management practices among people suffering from DM in the rural areas of Sindh.

**Methodology:** A descriptive cross sectional survey was performed on 400 Diabetes Mellitus (DM) Type 2 patients from March 2015 to June 2015, dwelling in rural areas of Sindh province, South Pakistan. A paper based questionnaire was used to determine sociodemographic features, knowledge and awareness with regards to DM and its complications and last part evaluated management practices to manage diabetes.

**Results:** Only 50% participants knew that DM is a condition of high blood glucose and only 39% considered it as a preventable disease. With regards to management practices, only 65.0% had a home glucometer and 48% regularly checked their blood sugar levels. Family history of DM, BMI, education level, monthly household income, marital status and age were important predictors of knowledge among rural dwellers.

**Conclusion:** Our study has revealed lack of knowledge and inadequate management practices among diabetic patients of rural areas of Sindh, especially in patients attending primary healthcare setups. Management techniques and knowhow of this silent and deadly pathological condition should be spread to rural populace through seminars and media, which would eventually mold their life in a better condition.

**Keywords:** diabetes mellitus, knowledge, management practices, rural dwellers, Sindh

### 1. Introduction

Diabetes mellitus (DM) is a disease, which is caused by the inadequate production of insulin by the body or by the body not being able to properly use the insulin that is produced, thereby resulting in hyperglycemia (Shah, 2004). According to the International Diabetes Federation (IDF), around 366 million people globally are currently estimated to have diabetes, of which 80% live in low and middle income countries (Unwin, Whiting, Guariguata, Ghyoot, & Gan, 2011). In addition DM is also estimated to be the cause of 4.6 million deaths annually world-wide (Unwin, Whiting, Guariguata, Ghyoot, & Gan, 2011). Diabetes is a commonly encountered disease worldwide with a number of complications associated to it, besides mortality, including diabetic retinopathy, neuropathy,

hypertension, stroke, poor blood supply to the limbs, diseases of skin appendages and cardiovascular diseases. These complications have resulted in a significant morbidity and mortality rate which have placed societies all over the world under a great amount of financial stress.

According to the International Diabetes Foundation (IDF), Pakistan had 6.2 million people with diabetes in 2003. By 2025 the number of people affected by diabetes is expected to rise to well over 14.5 million. Six million people are currently suffering from impaired glucose tolerance, and will eventually contract diabetes. Pakistan has the seventh largest population of diabetes in the world, and will take fourth place by the year 2025 (Basit, & Rhys, 2006). Almost 10 % of the adult population of Pakistan suffers from diabetes mellitus (Palma, et al., 2004). Diabetes being a silent disease, is one which goes undiagnosed for many years, as many sufferers only become aware that they have diabetes, when they develop one of its life-threatening complications. The lack of knowledge and awareness among the population of low and middle income countries, can be seen from the fact that, India heads the world with over 62 million diabetic patients and this number is projected to increase to 101 million by 2030 (Anjana, et al., 2011). DM along with its complications places a great burden on the society, as a significant portion of the individuals who suffer from DM are within the reproductive age, which consequently has a negative impact on the country's economy. DM is a manageable disease as lifestyle interventions (e.g. physical activity and weight loss) have proven to be more effective than medicine in preventing or delaying the onset of DM in persons at high risk of developing the disease (Yamaoka & Tango, 2005). Whereas, the most substantial method of control for the spread of DM, is the spreading of knowledge and information regarding DM and its complications. Since learning about DM risk factors and preventive measures is the first step in prevention, only then will it enable the public to make the informed decision of adopting a healthy lifestyle (Bowman et al., 2003).

While there have been a number of studies on DM, its risk factors and complications there have been no studies regarding the knowledge of this disease in the rural areas of Sindh. Hence, there is a dire need for a greater number of such studies, which would help in designing and implementing an educational program about DM for a vast majority of the people in developing countries. The objective of this study was to identify, investigate and evaluate the level of knowledge, awareness and management practices among people suffering from DM in the rural areas of Sindh.

## **2. Methodology**

### *2.1 Study Design and Setting*

A descriptive cross sectional survey was performed on 400 Diabetes Mellitus (DM) Type 2 patients from March 2015 to June 2015, dwelling in rural areas of Sindh province, South Pakistan. Half of the participants (200) were recruited from Outpatient department (OPD) of Civil Hospital Karachi. This government ran civil hospitals provide tertiary care treatment free of cost, so it serves as a basic tertiary health care provider for rural dwellers and participants residing in outskirts of city area who cannot afford the cost of treatment at other tertiary care setups. However, the other half of rural population was recruited from a primary care setup located in outskirt of Karachi.

The sample size of 384 was calculated by assuming the percentage knowledge of DM among rural dwellers to be 50 % at 95% level of significance and 5% confidence limit. However, 400 participants were recruited for the cross sectional survey.

To meet the inclusion criteria, subjects of minimum age 18 having this condition for more than 6 months were included in the study. However, participants of age less than 18 years and suffering from type 1 DM were excluded from the study.

### *2.2 Data Collection Procedure*

We employed non probability convenience sampling method to recruit 400 subjects from OPD of both primary and tertiary health care setups. A 3 page questionnaire based on English language was presented to the study subjects by people belonging to medical profession including nurses, clinical officers and nutritionist. A verbal and written informed consent was obtained from the study subjects after a brief introduction on study and its objective. The subjects who did not understand English, were interviewed in their local language Sindhi. Later, responses were back translated in English before entering information into questionnaire and handed over to research supervisor.

Initially, a pilot study was also conducted on 30 subjects who fulfilled the inclusion criteria in such a way that 15 subjects were enrolled from each setting. The data obtained from pilot study was not included in the final study. The feedback and responses obtained from investigators and participants were used to remove ambiguities from questionnaire before its final implementation in the full-scale research.

### 2.3 Data Collection Tool

We used paper based collection tool, which comprised of 3 parts. The variables were used from pre-designed and pre-tested questionnaires of previous studies. First part was based on questions related to sociodemographic conditions of participants and brief clinical history. Second part was based on questions which were supposed to test knowledge of participants with regards to DM and complications associated with it. Lastly, subjects were presented with questions regarding management methods to determine their management practices. The entire tool consisted of close ended questions only.

### 2.4 Ethical Consideration

The research protocol was approved by the Ethical Review Board of Dow University of Health Sciences. Additionally, permissions were obtained prior to study from respective hospitals.

### 2.5 Statistical Analysis

SPSS version 19 was used for data entry and data analysis. All the categorical variables under study were described with frequency and percentages. Age, BMI, random blood sugar and fasting blood sugar were taken as continuous variables and were presented as mean  $\pm$  SD. At invariable analysis stage, chi-square test was run to check association of Knowledge with gender, age groups, marital status, education level, household income, and family history of diabetes. Bivariate logistic regression model was executed to obtain crude odds ratio assessing likelihood of Knowledge due to individual factors under study. Results were reported as odds ratio with 95% confidence interval. The value of 0.05 was set as threshold for showing significant association between Knowledge status and demographics factors under study. The same procedure of analysis was repeated for management variables. All analysis was done separately for primary and tertiary care setups.

## 3. Results

A total of 400 subjects participated in the study. There were 200 patients from primary health care; out of which 185 (93%) were females and 15 (8%) were males. Among 200 subjects from tertiary care; 70 (35%) females and 130 (65%) males were recruited. The ratio of primary to tertiary hospital subjects was 1:1 (Table 1). The mean age of primary care hospital patients was  $45.9 \pm 4.9$  years while in Tertiary it was found to be  $60.2 \pm 12.6$  years. With regards to age, 225 subjects were in the age group of 40 to less than 65. Seventy four percent of the subjects were married. However, only 19% of the subjects were post graduates and 27.5% had no education. Furthermore, one hundred and six subjects (26.5%) earned in the range of 14001 – 50,000 PKR. And 40 % of the DM patients were overweight (BMI:  $23 < 27.5$ ). Moreover, 49% of the participants had family history of Diabetes. The demographic features are illustrated in Table 1 where as Table 2 depicts Mean (SD) of Age, BMI, Random Blood Sugar and Fasting Blood Sugar Levels of our study population.

Table 1. Sociodemographic features of study participants

Characteristics	Primary (n = 200)	Tertiary (n = 200)	Grand Total (n = 400)
<b>Gender</b>			
Female	185 (93%)	70 (35%)	255 (64%)
Male	15 (8%)	130 (65%)	145 (36%)
<b>Age Groups</b>			
15 - < 25	10 (5%)	5 (2.5%)	15 (3.8%)
25 - < 40	50 (25%)	5 (2.5%)	55 (13.8%)
40 - < 65	115 (57.5%)	110 (55%)	225 (56.3%)
65 and above	25 (12.5%)	80 (40%)	105 (26.3%)
<b>Marital Status</b>			
Single	25 (12.5%)	10 (5%)	35 (8.8%)
Married	125 (62.5%)	170 (85%)	295 (73.8%)
Widowed	50 (25%)	15 (7.5%)	65 (16.3%)
Divorced	0 (0%)	5 (2.5%)	5 (1.3%)

<b>Education Level</b>			
No Education	100 (50%)	10 (5%)	110 (27.5%)
Primary	45 (22.5%)	10 (5%)	55 (13.8%)
Secondary	15 (7.5%)	5 (2.5%)	20 (5%)
Matric	20 (10%)	15 (7.5%)	35 (8.8%)
Intermediate	5 (2.5%)	45 (22.5%)	50 (12.5%)
Undergraduate	15 (7.5%)	40 (20%)	55 (13.8%)
Postgraduate	0 (0%)	75 (37.5%)	75 (18.8%)
<b>Income Household</b>			
1000 - 7000	73 (36.5%)	0 (0%)	73 (18.3%)
7001 - 14000	76 (38%)	0 (0%)	76 (19%)
14001 - 50000	51 (25.5%)	55 (27.5%)	106 (26.5%)
50001 - 100000	0 (0%)	95 (47.5%)	95 (23.8%)
>100000	0 (0%)	50 (25%)	50 (12.5%)
<b>BMI</b>			
Underweight (<18.5)	10 (5%)	10 (5%)	20 (5%)
Normal Weight (18.5 - < 23)	70 (35%)	45 (22.5%)	115 (28.8%)
Overweight (23 - < 27.5)	80 (40%)	80 (40%)	160 (40%)
Greater than or Equal to 27.5	40 (20%)	65 (32.5%)	105 (26.3%)
<b>Family History Diabetes</b>			
No	100 (50%)	105 (52.5%)	205 (51.3%)
Yes	100 (50%)	95 (47.5%)	195 (48.8%)

Table 2. Mean (SD) of Age, BMI, Random Blood Sugar, Fasting Blood Sugar Levels

Health Care Hospital	Age (years)	BMI (kg/m <sup>2</sup> )	Random Blood Sugar	Fasting Blood Sugar
Primary	45.9 (14.9)	24.2 (3.9)	271 (89.2)	160.6 (102.5)
Tertiary	60.2 (12.6)	25.5 (4.9)	220.9 (80.8)	143.3 (49.4)
Overall	53.1 (15.5)	24.9 (4.5)	245.9 (88.6)	152 (80.8)

Table 3. Knowledge of Diabetes and complications associated with it

Characteristics	Primary (n = 200)	Tertiary (n = 200)	Grand Total (n = 400)
<b>Are you aware of any complications of DM</b>	110 (39.3%)	170 (60.7%)	280(70%)
<b>Which of the following complications of Diabetes are you aware of?</b>			
Coronary artery disease	100 (37.7%)	165 (62.3%)	265(66.3%)
Kidney Disease	110 (39.3%)	170 (60.7%)	280(70%)
Nerve Disease	50 (30.3%)	115 (69.7%)	165(41.3)
Eye Disease	85 (34.7%)	160 (65.3%)	245(61.3%)
Dementia	10 (9.1%)	100 (50.0%)	110(27.5)
Foot Ulcers	95 (40.4%)	140 (59.6%)	235(58.9%)
Increased Urination	120 (43.6%)	155 (56.4%)	275(68.8%)
Increased Thirst	100 (36.4%)	175 (63.6%)	275(68.8%)

Stroke	20 (13.8%)	125 (86.2%)	145(36.3%)
Weight Loss	60 (27.9%)	155 (72.1%)	215(53.8)
<b>Diabetes Mellitus is a Condition of High Blood Glucose</b>	45 (22.5%)	155 (77.5%)	200(50.0%)
<b>Diabetes Mellitus is Caused Increased Intake Dietary Sugar</b>	50 (24.4%)	155 (75.6%)	205(51.3%)
<b>Diabetes Mellitus is a condition in which blood fails to produce Insulin</b>	15 (10%)	135 (90%)	150(37.5%)
<b>Diabetes Mellitus is a preventable disease</b>	30 (19.4%)	125 (80.6%)	155(38.8%)
<b>Overall Knowledge</b>	70 (29.2%)	170 (70.8%)	240(60.0%)

Table 4. Self-care practices among Diabetic patients

<b>Characteristics</b>	<b>Primary (n = 200)</b>	<b>Tertiary (n = 200)</b>	<b>Grand Total (n = 400)</b>
<b>Do you have a home Glucometer</b>	80 (30.8%)	180 (69.2%)	260(65.0%)
<b>Do you regularly check your blood Sugar levels</b>	63 (33%)	128 (67%)	191(47.8)
<b>Have you ever admitted due to diabetes complications</b>	40 (50%)	40 (50%)	80(20.0%)
<b>What practices do you carry out to control your Diabetes</b>			
Attending Clinic on Follow-up for diabetes	10 (9.1%)	100 (50.0%)	110(27.5)
Undergoing Physical Exercise	70 (42.4%)	95 (57.6%)	165(41.3%)
Maintaining Ideal Weight	60 (35.3%)	110 (64.7%)	170(42.5%)
Taking Medications on time	190 (55.9%)	150 (44.1%)	340(85.0%)
Following Suitable diet	115 (48.9%)	120 (51.1%)	235(58.8%)
Cutting toe nails	60 (30.8%)	135 (69.2%)	195(48.8%)
Checking RBS regularly	90 (43.9%)	115 (56.1%)	205(51.3%)
Lifestyle Modification	60 (34.3%)	115 (65.7%)	175(43.8%)
<b>Which method do you use to check blood sugar</b>			
Glucometer	115 (48.5%)	128 (54%)	243(60.8%)
Urine dipstick	60 (23.1%)	2 (0.8%)	62(15.5%)
<b>Which Diabetes medications do you use</b>			
Insulin	35 (46.7%)	40 (53.3%)	75(18.8)
Tablet	150 (51.7%)	140 (48.3%)	290(72.5)
Tablet & Insulin	15 (42.9%)	20 (57.1%)	35(8.75%)
<b>How often do you consult your doctor for diabetes</b>			
Never	10 (66.7%)	5 (33.3%)	15(3.75%)
Every Month	145 (85.3%)	25 (14.7%)	170(42.5%)
Every 3-6 Months	35 (31.8%)	75 (68.2%)	110(27.5%)
Every 6-12 Months	0 (0%)	45 (100%)	45(11.3%)
Greater than 12 Months	10 (16.7%)	50 (83.3%)	60(15.0%)
<b>How often do you consult for an eye exam</b>			
Never	100 (52.9%)	89 (47.1%)	189(47.3%)
Every year	45 (42.5%)	61 (57.5%)	106(26.5%)
Every 1 - 3 years	45 (52.9%)	40 (47.1%)	85(21.3%)
3 - 5 years	10 (50%)	10 (50%)	20(5.0%)

<b>Is your diabetes well controlled</b>			
Never	15 (75%)	5 (25%)	20(5.0%)
Sometimes	80 (66.7%)	40 (33.3%)	120(30.0%)
Often	60 (44.4%)	75 (55.6%)	135(33.8%)
Always	45 (36%)	80 (64%)	125(31.3)
<b>Barriers towards self-testing for diabetes</b>			
Don't feel the need	70 (38.9%)	110 (61.1%)	180(45.0%)
Expensive	90 (60%)	60 (40%)	150(37.5%)
Lack of awareness	25 (71.4%)	10 (28.6%)	35(8.75)
Pain	15 (75%)	5 (25%)	20(5.0%)
Risk of Infection	0 (0%)	15 (7.5%)	15(3.75%)
<b>Impact of Diabetes Mellitus on life</b>			
No Effect	25 (41.7%)	35 (58.3%)	60(15.0%)
Some Effect	50 (32.3%)	105 (67.7%)	155(38.8%)
Intermediate Effect	60 (57.1%)	45 (42.9%)	105(26.3%)
Severe Effect	65 (81.3%)	15 (18.8%)	80(20.0%)

Table 5. Role of sociodemographic features with Knowledge of diabetes

Characteristics	Primary Care Hospital		Tertiary Care Hospital	
	OR <sup>a</sup> (95% CI)	P-value	OR <sup>a</sup> (95% CI)	P-value
<b>Descriptive Measures</b>				
<b>Gender</b>				
Male	1		1	
Female	1.08 (0.36 - 3.3)	0.888	0.48 (0.22 - 1.05)	0.065
<b>Marital Status</b>				
Single	1		1	
Married	1.18 (0.49 - 2.83)	0.713	5.8 (1.57 - 21.5)	0.009**
Widowed	0.17 (0.05 - 0.57)	0.004**	-	-
<b>Level of Education</b>				
No Education	1		1	
Primary	0.86 (0.37 - 1.98)	0.718	-	-
Secondary	1.5 (0.47 - 4.81)	0.495	-	-
Matric	9 (2.97 - 27.27)	<0.001**	-	-
Undergraduate	6 (1.87 - 19.24)	0.003**	-	-
<b>Monthly Household Income</b>				
1000 - 7000	1		1	
7001 - 14000	1.3 (0.64 - 2.62)	0.465	4.86 (2.07 - 11.42)	<0.001**
14001 - 50000	2.55 (1.2 - 5.41)	0.015*	-	-
<b>Body Mass Index - Asian Category</b>				
Underweight (<18.5)	1		1	
Normal Weight (18.5 - < 23)	-	-	3.5 (0.84 - 14.55)	0.085
Overweight (23 - < 27.5)	-	-	7 (1.72 - 28.55)	0.007**
Obese I & II (≥ 27.5)	-	-	12 (2.58 - 55.93)	0.002**

**Family History of diabetes**

No	1		1	
Yes	6.93 (3.52 - 13.61)	<0.001**	-	-

OR<sup>a</sup> = unadjusted odds ratios, CI = confidence intervals.

\*\*Significant at 1% ; \*Significant at 5%

Table 6. Role of sociodemographic features with Self-Care practices of diabetes

Characteristics	Primary Care Hospital		Tertiary Care Hospital	
	OR <sup>a</sup> (95% CI)	P-value	OR <sup>a</sup> (95% CI)	P-value
<b>Descriptive Measures</b>				
<b>Gender</b>				
Male	1		1	
Female	0.28 (0.09 - 0.92)	0.036*	0.92 (0.48 - 1.76)	0.803
<b>Marital Status</b>				
Single	1		1	
Married	1.18 (0.5 - 2.79)	0.715	2.95 (0.82 - 10.7)	0.099
Divorced	-	-	1.5 (0.17 - 13.23)	0.715
Widowed	0.92 (0.35 - 2.43)	0.869	2 (0.39 - 10.31)	0.407
<b>Level of Education</b>				
No Education	1		1	
Primary	0.74 (0.36 - 1.52)	0.417	-	-
Secondary	0.61 (0.2 - 1.92)	0.399	-	-
Matric	1.22 (0.47 - 3.2)	0.682	-	-
Undergraduate	2.44 (0.78 - 7.67)	0.126	-	-
<b>Monthly Household Income</b>				
1000 - 7000	1		1	
7001 - 14000	2.06 (1.06 - 4.02)	0.034*	0.56 (0.25 - 1.27)	0.164
14001 - 50000	3.66 (1.73 - 7.77)	<0.001**	0.4 (0.16 - 0.97)	0.042*
<b>Body Mass Index - Asian Category</b>				
Underweight (<18.5)	1		1	
Normal Weight (18.5 - < 23)	-	-	2 (0.5 - 8)	0.327
Overweight (23 - < 27.5)	-	-	4.33 (1.11 - 16.9)	0.035*
Obese I & II (≥ 27.5)	-	-	2.25 (0.59 - 8.65)	0.238
<b>Family History of diabetes</b>				
No	1		1	
Yes	0.85 (0.49 - 1.49)	0.57	1.12 (0.6 - 2.09)	0.721

OR<sup>a</sup> = unadjusted odds ratios, CI = confidence intervals.

\*\*Significant at 1% ; \*Significant at 5%.

Out of the 400 participants, only 50% participants knew that DM is a condition of high blood glucose, 51% responded correctly that DM is caused by increased intake of dietary sugar and 39% considered it as a preventable disease. Furthermore, 70% participants responded that they are aware of any complications of diabetes; where only 66% regarded CAD to be the complication of diabetes. Strikingly, only 27.5% regarded dementia as the

complication of diabetes. The individual frequencies and percentages obtained for variables regarding knowledge of complications and condition of DM are depicted in Table 3.

With regards to management practices, only 65.0% had a home glucometer and 48% regularly checked their blood sugar levels. When asked about the practices to control diabetes, taking medications on time was the most popular response (85.0%) followed by suitable diet (58%) and checking RBS regularly (51%). Sixty participants responded that they visit their doctor for diabetes in a time period greater than 12 months, whereas 60% never visited their doctor for an eye exam. The greatest barrier towards self-testing for diabetes was feeling that there is no need to carry out this practice (45.0%) followed by expensive procedure (37.5%). Lastly, only 15.0% thought that DM has no impact on one's life. The individual frequencies and percentages obtained for variables regarding management practices of Diabetes are depicted in Table 4. Furthermore, Table 5 illustrates correlation of sociodemographic features with knowledge of diabetes and Table 6 highlights role of sociodemographic features with Self-Care practices of diabetes in our study participants.

### **Family History**

Presence of diabetes in the family was reported by 50% of the participants in primary care and 47.5% in tertiary care hospital. Knowledge was higher among participants with family history of diabetes (OR = 6.93 95% CI: 3.52 - 13.61,  $P < 0.0001$ ). However, there was no correlation of management practices with family history of Diabetes ( $P > 0.05$ ).

### **Body mass index**

Eighty participants (40%) were found to be overweight in both the settings. Seventy participants (35%) were normal weight followed by 40 subjects were obese (20%) in primary setting. Moreover, 45 subjects were normal weight (22.5%) and 65 patients (32.5%) were found to be obese in tertiary care settings. In tertiary care setting it was deduced that obese patients had 12 times (OR = 12, 95% CI: 2.58 - 55.93,  $P = 0.002$ ), overweight patients have 7 times (OR = 7, 95% CI: 1.72 - 28.55,  $P = 0.007$ ) and normal weight patients have 3.5 times (OR = 3.5, 95% CI: 0.84 - 14.55,  $P = 0.085$ ) greater knowledge of Diabetes than underweight diabetic patients. It was also established that overweight patients have 4 times greater management practices than underweight patients (OR = 4.33, 95% CI: 1.11 - 16.9,  $P = 0.035$ ).

### **Monthly Household Income**

Seventy five percent patients (N=150) in tertiary care had monthly house hold income between 14,000- 100000 PKR whereas 149 subjects in primary care setup (74.5%) had monthly household income less than or equal to 14,000 PKR. Furthermore, our results indicated that subjects in primary care with monthly house hold income between 14001-50000 had 2.5 times greater (OR = 2.55, 95% CI: 1.2 - 5.41,  $P = 0.015$ ) and subjects in tertiary care having monthly house hold income between 7001-14000 had 4 times greater knowledge of Diabetes (OR = 4.86, 95% CI: 2.07 - 11.42,  $P < 0.001$ ) than participants having income in the range of 1000-7000 PKR. Consequently, participants in primary health care having income between 14001-50,000 PKR exhibited 3 times greater management practices (OR = 3.66, 95% CI: 1.73 - 7.77,  $P < 0.001$ ).

### **Education Level**

In the primary setting, 100 subjects (50%) had no education whereas in tertiary care setup, 115 (57.5%) patients were either postgraduates or undergraduates. According to our results, Matriculated participants in primary setting were 9 times more knowledgeable than participants who had no education (OR = 9.0, 95% CI: 2.97 - 27.27,  $P < 0.001$ ). With regards to management practices, as the level of education increased, level management practices improved significantly ( $P < 0.001$ ).

### **Marital Status**

Eighty five percent subjects (N=170) were married in tertiary care setting whereas 62.5% (N=125) patients were married in primary care setting. In tertiary care setting, married people were found to have 6 times more knowledge regarding Diabetes than singles (OR = 5.8, 95% CI: 1.57 - 21.5,  $P = 0.009$ ). However, marital status was found to have no correlation with management practices in both settings ( $P > 0.05$ ).

### **Age Groups**

More than half of the study subjects (56.3%) were found to be in age group of 40- <65 years. Age groups had positive correlation with knowledge of diabetes; as the levels of knowledge increased with increase in knowledge in primary care setting ( $P < 0.001$ ). Similarly, levels of management practices also increased with increment in age in both the primary and tertiary care setting ( $P = 0.006$  vs  $P = 0.002$ ).



## Gender

Gender was found to have no significant correlation with knowledge of diabetes ( $P > 0.05$ ). However, females in primary care setting exhibited reduced management practices than males (OR = 0.28, 95% CI: 0.09 – 0.92,  $P = 0.036$ )

## 4. Discussion

Our study shows that the tertiary diabetic patients are much more educated about diabetes when compared with the primary diabetic patients. Similarly, management practices among tertiary patients is also greater as compared to the primary patients. The lack of knowledge of risk factors of DM may impede preventive efforts such as the adoption of positive lifestyle changes. Therefore, a knowledge based perception of personal risk for the disease appears to be an important factor in many preventive health behaviors (Janz & Becker, 1984).

On the other hand, non-communicable diseases like diabetes and hypertension are more common in affluent societies of Pakistan. The main causes for diabetes being a higher consumption of soft drinks, taking fatty meals and a sedentary life style. Hence there is an urgent need for intensifying diabetes education measures to the community at large and to diabetics in particular. Imparting knowledge about diabetes to the community is the first step in prevention and early detection of the disease and prevention of its complications (Deshpande, Harris-Hayes, & Schootman, 2008). We found that there is a significant link between family history of diabetes and knowledge regarding the disease, as one has many opportunities to learn about the disease, its causes, complications and treatments when taking care of that family member. This suggests that many of those who are aware of the disease, are only aware due to an affected family member rather than the national education system.

Strikingly, only 50% of the study population reported that DM is a condition of high blood glucose level. Though overall, the knowledge about diabetes was low, there was a marked regional variation in unawareness levels varying from 30% in tertiary hospitals to 70% in primary hospitals. Two similar surveys conducted in Chennai in 2005 (Mohan et al., 2005) and 2007 (Mohan et al., 2005), reported that only 25% and 10% of the participants, respectively had not heard of diabetes. Our results indicated that, the level of knowledge regarding diabetes also increases with marital status, as married individuals face greater responsibilities and have to take care of their family. Similarly, our study showed that the average monthly income which ranged between fourteen and fifty thousand rupees, had a positive relationship with that of the knowledge among people with this income or more. With a greater income the people were able to afford a greater level of education and better health care, therefore having a greater understanding of the disease.

Studies in India and Pakistan showed that obesity and over weight problems are less potent in rural areas as compared to urban areas (Lau et al., 2009). This may be due to consuming whole grain meals rather than refined meals and being more physically active and less sedentary than the urban people (Nisar, Khan, Qudri, & Sher, 2008). On the other hand, the level of knowledge among such people would be considerably greater as shown by our study, the amount of knowledge improves with BMI moving from normal to overweight with obese patients having the greatest knowledge. Whereas the management practices were considerably greater in overweight patients. In another study, it was shown that adults had poor diets, refrained from physical activity, and sometimes even knowingly put themselves at risk for diseases such as diabetes, hypertension, and heart disease (Rafique, & Khuwaja, 2003). Additionally, it was seen that amongst even the most populated city of Pakistan, the risk factors of diseases such as Diabetes Mellitus were rampant and the need for patient education and public awareness was significant (Dodani et al., 2005). As prevention of diabetes is primarily dependent on altering lifestyle and increasing levels of physical activity, changing societal perceptions of health and improving knowledge about the risk factors of diabetes and steps to promote physical activity must receive urgent attention of policy makers and healthcare planners (Ramachandran et al., 2004).

Additionally, only 70% of the people were aware of the presence of diabetic complications with only 40% from primary care hospitals. Coronary artery disease perhaps the most well-known complication was only apparent to 65% of the patients with 37.7% being from the primary health-care centers. Another matter of concern is that overall, only about 38% of the population was aware that diabetes could be prevented and 35% knew it was caused by a lack of insulin production. This finding is in agreement with that of Unadike et al. who reported that only few respondents in Uyo (Nigeria), knew that lack of insulin can cause diabetes (Unadike, & Chineye, 2009). Knowledge of the visible complications of DM such as loss of vision, poor wound healing and amputations appeared to be somewhat better than knowledge of non-visible complications such as heart failure, kidney failure and stroke. This observation is consistent with findings reported by Unadike et al. (Unadike, & Chineye, 2009) and Muninarayana *et al* (Muninarayana, Hiremath, Krishna, & Anil, 2010). This lack of knowledge can be explained by the educational status of the people as half of the patients were uneducated in primary hospitals, while only 37.5%

were postgraduates in tertiary hospitals. Our study showed a direct link between knowledge of diabetes and the level of education, with the educated having nine times greater amount of knowledge than the uneducated people. At the same time, as the age of an individual increases so does their knowledge about the disease as well as their ability to provide management. Lastly, our study did not show any link between gender and an understanding of the disease. However, there was a significant difference between the management practices of men and women, as more men were seen to be comparatively more active than their female counterparts. One reason for this finding could be the low female literacy rate in Pakistan (Fact Sheet; Pakistan. United Nations Publication, 2003).

Apart from adequate knowledge, management practices is also essential for diabetic patients (Bin-Afif & Al-Mubarak, 2006). Therefore, attitudes and management practices of diabetic patients has been subjected to research in previous studies as well (Shah, Kamdar, & Shah, 2009; Azar et al., 2013). Taking medications on time was the most worked upon in practices to manage Diabetes. However, very few participants responded for maintaining ideal weight and daily physical exercise. This suggests that physicians must emphasize their patients on these areas to avoid getting diabetes related complications. Alarming, only 48% subjects regularly monitored their sugar levels. This is in direct contrast to finding of other researches where greater proportion of participants monitored their blood sugar levels regularly (Lombardo, Salzano, Messina, & De-Luca, 2003), which further highlights their positive attitudes towards DM. Similarly, few patients kept glucometer at home. Furthermore, compliance with regards to physician visit for DM and eye checkup was also low. Previous studies have linked this low compliance with insufficient knowledge and negative attitudes of study subjects towards Diabetes (Lombardo, Salzano, Messina, & De-Luca, 2003). These alarming results must be taken into consideration by healthcare authorities in order to reduce the burden of morbidities associated with DM in rural areas of Sindh. Awareness programs directing diabetic and non-diabetic patients must be initiated urgently as it is expected for the diabetic patients in Pakistan to escalate to the fourth highest in the world (Diabetologia, 2012). With the increase in numbers of diabetics, there is a need to improve health care facilities to cater for the projected increase in complications.

Although this study has provided useful information about the state of awareness of DM and management practices among diabetic patients attending the primary and tertiary hospitals in rural areas of Sindh, certain limitations must be acknowledged. As the majority of our study participants had no formal education, accurate administration of our questionnaires (written in English) depended on the translation of the interviewer, which could have in some way introduced a translation bias. Similarly, the documentation of responses also depended on the interviewer's understanding of the response, which could have also been subjected to bias or misrepresentation. Secondly, responses to most questions were self-reported and no references was made to medical reports/charts as these documents were hardly available. This reliance on self-reporting may be prone to "recall bias". Third, the use of certain instruments as well as certain practices carried out by the patients, again cannot be relied upon. Nevertheless, the present findings lay the groundwork for further similar studies in other parts of the country.

## 5. Conclusion

Our study has revealed lack of knowledge and inadequate management practices among diabetic patients of rural areas of Sindh, especially in patients attending primary healthcare setups. The results emphasize that prompt actions must be taken to increase the level of awareness among rural subject. Hence, educating the masses about diabetes should be the major task of healthcare authorities. General physicians must educate their patients about the negative impact of diabetes on their lives due to its potential consequences and morbidities associated with it. Furthermore, management techniques and knowhow of this silent and deadly pathological condition should be spread to rural populace through seminars and media, which would eventually mold their life in a better condition.

## Funding

There was no funding for this research.

## Competing Interests Statement

The authors declare that there is no conflict of interests regarding the publication of this paper.

## References

- Anjana, R. M., Pradeepa, R., Deepa, M., Datta, M., Sudha, V., & Unnikrishnan, R. (2011). Prevalence of diabetes and prediabetes (impaired fasting glucose and/or impaired glucose tolerance) in urban and rural India: Phase I results of the Indian Council of Medical Research-India DIABetes (ICMR-INDIAB) study. *Diabetologia*, 54, 3022-7. PMID:21959957. <http://dx.doi.org/10.1007/s00125-011-2291-5>
- Azar, S. T., Malha, L. P., Zantout, M. S., Naja, M., Younes, F., & Sawaya, M. T. (2013). Management and control of patients with type 2 diabetes mellitus in Lebanon: results from the International Diabetes Management

- Practices Study (IDMPS). *Le Journal medical libanais The Lebanese medical journal*, 61(3), 127-31.
- Basit, A., & Rhys W. (2006). World Diabetes Day. Promoting care in underserved communities: Launching World Diabetes Day in Karachi, Volume 51 Issue 2.
- Bin-Afif, S., & Al-Mubarak, S. (2006). Level of knowledge in diabetes medical care and disease complication among Saudi diabetics. *Saudi medical journal*, 27(12), 1926-8. PMID:17143383
- Bowman, B., Gregg, E., Williams, D., Engelgau, M., & Jack, L. (2003). Translating the science of primary, secondary, and tertiary prevention to inform the public health response to diabetes. *J Public Health Manag Pract*, 9, S8-S14. <http://dx.doi.org/10.1097/00124784-200311001-00002>
- Deshpande, A. D., Harris-Hayes, M., & Schootman, M. (2008). Epidemiology of diabetes and diabetes-related complications. *Phys Ther*, 88, 1254-64. PMID:PMC3870323. <http://dx.doi.org/10.2522/ptj.20080020>
- Dodani, S., Mistry, R., Khwaja, A., Farooqi, M., Qureshi, R., & Kazmi, K. (2005). Prevalence and awareness of risk factors and behaviors of coronary heart disease in an urban population of Karachi, the largest city of Pakistan: a community survey. *J Public Health*, 27, 309-10. PMID:15985444. <http://dx.doi.org/10.1093/pubmed/fdi041>
- Fact Sheet Pakistan. (2012). United Nations Publication.
- Janz, N., & Becker, M. (1984). The Health Belief Model: A decade later. *Health Educ Q*, 11, 1. PMID:6392204. <http://dx.doi.org/10.1177/109019818401100101>
- Lau, S. L., Debarm, R., Thomas, N., Asha, H. S., Vasani, K. S., & Alex, R. G. (2009). Healthcare Planning in North-East India: A Survey on Diabetes Awareness, Risk Factors and Health Attitudes in a Rural Community. *J Assoc Physicians India*, 57, 305-9. PMID:19702036
- Lombardo, F., Salzano, G., Messina, M.F., & De-Luca, F. (2003). How self-management therapy can improve quality of life for diabetic patients. *Acta bio-medica: Atenei Parmensis*, 74(Suppl 1), 26-8.
- Mohan, D., Raj, D., Shanthirani, C.S., Datta, M., Unwin, N. C., & Kapur, A. (2005). Awareness and knowledge of diabetes in Chennai – The Chennai Urban Rural Epidemiology Study [CURES-9]. *J Assoc Physicians India*, 53, 283-7. PMID:15987011
- Muninarayana, C., Hiremath, G., Krishna, I., & Anil, N.S. (2010). Prevalence and awareness regarding diabetes mellitus in rural Tamaka, Kolar. *Int J Diabetes Dev Ctries*, 30(1), 18-21. PMID:20431801 PMID:PMC2859279. <http://dx.doi.org/10.4103/0973-3930.60005>
- Murugesan, N., Snehalatha, C., Shobhana, R., Roglic, G., & Ramachandran, A. (2007). Awareness about diabetes and its complications in the general and diabetic population in a city in southern India. *Diabetes Res Clin Pract*, 77, 433-7. PMID:17291622. <http://dx.doi.org/10.1016/j.diabres.2007.01.004>
- Nisar, N., Khan, I. A., Qudri, M. H., & Sher, S. A. (2008). Knowledge and risk assessment of diabetes mellitus at primary care level: A preventive approach required combating the disease is developing country. *Pak J Med Sci*, 24, 667-72.
- Palma, G. J. L., Hernandez, M. A., Bertomeu, M. V., Gonzalez-Juanatey, J. R., Lopez, G. A. V., Calderon, M. A., Alegria, E.E., & Cadierno, C.M. (2004). Diabetes mellitus in clinical cardiology in Spain. Survey by the working group on the heart and diabetes regarding the importance of diabetes mellitus in relation with other cardiovascular diseases. *Rev Esp Cardiol*, 57(7), 661-666.
- Rafique, G., & Khuwaja, A. K. (2003). Diabetes and hypertension: public awareness and lifestyle - findings of a health mela. *J Coll Phys Surg Pak*, 13, 679-83. PMID:15569550
- Ramachandran, A., Snehalatha, C., Baskar, A. D., Mary, S., Kumar, C. K., & Selvam, S. (2004). Temporal changes in prevalence of diabetes and impaired glucose tolerance associated with lifestyle transition occurring in the rural population in India. *Diabetologia*, 47, 860-5. PMID:15114469 <http://dx.doi.org/10.1007/s00125-004-1387-6>
- Shah, M. A. (2004). Diabetes mellitus increasing at alarming rate. *The News*.
- Shah, V. N., Kamdar, P. K., & Shah, N. (2009). Assessing the knowledge, attitudes and practice of type 2 diabetes among patients of Saurashtra region, Gujarat. *International journal of diabetes in developing countries*, 29(3), 118-22. PMID:20165648 PMID:PMC2822215. <http://dx.doi.org/10.4103/0973-3930.54288>
- Skriver, M. V., Støvring, H., Kristensen, J. K., Charles, M., & Sandbæk, A. (2012). Short-term impact of hba1c on morbidity and all-cause mortality in people with type 2 diabetes: A danish population-based observational

- study. *Diabetologia*, 55(9), 2361-70. PMID:22736395. <http://dx.doi.org/10.1007/s00125-012-2614-1>
- Unadike, B. C., & Chineye, S. (2009). Knowledge, awareness, and impact of diabetes among adolescents in Uyo, Nigeria. *African Journal of Diabetes Medicine*, 3, 12-14.
- Unwin, N., Whiting, D., Guariguata, L., Ghyoot, G. & Gan, D. (2011). Diabetes Atlas. *International Diabetes Federation*, 11-74.
- Yamaoka, K., & Tango, T. (2005). Efficacy of lifestyle education to prevent type 2 diabetes. *Diabetes Care*. 28(11), 2780-86. PMID:16249558. <http://dx.doi.org/10.2337/diacare.28.11.2780>

### Copyrights

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).