

# Diabetes Knowledge in Elderly Type 2 Diabetes Mellitus Patients and Association with Glycemic Control

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## ABSTRACT

**BACKGROUND:** With the increased life expectancy, there is rise in geriatric diabetic population. A knowledgeable diabetic in collaboration with physician can contribute to a successful diabetes management plan. Current study was conducted to determine the diabetes knowledge, its associations and risk factors in elderly type 2 diabetics.

**METHODS:** This descriptive cross sectional study was conducted at outdoor Medicine Dept. Rawal Institute of Health Sciences Islamabad over 8 months period from January to August 2015. Geriatric type 2 diabetics (>65 years) were included. Critically ill patients, having physical or mental limitation to answer the questionnaire were excluded. The demographic details, socioeconomic class, literacy level, duration of diabetes, other modes of therapy and glycemic control documented. Michigan Diabetes Knowledge Questionnaire (DKQ-24) was applied with outcome of diabetes knowledge as good, acceptable and poor. Data analyzed by SPSS version 17 with significant p-value < 0.05.

**RESULTS:** Among 163 diabetics (21.5% males and 78.5% females), mean age was 64.7+5.6 years and mean duration of diabetes 8.4+6.6 years. Diabetes knowledge was poor in 86(52.8%), acceptable in 37(22.7%) and good in 40(24.5%) diabetics. Poor diabetes knowledge was found to be associated with illiteracy, poverty, unsatisfactory glycemic control, practicing other modes of therapy and poor dietary control.

**CONCLUSION:** The unsatisfactory diabetes knowledge in geriatric diabetic population needs to be addressed. Illiteracy and low socioeconomic class are the contributory factors in addition to advanced age. Imparting knowledge to geriatric group about diabetes and its complications, dietary advice supplemented by easy to interpret diet charts and literature may lead to empowerment of geriatric diabetics for better diabetic control and reduced diabetes related morbidity.

**KEY WORDS:** Diabetes Mellitus, Diabetes Knowledge, Glycemic Control.

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## INTRODUCTION

Diabetes mellitus is an emerging health problem faced by developing countries during last few decades. According to IDF Diabetes Atlas 2013, estimated global burden of diabetes is 382 million with the expected figure of 592 million by the year 2035.<sup>1</sup> Pakistan currently has 6.9 million people affected by diabetes and is considered as high prevalence area for diabetes. This figure is estimated to double by 2025 and affect 11.5 million people.<sup>2,3</sup>

Despite advancement in management of diabetes, there has been persistent rise in its prevalence globally. The contributing factors being sedentary life style, unhealthy dietary habits, obesity and urbanization. As a consequence of improved health care, there is rise in life expectancy of diabetics in developing as well as developed countries.<sup>4</sup> Pakistan being a developing country has an average life expectancy of 62 years with 4% of its population above 65 years age.<sup>5</sup> This

increasing number of geriatric population is expected to impose fresh challenges to the health care system in coming years. A regional study by Zafar et al concluded that diabetes, hypertension and arthritis are the most frequent chronic illnesses observed in geriatric population that needs to be supported by our health care system.<sup>6</sup>

Diabetes is a metabolic disorder characterized by pathophysiologic changes in several organs leading to complications, hence imposing significant burden on individual as well as the health care system.<sup>7</sup> The management of diabetes is multidimensional including dietary and life style modifications in addition to pharmacotherapy requiring acceptance and adaptation of the patient for better glycemic control. The lifelong education of diabetics is mandatory in new as well as old cases of diabetes. It has been suggested that an empowered diabetic can take favorable decisions for day to day management of diabetes.<sup>8</sup>

Certain regional, social and cultural factors are responsible for regional variation in diabetes knowledge.<sup>9</sup> It has been suggested that patients with good knowledge of diabetes are able to follow their dietary, medication and life style modification plan in an effective way. Diabetes is prevalent in Pakistan secondary to rapid urbanization, changing life style and dietary patterns. Due to poverty, illiteracy, socioeconomic conditions and cultural beliefs our diabetics lag behind in diabetes knowledge as compared to developed countries.

Certain regional studies have been conducted to evaluate diabetes knowledge but few have focused on the risk factors and associations, particularly in geriatric diabetics. Current study has been conducted to assess the overall diabetes knowledge and its particular domains in which our diabetics are deficient, also to identify the risk factors and associations of insufficient knowledge among elderly diabetics. This study will enable health care providers to incorporate the socially and culturally acceptable diabetes education programs for elderly type 2 diabetics.

## SUBJECTS AND METHODS

This descriptive cross sectional study was conducted after ethical approval from institutional committee at Rawal Institute of Health Sciences Islamabad (from January to August 2015).

**Inclusion criteria:** 163 geriatric type 2 diabetes patients (> 65 years) were selected from outdoor medical clinic by consecutive sampling. Sample size of 163 was calculated by WHO sample size calculator (95% confidence interval, 5% precision and 12% regional prevalence of diabetes).

**Exclusion criteria:** Patients having type 1 diabetes, critically ill patients and those with mental or physical condition that could interfere with their capability to understand or answer the questionnaire were excluded.

Their demographic details, socioeconomic status, education, duration of diabetes (years since diagnosed), dietary adherence and use of other modes of therapy were documented. Patients below poverty line was defined as family income < 2\$/day.<sup>10</sup> Satisfactory glycemic control was labeled at cut-off point HbA1c < 7% as per recommendation of American Diabetic Association (ADA).<sup>11</sup>

Diabetes knowledge was assessed by Michigan Diabetes Knowledge Test (MDKT). This includes 24 questions compiled by Michigan Diabetes Research and Training Centre (Table II).<sup>12</sup> It comprises basic diabetes information (10 questions), glycemic control (7 questions) and diabetic complications (7 questions). Each question carries three options; yes, no and don't know. One mark was given for right answer, and zero

for wrong answer or doesn't know. Patients were classified as having low knowledge (0-60%), medium knowledge (61-80%) and high knowledge (>80%). The cut-off for sufficient diabetes knowledge labeled at > 60% score.<sup>13</sup> Data analyzed by SPSS version 17. Mean and standard deviation calculated for quantitative variables (age and duration of diabetes). Frequencies and percentages calculated for qualitative variables (gender, socioeconomic status, literacy, use of other modes of therapy, dietary adherence and glycaemic control). Chi-square test applied to study association of insufficient diabetes knowledge with gender, glycemic control, literacy, poverty, use of other modes of therapy and dietary adherence. The t-test was applied to study association of diabetes knowledge with age and duration of diabetes. P-value < 0.05 was considered as statistically significant.

## RESULTS

Among 163 type 2 elderly diabetics (21.5% males and 78.5% females), mean age was 72.08±6.71 (65-93) years and mean duration of diabetes was 8.2±6.03 (1-35) years. Diabetes knowledge was poor in 86 (52.8%), acceptable in 37(22.7%) and good in 40 (24.5%) (Table I & II). Among the various domains of diabetes knowledge questionnaire, the least correctly answered questions (i.e. <60%) were about the types of diabetes (16%), wound care (23%), eating excess sugar to be cause of diabetes (28%), role of diet and exercise (28%), etiology of diabetes (43%), diabetes can't be cured (48%), care while cutting nails (48%) and source of insulin production (58%). Certain questions were >60% correctly answered. These include diabetic neuropathy (93%), nephropathy (88%), hyperglycemia symptoms (79%) and hypoglycemia symptoms (67%). There were 83(51%) patients who were illiterate and illiteracy was found to associated with poor diabetes knowledge; i.e. 70% of illiterate cases had unsatisfactory diabetes knowledge Vs 30% having satisfactory diabetes knowledge (p = 0.001). There were 98(60%) patients below poverty line and 61 (62%) of these had poor diabetes knowledge having a significant association between poverty and poor diabetes knowledge (p = 0.003). 51 (31%) patients practiced other modes of therapy (i.e. Hikmat, homeopathic and herbal medicine) and 37(73%) of these had poor diabetes knowledge. Poor diabetes knowledge was associated with use of other modes of therapy (p = 0.001). About 75(46%) had unsatisfactory dietary adherence and 46(61%) of these had poor diabetes knowledge having positive association with dietary non-adherence (p = 0.043). Unsatisfactory glycemic control was present in 134(82%) diabetics; and 76 (57%) of these had poor diabetes knowledge with significant association (p = 0.030).

**TABLE I: THE DEMOGRAPHIC FEATURES AND VARIOUS RISK FACTORS FOR POOR DIABETES KNOWLEDGE IN TYPE 2 DIABETES (n=163)**

Variables	n (%)	Comparison with Diabetes Knowledge		
		Satisfactory 77 (47%)	Unsatisfactory 86 (53%)	P - Value
<b>AGE</b> (mean + SD) years	72.08 + 6.71	70.27 + 5.94	73.70 + 6.97	0.001**
<b>GENDER</b> n (%)				
Male	35 (21.5 %)	19 (54 %)	16 (46 %)	0.346*
Female	128(78.5 %)	58 (45 %)	70 (55 %)	
<b>DURATION OF DIABETES</b> (mean + SD) years	8.2 + 6.03	9.42 + 6.17	7.19 + 5.73	0.018**
<b>LITERACY</b> n (%)				
Illiterate	83 (51 %)	25 (30 %)	58 (70 %)	0.001*
Literate	80(49 %)	52 (65 %)	28 (35 %)	
<b>SOCIOECONOMIC CLASS</b> n (%)				
Below poverty line	98 (60 %)	37 (38 %)	61 (62 %)	0.003*
Above poverty line	65 (40 %)	40 (62 %)	25 (38 %)	
<b>ANTI-DIABETIC THERAPY</b> n (%)				
Oral hypoglycaemics	125(77 %)	57(46 %)	68 (54 %)	0.010*
Insulin	18 (11 %)	14(78 %0	4 (22 5)	
Combination therapy	20 (12 %)	6 (30 %0	14 (70 %)	
<b>OTHER MODES OF THERAPY</b>				
Yes	51 (31 %)	14 (27 %)	37 (73 %)	0.001*
No	112 (69 %)	63 (56 %)	49 (44 %)	
<b>DIETARY ADHERENCE</b>				
Poor	75 (46 %)	29 (39 %)	46 (61 %)	0.043*
Good	88 (54 %)	48 (55 %)	40 (45 %)	
<b>Glycemic control</b>				
Satisfactory	29 (18 %)	19 (66 %)	10 (34 %)	0.030*
Un-satisfactory	134 (82 %)	58 (43 %)	76 (57 %)	

(Test of significance; \* Chi-square, \*\*t-test; Significant p-values in bold)

## DISCUSSION

With the improved health care and increased life expectancy, there has been a significant rise in elderly patients with prolonged diabetes and increased morbidity along with diabetes related ocular, renal and cardiac complications.<sup>14</sup> 52.8% diabetics were labeled as having poor diabetes knowledge and scored <60% in response to 24 item diabetes knowledge questionnaire (table 2). A study conducted by Omar et al in Malaysia<sup>15</sup> shows high level of good knowledge (53.7%) in diabetics as compared to lower figure (24.5%) in our patients. A regional study conducted at Aga Khan Hospital Karachi shows >60% score in only 13.7% cases.<sup>13</sup> Also generally poor level of knowledge in diabetics shown in studies from United Arab Emirates<sup>16</sup> and India<sup>17</sup>.

The above mentioned studies used self-designed

questionnaires however we followed the DKQ-24 questionnaire.<sup>14,15</sup> This questionnaire is simple, inexpensive, quick and effective way to assess the diabetes knowledge with reading level of the 6<sup>th</sup> Grade. Fifty one percent of our participants were illiterate, so they were helped out by the authors. Also, this was a good opportunity to counsel the patients about wrongly answered questions that was further supported by printed literature.

Among the geriatric group of diabetics, those having insufficient knowledge were elder with high mean age as compared to those with sufficient knowledge. The possible reason could be the age related decline in cognitive function. West JD<sup>18</sup> concluded that age related decline in diabetes knowledge score is estimated to fall by 3% with every 10 years rise of age. Similarly Exalto et al<sup>19</sup> suggested that in type 2



diabetics the predictors of dementia in next decade are diabetic complications, education and age. Though, the guidelines provide same goals and targets for elderly and younger diabetics, yet managing diabetes is much more difficult in elderly and requires individualization of the management plan.<sup>20</sup>

Female diabetics had poor knowledge as compared to males, however difference wasn't statistically significant. Contrary to this, studies conducted by Guicciardi et al<sup>21</sup> and Yu MK<sup>22</sup> et al show better diabetes knowledge and self-care in women in view of likelihood of seeking diabetic education and background family history of diabetes. Poor knowledge in our female diabetics can be explained by low literacy rate among females of Pakistan. As 78% of our outdoor diabetics were females, this was a good opportunity to approach and educate female diabetics seeking health care. Authors suggest that female diabetic educators be preferred, as they can communicate well with female diabetics in context of our social norms and beliefs.

The prolonged duration of diabetes was associated with satisfactory diabetes knowledge. A study conducted in Bangladesh also found strong association between duration of diabetes and diabetes knowledge.<sup>23</sup> Thus indicating that over a period of time, diabetics gain better disease knowledge and hence patients with new onset diabetes need extensive counseling sessions that should be followed by scheduled life time education programs.

About 60% of our diabetics were below poverty line and 62% of these had poor diabetes knowledge. Possible reasons could be low literacy, inability to approach health care facility, comparatively limited access to literature and lack of continued medical care in poor diabetics. Also among the patients who were illiterate, 70% had poor knowledge. Hence, indicating poverty and illiteracy to be contributing factor for poor knowledge. Goldman D<sup>24</sup> concluded the rising education level is associated with better health behaviors in chronic diseases including diabetes.

Most of the patient's (77%) were taking oral hypoglycaemics, while 23% were taking insulin or combination therapy. In view of cultural and regional beliefs, there is reluctance in many diabetics to initiate insulin therapy. However, these views improve after the initiation of insulin as per study conducted by Ahmed et al at Aga Khan Hospital Karachi.<sup>25</sup> The plan of diabetes management has to be revised and individualized from time to time according to needs and indications. Educating diabetics about risks and benefits of therapy and various options may lead to better acceptance and agreement with management plan.

Significant number of diabetics with poor knowledge gave history of other modes of therapy that contrib-

utes to delay in initiating and complying with management of diabetes. There is a need to increase awareness about hazards and risks associated with such malpractices. An Indian study by Kumar et al found highly prevalent complementary and alternative medicine use among diabetics despite of high levels of disappointment after its use.<sup>26</sup>

Eighty two percent of diabetics had HbA1c >7% indicating poor glycemic control and significant association with poor disease knowledge. A regional study by Shams N et al shows comparable figure of 75% diabetics having poor glycemic control.<sup>27</sup> The knowledge of target glycemic level correlates with better understanding of diabetes treatment.<sup>28</sup> Dietary non-adherence was found in 46% patients and its association with poor diabetes knowledge points to need of counseling by dietician along with provision of easily understandable diet charts in local language with pictures.

The various domains of diabetes knowledge were assessed i.e. basic diabetes knowledge, glycemic control and diabetes related complications (Table 2). The least correctly answered questions included two main types of diabetes, type 1 and type 2 (only 16% answered correctly), eating excess sugar causes diabetes (28% answered correctly) and the importance of exercise in diabetes management (28% answered correctly). There were 48% patients who thought that diabetes can be cured and this may be linked to the use of other modes of therapy with the expectation of permanent cure.

Significant number of patients knew that wounds heal slowly in diabetics, but were not aware of precautions while cutting nails and dealing with cuts and abrasions. Patients were quite aware of the target blood sugar levels and that ideally sugar should be checked in blood rather than urine. Also, patients were well aware of diabetic complications like neuropathy, nephropathy and delayed wound healing. An Irish study demonstrated that awareness of retinopathy, stroke, peripheral arterial disease and amputation was 61%, 17%, 16% and 12%<sup>29</sup>. Possible reason of increased awareness in our diabetics could be that these complications are prevalent in our region as a result of poor glycemic control and delay in seeking help from health care facility and hence frequently observed.

Though, people knew well about these complications but few were aware of the etiology, pathophysiology, risks and preventive approach to minimize these. There is need to educate diabetics about preventive measures that can be incorporated in their daily routine whether its diet, glycemic control, foot care, exercise, drug compliance or hygiene.

Our geriatric population is prone to these complications in view of long standing diabetes, multiple

co-morbid conditions, physical or visual morbidity, side effects of medications, along with the poverty and illiteracy. Certain developed countries have organized system for home monitoring of diabetics by health care visitors and frequent counseling. However Pakistan being a developing country has been facing the challenges of poverty, illiteracy, social and cultural beliefs. Education seems to be the most economical and fruitful solution to improve wellbeing of our diabetics. Berikai et al<sup>30</sup> concluded that targeting specific population groups (e.g. with low literacy) may lead to better glycemic control. It is also suggested that not only the diabetic him or herself be educated but a close family member or the caretaker be educated in the same session as many elderly patients are dependent and bear morbidities.

There are few regional studies particularly assessing knowledge in geriatric group of diabetics. Current study will provide the figures that can be used for comparison with the regional and international data. The assessment of particular domains in which our diabetic lag, will be helpful for the healthcare providers to focus while dealing with geriatric group of diabetics. Certain limitations of this study are inability to study other factors like physical or visual morbidity, and inability to follow the subsequent changes in knowledge level during scheduled counseling sessions. There might be an over-estimation of diabetes knowledge in our population as patients attending diabetic clinics are the ones actually concerned about their health as compared to those who don't attend the clinics. The sample was collected from hospital being located in an area providing services to most of the patients from lower socioeconomic class having low literacy level and predominance of female patients. Hence, authors recommend that results of this study should be interpreted carefully. Authors suggest further regional studies with better sample size focusing the geriatric diabetics.

## CONCLUSION

Poor diabetes knowledge in geriatric diabetic population needs to be addressed. Illiteracy, poverty and advanced age are the contributory factors. Our patients are well aware of diabetes related complications and target glycemic control but they lag in basic knowledge about diabetes and preventive measures for its complications.

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