



RESEARCH ARTICLE

PATIENTS WITH DIABETES MELLITUS IN A TERTIARY CARE HOSPITAL; THEIR  
KNOWLEDGE ON DISEASE, TREATMENTS AND COMPLICATIONS

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ABSTRACT

Diabetes Mellitus (DM) is a major health problem worldwide. It is a disease which is not cured once it is developed, but it can be controlled. It causes many complications when uncontrolled but can be prevented with proper control. Overall knowledge on health promotion is essential to prevent complications of DM. The aim of this study is to assess the knowledge of DM, its treatments, complications, prevention of complications and maintaining general health among the Tamils attending the Diabetic Education Center at the Teaching Hospital, Batticaloa, Sri Lanka. A descriptive cross sectional study involving a systematic sample of 384 patients was conducted using an interviewer administered semi structured questionnaire in Tamil diabetic patients attending the Diabetic Education Center at the Teaching Hospital, Batticaloa, Sri Lanka. Majority of patients (73.3%) scored less than 50 in the knowledge test and critical gaps in knowledge were revealed, especially regarding knowledge of risk factors, symptoms, type of DM and fasting blood sugar level. However patients of younger age (less than 50 years), higher education levels, high monthly income, with a family history of diabetes and unemployed obtained significantly higher mean knowledge score ( $P < 0.05$ ). Knowledge among subjects (80%) regarding complications of DM was optimal. Many subjects (95.3%) reported routinely controlling their DM through modifying diet. A majority of subjects had an unsatisfactory level of overall knowledge related to DM. Further, education programmes are needed to address critical gaps in patients' knowledge.

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INTRODUCTION

Diabetes Mellitus (DM) is a metabolic disease characterized by hyperglycemia resulting from defects in insulin secretion, not enough insulin or both. Insulin involves in the metabolism of carbohydrates, protein and fats. DM in Sri Lanka seems to be mainly of NIDDM variety (Wijesuriya 1997). Diabetes Mellitus is a silent killer. At present, there is no radical cure for this disease, and control depends on appropriate management, compliance and self-care. The global prevalence of DM is estimated to increase, from 4% in 1995 to 5.4% by the year 2025 (Ramachandran et al., 2001). In 2011, 366 million people (8.3%) worldwide were affected by diabetes. Numbers are expected to rise to 552 million (9.9%) for diabetes by 2030. In 2011, 71.4 million people (8.3%) in South East Asia were affected by diabetes. Numbers are expected to rise to 120.9 million (10.2%) for diabetes by 2030 (<http://www.diaabetessrilanka.org/home/facts-figures>). Standardized prevalence for Sri Lankans aged above 20 years was 10.3%. In urban

population the prevalence was 16.4% and in the rural population the prevalence was 8.7%. In both the urban and the rural populations the prevalence of pre-diabetes was 11.5% and the overall prevalence of some form of dysglycaemia (sugar problems) was 21.8% (Katulanda et al., 2008). Complications of DM are physiologically harmful, impact on quality of life and are costly for both the patients and the government. Alshafae et al. (2008) stated that DM is a condition that, if uncontrolled, can produce lifelong complications affecting different organs of the body. Although DM incurable, it can be managed very well. Proper management requires patients to be aware of the disease, its risk factors, its treatment and its complications (Sabri et al., 2007). Knowledge of DM can assist in early detection of the disease and reduce the incidence of complications. Thus considerable efforts had been put in to inform the diabetic patients about Diabetes Mellitus (Wee et al., 2002). The need to educate the diabetic patients regarding causes, symptoms, preventions of complications to improve health was highlighted in several studies (Arslantas et al., 2008; Murugesan et al., 2007). In order to educate diabetic patients, it is important to assess their knowledge on DM and its complications. Lack of knowledge regarding DM and its complications among diabetic patients was highlighted in some

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studies (Murugesan *et al.*, 2007; Moodley and Rambiritch 2007). Patients are not sufficiently equipped with knowledge to comprehensively manage their disease (Moodley and Rambiritch 2007). There is an urgent need of strategies to spread awareness about DM in general population and diabetic subjects on many aspects (Murugesan *et al.*, 2007). Knowledge of this disease can thus prevent the impending chronic co-morbidities for DM, which impact significantly on the quality of life of the diabetic patients which may compromise their lifestyles as well as increase the burden on public health care (Moodley and Rambiritch 2007). Early recognition of symptoms of DM may aid in early detection of the disease and allow for prompt treatment (Wee *et al.*, 2002). Regular tests have to be carried out for the control of blood glucose level. Some studies have shown that appropriate knowledge of DM is effective in keeping blood glucose level under control (Arslantas *et al.*, 2008). The objective of this study is to determine the knowledge about DM among Tamil diabetic patients attending Diabetic Education Center, Teaching Hospital, Batticaloa, Sri Lanka.

## MATERIALS AND METHODS

The study was conducted in the Diabetic Education Center, (DEC)Teaching Hospital, Batticaloa (THB). It is a multispecialty hospital with 930 beds catering to the needs of multilingual patients from various part of Batticaloa District, Sri Lanka. The study population were Tamils, between 30 – 70 years of age, who have lived for at least 2 years in the Batticaloa district with Type-2 DM and who had been diagnosed at least 2 years ago and treated with oral hypoglycemic agents or insulin, attending the diabetic education center of the Teaching Hospital Batticaloa, for first or subsequent visit, on Monday to Saturday between 8Am- 12 Noon every week. The exclusion criteria were patients who refused to give consent for participating in the study and patients having any physical discomfort or pain due to surgery or ulcers, when attending the Diabetic Education Center.

### Sample size

$$n = \frac{Z^2 * P(1 - P)}{d^2}$$

As there are no studies on level of knowledge regarding DM in the Batticaloa District the proportion (p) of patients having good knowledge was considered to be 50%.

$$d^2=0.05$$

$$Z=1.96$$

Therefore, n=384

A total of 384 patients will be enrolled in the study. The Patients' attendance register was obtained during the data collection dates. Then every 2<sup>nd</sup> name was chosen from the attendance register until the desired sample size was obtained.

An interviewer administered questionnaire (IAQ) was used to collect the socio-demographic data and clinical information and the knowledge of patients regarding DM. An interviewer administered questionnaire was prepared taking into consideration the objective of the study and was designed after a literature review and advice from the supervisors. The IAQ was prepared in English and translated to Tamil and retranslated back into English. It consists of two parts. Part I consists of demographic data (including gender, age, education level, monthly income, duration of illness, family history of DM, marital status, occupation, and location of residence) of the subject and Part II consists of 29 questions prepared by the investigator to assess the knowledge of the patient. Part II is divided into five units as follows: (i) Knowledge on general concepts of DM, (ii) Knowledge on treatment, (iii) Knowledge on diabetic diet, (iv) Knowledge on complication of DM and (v) Knowledge on preventive measures of complications of DM. Each correct answer was given a score of 1 and incorrect response 0. Knowledge was specified as follows, (i) Adequate knowledge - >75% (ii) Moderate knowledge between 50%-75% and (iii) Inadequate knowledge <50%. The ethical clearance for the study was obtained from the Ethic Review Committee, Faculty of Medical Sciences, University of Sri Jayewardenepura, Gangodawila, Nugegoda, Sri Lanka. The written informed consent was obtained from each subject after explaining the procedure, purpose of the study and its benefits. The questionnaires were coded and subjects were identified by a number but not by their names. Data obtained were kept under lock and key. Privacy, confidentiality and anonymity of the subjects were ensured during interviews.

### Data entry and analysis

Statistical software SPSS (version 15.0) were used for data entry and analysis. Descriptive statistics was applied to obtain percentage and means and relevant inferential statistics was performed. Independent t- test was performed to compare the mean diabetes knowledge score between relevant groups. Chi-squared test was carried out to determine the association between the knowledge score and other factors.

## RESULTS

### Socio-Demographic characteristics of the subjects

Three hundred and eighty four (384) subjects were interviewed, of which 151 (39.3%) were male and 233 (60.7%) were female. The mean age of the subjects was 55.45 years (standard deviation [SD] 11.76 years). Nearly subjects (46.9 %) had studied upto Grade 5 to GCE (O/L). Monthly income of more than half the subjects (57.8%) was less than Rs. 5,000 (38 US\$). About thirty six percent of the subjects (35.9%) reported a positive family history of DM and a diabetic mother was identified as the predominant contributor to a positive family history. Forty nine (48.7%) percent of the subjects have had DM for less than 5 years (Mean = 7.70, SD= 5.61) ranging from 2 years to 33 years. Most of the subjects (80.2%) reported having received health advice regarding DM management from Doctor or Nurse at their clinic. (Table – 1)

**Table 1. Distribution of Sociodemographic characteristics of the subjects and gender differences**

Characteristic	Responses	Males (%) n=151	Females (%) n=233	Totals (%) n=384
Age group (years)	30 - 50	42 (27.8)	80 (34.3)	122 (31.8)
	51 - 60	36 (23.8)	77 (33.0)	113 (29.4)
	61 - 70	73 (48.3)	76 (32.6)	149 (38.8)
Educational level	Up to Grade 5	54 (35.8)	107 (45.9)	161 (41.9)
	Grade 5 to GCE (O/L)	71 (47.0)	109 (46.8)	180 (46.9)
	GCE (A/L)	19 (12.6)	15 (6.4)	34 (8.9)
	Diploma/Graduates	7 (4.6)	2 (0.9)	9 (2.3)
Monthly income	Less than Rs. 5,000	56 (37.1)	166 (71.2)	222 (57.8)
	Between Rs. 5,000 – Rs. 9,999	25 (16.6)	33 (14.2)	58 (15.1)
	Between Rs. 10,000 – Rs. 14,999	31 (20.5)	18 (7.7)	49 (12.8)
	More than Rs. 15,000	39 (25.8)	16 (6.9)	55 (14.3)
Presence Family history of DM	Yes	57 (37.7)	81 (34.8)	138 (35.9)
	No	94 (62.3)	152 (65.2)	246 (64.1)
Duration (years) of diagnosed as having DM	2 - ≤ 5	69 (45.7)	118 (50.6)	187 (48.7)
	6 - 10	28 (18.5)	43 (18.5)	71 (18.5)
	> 10	54 (35.8)	72 (30.9)	126 (32.8)
Marital status	Married	143 (94.7)	214 (91.8)	357 (93.0)
	Unmarried	6 (4.0)	5 (2.1)	11 (2.9)
	Living together	-	-	-
	Separated	0 (0)	1 (0.4)	1 (0.3)
	Divorced	0 (0)	5 (2.1)	5 (1.3)
	Widowed	2 (1.3)	8 (3.4)	10 (2.6)
Occupation	Employed	87 (57.6)	35 (15.0)	122 (31.8)
	Not employed	64 (42.4)	198 (85.0)	262 (68.2)
Distance in Km	≤ 5	76 (51.7)	114 (48.9)	192 (50.0)
	6 - 10	16 (10.6)	29 (12.4)	45 (11.7)
	> 10	57 (37.7)	90 (38.6)	147 (38.3)
Health advice Received	Yes	114 (75.5)	194 (83.3)	308 (80.2)
	No	37 (24.5)	39 (16.7)	76 (19.8)
How long ago was it given	In the last clinic	37 (24.5)	39 (16.7)	76 (19.8)
	2 months ago	34 (22.5)	48 (20.6)	82 (21.4)
	2-6 months ago	27 (17.9)	38 (16.3)	65 (16.9)
	Last year	27 (17.9)	59 (25.3)	86 (22.4)
	Before one year	23 (15.2)	45 (19.3)	68 (17.7)
		3 (2.0)	4 (1.7)	7 (1.8)

### Knowledge regarding Diabetes Mellitus

Hundred two (26.56%) patients did not know the risk factors involved in the development of DM. Those who reported a presence of positive family history of diabetes were much more aware of family history as a risk factor for DM than those with no positive family history for the DM ( $p < 0.05$ ). Table 2 - Knowledge about risk factors in relation to gender differences. Only 33 patients (8.6%) were aware of the type of DM that they are suffering from. Among them, 8.1% (31) had Non-Insulin Dependent Diabetes Mellitus (Type 2). Seventy (18.2%) patients did not know their target fasting blood sugar. Polyuria was the most commonly identified symptom reported by 171 subjects (44.5%) followed by polydipsia 137 (35.7%), lethargy 113 (29.4%) unexplained weight loss 51 (13.3%), excessive hunger 33 (8.6%) and blurred vision 15 (3.9%). A significant gender differential was noticed with respect to identifying polyuria and excessive hunger as symptoms of DM ( $p < 0.05$ ).

**Table 2. Knowledge about risk factors in relation to gender differences**

Risk factors	Males (%) n=151	Females (%) n=233	Totals (%) n= 384
Excessive intake of sugar	105 (69.5)	140 (60.1)	245 (63.8)
Family history	31 (20.5)	23 (9.9)	54 (14.1)
Physical inactivity/ obesity	31 (20.5)	18 (7.7)	49 (12.8)
Stress	9 (6.0)	25 (10.7)	34 (8.9)
Advanced age	1 (0.7)	5 (2.1)	6 (1.6)
DM occurred during pregnancy (GDM)	0 (0)	3 (1.3)	3 (0.8)

### Awareness of treatment of Diabetes Mellitus

Most of the subjects (52.1%) were aware that only tablets are available as treatment methods for DM. 173 subjects (45.1%) were of the opinion that taking tablets and insulin are the methods available. The mode of treatment used by subjects during the study period is as follows; most (82.6%) used tablets only, 13.3% of the subjects used insulin only, 3.6% used both tablets and insulin and 0.5% used neither treatment. Among those who used tablets (331/384), 189 of the subjects (57.0%) were aware of the name of the tablets and the daily dose (frequency) of tablets they used. Among those who used insulin (65/384), only 29 subjects (44.61%) were aware of the type and dose of insulin they used. Majority of them (97.1%) were taking prescribed medication regularly, either tablets or insulin, while 2.9% subjects were not. It was stated that the causal factors were forgetfulness, side effects of drugs, irregular attendance at clinics and trust that god will look after. Further, 79.2% of subjects stated correctly the diet should be taken and 77.1% subjects stated correctly the diet should be avoided.

### Knowledge about complications of Diabetes Mellitus

Knowledge regarding complications leading to severe consequences due to DM was optimal. Three hundred six diabetic patients (80%) knew that diabetes is a condition that, if uncontrolled, can produce lifelong complications affecting different organs of the body. Cataract was identified as a major complication of diabetes by 210 (54.7%) patients. Most of

them 93 (24.2%) stated tiredness/drowsiness as symptoms developed due to hyperglycemia, followed by polyuria, increased thirst and altered vision, 20.6%, 9.9% and 5.7% respectively. Two hundred thirty six (61.5%) did not know about any symptoms of hypoglycemia. Further, 14.0% patients stated that sweating as symptoms of hypoglycemia. Table 3- Knowledge regarding complications of diabetes in relation to gender differences

**Table 3. Knowledge regarding complications of diabetes in relation to gender differences**

Complications	Males (%) n=151	Females (%) n=233	Totals (%) n=384
Cataract	89 (58.9)	121 (51.9)	210 (54.7)
Kidney diseases	67 (44.4)	108 (46.4)	175 (45.6)
Heart diseases (heart attack)	61 (40.4)	94 (40.3)	155 (40.4)
Neuropathy	38 (25.2)	65 (27.9)	103 (26.8)
Peripheral vascular diseases (ulcer/ amputation)	30 (19.9)	50 (21.5)	80 (20.8)
Stroke	16 (10.6)	34 (14.6)	50 (13.0)
Coma	12 (7.9)	15 (6.4)	27 (7.0)
Infection	7 (4.6)	6 (2.6)	13 (3.4)
Metabolic difficulties	0 (0)	4 (1.7)	4 (1.0)

### Knowledge about prevention of complications of Diabetes Mellitus

It can be seen that 95.3% reported that diabetes can be prevented by modifying dietary habits, and 81.8% stated that diabetes can be controlled by regular medication. However, only 42.4% and 9.6% felt that doing exercise and stress management can play important roles in the controlling diabetes respectively. Further, 0.8% of the study samples were not sure about methods for controlling DM to prevent complications. Awareness of increasing physical activity (exercise) as a controlling measure was significantly associated with their education level ( $p < 0.05$ ). Most of the subjects 256 (66.7%) stated that regular investigations should be done, apart from the fasting blood glucose, in order to manage diabetes better. Even-though among them, only 124 subjects mentioned the name of the test which had been done routinely. About 19% (18.8%) of the subjects stated that the blood test for cholesterol level was prescribed by the doctor regularly other than testing for blood sugar level. Only Two hundred samples (52.0%) were exercising regularly by the means of walking (90.5%), cycling (8.5%), and house hold working and gardening (1.0%) with 17.18 minutes mean duration (SD = 21.97), mostly (52.5%) more than three times per week. Majority of them (97.7%) visited the follow-up clinic every month. Most of the subjects (84.4%) were aware that use of foot wear was the most important activity to prevent foot ulcer followed by washing of feet with soap and water and drying 82.0%.

### Score for overall knowledge of Diabetes Mellitus, its treatments, complications and preventive measures

Total knowledge scores for each patient were calculated by cumulating the scores for correct answers. The maximum score attainable was 41. The percentage mean score obtained by diabetics was 40.0% (SD = 14.98). Most of the patients (73.7%) obtained score for knowledge regarding DM less than

50% and only 1% of them scored more than 75%. Male patients scored slightly more mean knowledge score than female patients [41.28 (SD=15.19 vs 39.32 (SD= 14.83)]. But there was no statistical significant difference between the scores obtained by male and female patients ( $P > 0.05$ ). The age, educational level, family history of DM, monthly income, unemployed and received health education had significant association between the knowledge score ( $P < 0.05$ ).

## DISCUSSION

### Knowledge about Diabetes Mellitus

It is essential that diabetic patients should possess good knowledge about their illness in order to improve their self-management skills and thereby prevent complications. Research has found that less frequent self-care behaviors were evident among particularly diabetic patients with lower knowledge level (Karter *et al.*, 2007). It is widely acknowledged that excessive sugar intake is a risk factor for Diabetes Mellitus. In the present study, approximately 63.8% (n= 384) of the subjects were aware of high consumption of dietary sugar as an important risk factor. Somewhat similarly in the study by Alshafee *et al.* (2008), 59.9% (n = 563) participants from a general population perceived high consumption of dietary sugar as an important risk factor for developing DM. In an another study, excessive sugar intake was found as a major risk factor in 141 (46.2%) subjects in urban and semi-urban population of Peshawar, Pakistan (Zuhaid *et al.*, 2012). Also in the present study, 54.1% of the subjects stated the family history a cause for developing DM. Somewhat similar result was seen in a study, 49.5% reported that positive family history as a predisposing factor for DM (Tham *et al.*, 2004). A majority (91.4%) of the subjects in the present study did not know their type of DM. Adil *et al.* (2005) in Islamabad found that 27.5% (n = 40) did not have knowledge on the type of Diabetes. This indicates that learning has not occurred regarding the type of DM among diabetic patients. In the present study, about half (50.5%) of the subjects had knowledge of normal fasting blood sugar level.

Moodley *et al.* (2007) in South Africa found that 31.5% (n = 181) of subjects had knowledge of normal fasting blood glucose level. Subjects in our study showed higher level of knowledge than the Moodley *et al.* (2007) study sample. In another study, only around 60% knew the normal range of fasting blood sugar (Perera *et al.*, 2013), similarly a study by Gulabani *et al.* (2008) showed that only 60.4% were actually aware of their target fasting blood sugars. This knowledge is important for optimal diabetic self-management by interpreting plasma glucose levels. A lack of understanding of plasma glucose levels leads to a poor prognosis in terms of complications; this also indicates an overdependence on the physician and lack of empowerment of the patient. When considering the above results, knowledge regarding type of DM, normal fasting blood glucose level and symptoms of DM were poor. This indicates that majority of subjects have not been taught about DM by their physicians or nurses. This may be due to lack of time due to huge numbers of patients, and inadequate number of the health care workers at the clinic.

### Awareness of treatment of Diabetes Mellitus

In the present study, less than half of the subjects (45.1%) were aware of tablet and insulin as the available treatment methods for DM. A majority of the subjects (82.6%) were on oral medication (tablets), 13.3% on insulin only and 3.6% were on both tablets and insulin. These findings were consistent with those of Moodley *et al.* (2007) who found that the majority of patients were on oral medications (80.7%).

### Knowledge about complications of Diabetes Mellitus

The American Association of Clinical Endocrinologists states that the cause of complications in both acute and chronic diabetes is either a lack of understanding with regard to the long- and short-term regulation of blood glucose or the refusal of the patients to control the blood glucose levels (Bruce *et al.*, 2003). Knowledge of DM as a serious condition which can produce lifelong complications was adequate among the present study sample. Most (79.7%) subjects knew that DM caused complications. The study by Mohan *et al.* (2005) in Chennai (India) found that only 40.6% (n = 1529) of self-reported diabetic subjects knew that DM could cause complications. It showed that the subjects had better knowledge of complications of DM. Further, half of the subjects (54.7%) in the present study identified cataract as a complication of DM. Majority (92%) of the sample in Moodley *et al.* (2007) study has identified blindness as the main complication of DM. This may be due to the diabetic patients undergoing eye checkups done on every 3 months. Diabetes is also a leading cause of end-stage renal disease. In the present study, only 45.6% of the patients know that diabetes affects the kidneys. The most common cause of death amongst diabetics is cardiovascular disease. Only 40.4% of the subjects knew that diabetes affects the heart. These findings do not agree with evidence from other studies which indicated that a high proportion of subjects were aware that diabetes could cause kidney disease and heart disease with 73.3% and 64.4% respectively Gulabani *et al.* (2008). In this study, sweating (14.0%), headache (10.9%) and weakness & confusion (8.6%) were stated by subjects as symptoms of hypoglycemia. However, the great majority of patients did not know the symptoms of hypoglycemia. This shows that the knowledge of diabetic symptoms in patients is only partial and that most patients may not be able to take appropriate corrective measures sufficiently early and may seek medical aid only at the very late stages. Another study stated that only 51.5% patient actually knew the symptoms of hypoglycemia Gulabani *et al.* (2008) and most of (90%) were unaware of the symptoms of hyperglycemia or hypoglycemia (Perera *et al.*, 2013).

### Knowledge of prevention of complications of Diabetes Mellitus

In the present study, knowledge of prevention of complications of DM was optimal. Majority (95.3%) of subjects stated that DM can be controlled by modifying dietary habits, 81.8% of participants stated that regular medications help to control complications of DM. A higher proposition of our subjects (57.6%) did not know that regular exercise was helpful in controlling diabetes. In a similar study, conducted in primary

care clinic in Sri Lanka, it was reported that only 40% of participants did not know that regular exercise was helpful in controlling type 2 diabetes (Perera *et al.*, 2013).

### Score for overall knowledge of Diabetes Mellitus, its treatments, complications and preventive measures

The results of this study showed that diabetic subjects had inadequate knowledge with regard to the risk factors for the development of DM, types of DM and regular investigations for diabetic management. Most of the subjects 283 (73.7%) obtained score for knowledge regarding DM less than 50% and only 1% of them scored more than 75%. The present study indicates that one's level of education has direct influence on one's level of knowledge regarding DM, its treatment, complication and prevention of complication. In addition to the education level, age group, monthly income, presence of family history of DM, health education received and occupation also appear to influence one's level of knowledge regarding DM ( $p < 0.05$ ). Similarly (Nisar *et al.*, 2008) stated that higher education level was significantly associated with greater knowledge of diabetic symptoms, risk factors and complications. A study from Singapore demonstrated that diabetic education had changed the practice among diabetics towards self-care (Wee *et al.*, 2002). Another study showed that education played a significant role in diabetic awareness to keep correct blood glucose level. These finding are consistent with our study (Hoque *et al.*, 2009). This study confirms that patient overall knowledge of DM, complications and its management is inadequate. There is a definite need to empower patients with the knowledge required to help them obtain maximum benefit from their treatment for DM. It is recommended that further studies be done to evaluate diabetic knowledge in other provinces among rural and urban populations. This will assist in empowering patients with knowledge of DM and the importance of understanding treatment and management options.

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