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## **FACTORS ASSOCIATED WITH COMPLIANCE FOR TREATMENT OF DIABETES MELLITUS AMONG PATIENTS ATTENDING DIABETIC CLINIC IN NATIONAL HOSPITAL OF SRI LANKA**

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### **ABSTRACT**

More than 80% of diabetes deaths occur in low- and middle-income countries. Literature shows poor control of diabetes all over the world including developed countries. To describe the prevalence and associated factors of compliance and health seeking behaviour for diabetes treatment among diabetes mellitus patients attending Teaching Hospital, Jaffna. The study was conducted among patients with Diabetes Mellitus attending medical clinics of Teaching Hospital, Jaffna. The sample was 425 and consecutive sampling method was used to achieve the sample size. The study instrument was an interviewer administered questionnaire developed by the investigator with expert consultation. Almost all the patients belonged to Tamil ethnicity and the mean age was 58.6 years and the sex distribution was little higher with males than females. Approximately two thirds of the patients studied up to G.C.E (O/L). Among the patients, more than three quarters were non smokers and non

alcoholics. Majority of the patients (64.7%) attended the clinic regularly and majority had taken the medicines regularly (61.8%). More than two thirds of the patients reported that they follow the dietary advice of the health staff and less than 10% reported doing exercise. Approximately 15% of patients reduced alcohol consumption and smoking after getting the disease. The compliance for clinic attendance and the medication intake was good while compliance for the life style modifications is not satisfactory. Health education on importance of compliance for diabetes mellitus may pave way to improve the control

Key words: Diabetes mellitus, Diabetes mellitus management, diet control of diabetes mellitus

### **DIABETES MELLITUS**

Diabetes Mellitus is a group of metabolic diseases in which there are high blood sugar levels over a prolonged period. Diabetes is a chronic disease that occurs either when the pancreas does not produce enough insulin or when the body

cannot effectively use the insulin it produces. Insulin is a hormone that regulates blood sugar (WHO 2011)

Symptoms of High blood sugar include frequent urination, increased thirst, and increased hunger. If left untreated, diabetes can cause many complications (WHO 2011). Acute complications include diabetic ketoacidosis and non ketotic hyperosmolar coma. Hyperglycaemia, or raised blood sugar, is a common effect of uncontrolled diabetes and over time leads to serious damage to many of the body's systems, especially the nerves and blood vessels, include cardiovascular disease, stroke, chronic kidney failure, foot ulcers, and damage to the eyes. There are mainly two types of diabetes mellitus, Type I & II.

### **Type 1 diabetes**

Type 1 diabetes (previously known as insulin-dependent, juvenile or childhood-onset) is characterized by deficient insulin production and requires daily administration of insulin. The cause of type 1 diabetes is not known and it is not preventable with current knowledge.

Symptoms include excessive excretion of urine (polyuria), thirst (polydipsia), constant hunger, weight loss, vision changes and fatigue. These symptoms may occur suddenly.

### **Type 2 diabetes**

Type 2 diabetes (formerly called non-insulin-dependent or adult-onset) results from the body's ineffective use of insulin. Type 2 diabetes comprises 90% of people with diabetes around the world, and is largely the result of excess body weight and physical inactivity. Symptoms may be similar to those of Type 1 diabetes, but are often less marked. As a result, the disease may be diagnosed several years after onset, once complications have already arisen.

## **Global Situation of Diabetes Mellitus**

In 2014, 9% of adults, 18 years and older had diabetes. In 2012 diabetes was the direct cause of 1.5 million deaths. More than 80% of diabetes deaths occur in low- and middle-income countries (WHO 2011). As of 2013, 382 million people have diabetes worldwide. Type 2 makes up about 90% of the cases. This is equal to 8.3% of the adult population with equal rates in both women and men (Yuankai 2014).

Diabetes mellitus occurs throughout the world, but is more common (especially type 2) in more developed countries. The greatest increase in rates was expected to occur in Asia and Africa, where most people with diabetes will probably live in 2030. The increase in rates in developing countries follows the trend of urbanization and lifestyle changes, including a "Western-style" diet. This has suggested an environmental (i.e., dietary) effect, but there is little understanding of the mechanisms at present (Wild 2004).

## **Common consequences of diabetes**

Over time, diabetes can damage the heart, blood vessels, eyes, kidneys, and nerves.

- Diabetes increases the risk of heart disease and stroke. In a multinational study, 50% of people with diabetes die of cardiovascular disease (primarily heart disease and stroke).
- Combined with reduced blood flow, neuropathy (nerve damage) in the feet increases the chance of foot ulcers, infection and eventual need for limb amputation.
- Diabetic retinopathy is an important cause of blindness, and occurs as a result of long-term accumulated damage to the small blood vessels in the retina. One percent of global blindness can be attributed to diabetes.

- Diabetes is among the leading causes of kidney failure.

- The overall risk of dying among people with diabetes is at least double the risk of their peers without diabetes.

- **Prevention**

Prevention and treatment involve a healthy diet, physical exercise, not using tobacco and being a normal body weight. Blood pressure control and proper foot care are also important for people with the disease. Type 1 diabetes must be managed with insulin injections. Type 2 diabetes may be treated with medications with or without insulin (WHO 2013).

Simple lifestyle measures have been shown to be effective in preventing or delaying the onset of type 2 diabetes. To help prevent type 2 diabetes and its complications, people should:

- achieve and maintain healthy body weight;
- be physically active – at least 30 minutes of regular, moderate-intensity activity on most days. More activity is required for weight control;
- eat a healthy diet of between 3 and 5 servings of fruit and vegetables a day and reduce sugar and saturated fats intake;
- avoid tobacco use – smoking increases the risk of cardiovascular diseases.

### **Diagnosis and treatment**

Early diagnosis can be accomplished through relatively inexpensive blood testing. Treatment of diabetes involves lowering blood glucose and the levels of other known risk factors that damage blood vessels. Tobacco use cessation is also important to avoid complications.

Interventions that are both cost saving and feasible in developing countries include:

- Moderate blood glucose control. People with type 1 diabetes require

insulin; people with type 2 diabetes can be treated with oral medication, but may also require insulin;

- blood pressure control;
- Foot care.

Other cost saving interventions includes:

- screening and treatment for retinopathy (which causes blindness);
- blood lipid control (to regulate cholesterol levels);
- Screening for early signs of diabetes-related kidney disease.

These measures should be supported by a healthy diet, regular physical activity, maintaining a normal body weight and avoiding tobacco use.

### **Compliance for Management**

The clinical antecedents of diabetes-related complications include poor glucose control, hypertension, and dyslipidemia, which result in a requirement for a combination of preventative or remedial strategies. While treatment efficacy for blood pressure and cholesterol levels has improved in recent years, glucose control has improved little (Currie 2010). A recent study in the U.S. finds that only 13.2% of people with diabetes achieved target levels for all three risk factors (Ong 2008). Although the choice of treatment regimen and the specific glucose-control target at a population level remains contentious. It is clear that an individual's failure to use prescribed medications properly—in terms of adherence and/or persistence—also contributes to adverse clinical outcomes. On average, half the patients prescribed medications for modifiable risk factors common to people with diabetes discontinue therapy within 12 months of treatment initiation (Yudkin 2010). Poorly compliant patients miss scheduled appointments for diabetes-related monitoring and treatment, and this

is associated with poor glucose control. In a study by (Currie 2012), data were extracted from U.K. general practice records and included patients (N = 15,984) who had diagnostic codes indicative of type 2 diabetes or who had received a prescription for an oral anti diabetic agent and were treated with insulin. Records in the 30 months before the index date were inspected for clinical codes (recorded at consultation) indicating medication noncompliance or medical appointment nonattendance. Noncompliance was defined as missing more than one scheduled visit or having at least one provider code for not taking medications as prescribed. Relative survival post index date was compared by determining progression to all-cause mortality using Cox proportional hazards models. Those identified as clinic non attendees were more likely to be smokers, younger, have higher HbA1c, and have more prior primary care contacts and greater morbidity (P < 0.001). Those identified as medication non compliers were more likely to be women (P = 0.001), smokers (P = 0.014), and have higher HbA1c, more prior primary care contacts, and greater morbidity (all P < 0.001). After adjustment for confounding factors, medication noncompliance (hazard ratio 1.579 [95% CI 1.167–2.135]), clinic nonattendance of one or two missed appointments (1.163 [1.042–1.299]), and clinic nonattendance of greater than two missed appointments (1.605 [1.356–1.900]) were independent risk factors for all-cause mortality.

## **JUSTIFICATION**

If left untreated, diabetes can cause many complications (WHO 2011). Acute complications include diabetic ketoacidosis and non ketotic hyperosmolar coma. Hyperglycaemia, or raised blood sugar, is a common effect of

uncontrolled diabetes and over time leads to serious damage to many of the body's systems, especially the nerves and blood vessels, include cardiovascular disease, stroke, chronic kidney failure, foot ulcers, and damage to the eyes.

In 2012 diabetes was the direct cause of 1.5 million deaths. More than 80% of diabetes deaths occur in low- and middle-income countries (WHO 2011). It is clear that an individual's failure to use prescribed medications properly—in terms of adherence and/or persistence—also contributes to adverse clinical outcomes. On average, half the patients prescribed medications for modifiable risk factors common to people with diabetes discontinue therapy within 12 months of treatment initiation (Yudkin 2010). The identified clinic non attendees were more likely to be smokers, younger, have higher HbA1c, and have more prior primary care contacts and greater morbidity (P < 0.001) according to a study in UK (Currie 2012). Those identified as medication non compliers were more likely to be women (P = 0.001), smokers (P = 0.014), and have higher HbA1c, more prior primary care contacts, and greater morbidity (all P < 0.001).

As there are no vast studies done on this subject especially in North of the country, this study will pave for the health sector to design appropriate interventions according to the factors for the region.

## **Objectives**

### **General objective**

To describe the prevalence and associated factors of compliance and health seeking behaviour for diabetes treatment among diabetes mellitus patients attending medical clinic in teaching hospital Jaffna

### **Specific objectives**

To describe the prevalence of compliance for diabetes treatment among diabetes mellitus patients attending medical clinic in teaching hospital Jaffna

To describe the associated factors for compliance

To describe the health seeking behaviour

## **METHODOLOGY**

### **Study design**

It was a descriptive cross sectional study

### **Study period**

This study was conducted from April 2016 to July 2017.

### **Study setting**

The study setting was the Teaching hospital Jaffna

### **Study Population**

The study population was the patients attending medical clinics in Teaching hospital Jaffna

### **Inclusion criteria**

Diabetic patients attending Medical Clinics in Teaching hospital Jaffna

### **Exclusion criteria**

Patients with problems in understanding or with psychiatric patients

### **Study sample**

#### **3.2.6.1. Sample size calculation**

Sample size was calculated by using the following formula (Lwanga and Lameshow 1991) as it is a prevalent study

$$\text{Sample size (N)} = \frac{Z^2 \times P(1-P)}{d^2}$$

Z = 1.96 ( standard normal deviation for %  $\alpha$  error)

d = The degree of precision desired for margin of error was set at 0.05

Since the international studies showed half of the patients discontinue the

therapy within 12 months the 'P' is taken as 50%.

P = Expected proportion of compliance = 50%

Substituting the values in the above formula gives

$$N = 384$$

Adding 10 % of non responders gave a sample size of 425.

### **Sampling technique**

All the diabetic patients attending medical clinic of Teaching hospital Jaffna were included till the sample size is achieved. The duplication was avoided using reference numbers.

## **DATA COLLECTION**

### **The study instrument**

The study instrument was developed by the PI (attached) with the help of literature review and expert opinion. The instrument is an Interviewer Administered Questionnaire (IAQ). The judgemental validity was established by face, content and consensual validity by expert opinion.

### **Data collection**

Data collection team consisted of two trained data collectors who were pre intern doctors. Both data collectors were given adequate training by PI and guidelines to minimize observation variability and to increase the quality of data. The study instrument was pretested in BH/Chavakachcheri. The data were collected from the patients after getting consent. The questions were read out by the data collectors without any explanation and the answer was taken down.

## **DATA ENTRY AND ANALYSIS**

Data were entered and analysed by the PI using SPSS version 15.0. Proportions and percentages were used to describe the data. The socio demographic factors of patients with compliance and non compliance were compared using chi - square test whenever necessary.

### Ethical Considerations

Ethical clearance for the study was obtained from University of Jaffna, before the start of the study. Permission to conduct the study were obtained from the Director of the Teaching hospital Jaffna. The confidentiality of the information was maintained by PI and the name of the participant was not taken down. A copy of that written permission was given to each data collector. First, the purpose of the data collection and the nature of the voluntary participation were informed to the participant and the informed written consent was obtained (Annexure III). If the patient is under 18 years the consent was obtained from the husband/parents/ guardian. If the participant was not willing to participate in the research, the purpose, the benefits of the research, confidentiality of results and non inclusion of the name were explained clearly to get the permission. Even after, if the participant was not willing to participate he/ she was considered as a non respondent. After getting consent, the data collector asked the questions in the questionnaire one by one and took down the answers.

The confidentiality of the information was maintained by PI and the name of the patient was not included in the questionnaire.

## RESULTS AND DISCUSSION

The study included 425 Diabetic patients from medical clinics in Teaching hospital Jaffna. Out of 502 patients approached, 73 did not consent (response

rate 83.5%) and 4 questionnaires were removed due to incomplete data which resulted in 425 participants. Socio demographic features, information related to the disease, compliance and associated factors and health seeking behaviour in relation to diabetes mellitus were studied.

### Socio demographic features

The mean age of the study population was 52.8 years the sex distribution was almost equal between male and female. Majority were Sinhala Buddhists and almost half of the study population studied up to G.C.E (O/L). The average income of little more than half of the study population (52.5%) was less than Rs 25,000/= per month

### Disease related factors

**Table 2: Study population by disease related factors**

Disease related variables	Number	%
<b>Duration of DM</b>		
< 5 years	91	21.3
5-10 years	172	40.4
More than 10 years	162	38.3
<b>Other medical problems</b>		
Hypertension		
IHD	218	51.2
Hypercholesterolemia	177	41.6
	269	63.3
<b>Family history of DM</b>		
Yes		
No	274	64.4
	151	35.6
<b>Smoking status</b>		
Non smokers	382	89.8
Occasional	22	5.3
Moderate	14	3.4
Heavy	07	1.5

**Table 3: Management related factors**

Disease related variables	Number	%
<b>Regular clinic follow up</b>		
Yes	275	64.7
No	150	35.3
<b>Regular medication intake</b>		
Yes	263	61.8
No	162	38.2
<b>Health education received</b>		
Diet	392	92.2
Exercise	352	82.8
Alcohol	59	92.1(among alc)
Smoking	41	95.3 (among sm)
<b>Health personal provided HE</b>		
Doctor	356	83.7
Nurse	41	9.6
Medical student	143	33.6
<b>Lifestyle change after diagnosis of DM</b>		
Diet	378	88.9
Exercise	42	9.8
Alcohol	11	18.1
Smoking	08	17.9
<b>Health seeking other than western medicine</b>		
Acupuncture	28	6.6
Ayurvedic	67	15.8
Herbals/home made	374	88.0

Factors associated with compliance

Table 4: Study population by clinic attendance and socio demographic factors

Variable	Clinic attendance				Total No	Sig
	Regular		Irregular			
	No	%	No	%		
<b>Sex</b>						
Male	131	59.8	88	40.1	219	$\chi^2=4.72$ $df=1$ $p=0.02$
Female	144	69.9	62	30.1	206	
<b>Education</b>						
Up to O/L	232	66.3	118	33.7	350	$\chi^2=2.16$ $df=1$ $p=0.14$
Above O/L	43	57.3	32	42.7	75	
<b>Income</b>						
Less than Rs. 25,000/=	124	55.6	99	44.4	223	$\chi^2=17.01$ $df=1$ $p=0.00$
More than Rs.25,000/=	151	74.7	51	25.3	202	
<b>Alcohol intake</b>						
Alcoholics	46	71.9	18	28.1	64	$\chi^2=1.69$ $df=1$ $p=0.19$
Non alcoholics	229	63.4	132	36.6	361	
<b>Smoking status</b>						
Smokers	31	72.1	12	27.9	43	$\chi^2=1.14$ $df=1$ $p=0.28$
Non smokers	244	63.8	138	36.2	382	

Table 5: Study population by medical adherence and socio demographic factors

Variable	Medication adherence				Total No	Sig
	Regular		Irregular			
	No	%	No	%		
<b>Sex</b>						
Male	135	61.6	84	38.4	219	$\chi^2=0.01$ $df=1$ $p=0.91$
Female	128	62.1	78	37.9	206	
<b>Education</b>						
Up to O/L	211	60.3	139	39.7	350	$\chi^2=2.14$ $df=1$ $p=0.14$
Above O/L	52	69.3	23	30.7	75	
<b>Income</b>						
Less than Rs. 25,000/=	131	58.7	92	41.2	223	$\chi^2=1.9$ $df=1$ $p=0.16$
More than Rs.25,000/=	132	65.3	70	34.7	202	
<b>Alcohol intake</b>						
Alcoholics	43	67.2	21	32.8	64	$\chi^2=0.89$ $df=1$ $p=0.34$
Non alcoholics	220	60.9	141	39.1	361	
<b>Smoking status</b>						
Smokers	27	62.8	16	37.2	43	$\chi^2=0.02$ $df=1$ $p=0.89$
Non smokers	236	61.7	146	38.3	382	

Table 6: Study population by diet adherence and socio demographic factors

Variable	Diet modification				Total No	Sig
	Yes		No			
	No	%	No	%		
<b>Sex</b>						
Male	188	85.8	31	14.2	219	$\chi^2=4.4$ $df=1$ $p=0.03$
Female	190	92.2	16	7.8	206	
<b>Education</b>						
Up to O/L	311	88.9	39	11.1	350	$\chi^2=0.01$ $df=1$ $p=0.90$
Above O/L	67	89.3	08	10.7	75	
<b>Income</b>						
Less than Rs. 25,000/=	194	87.0	29	13.0	223	$\chi^2=1.8$ $df=1$ $p=0.17$
More than Rs.25,000/=	184	91.1	18	8.9	202	
<b>Alcohol intake</b>						
Alcoholics	56	87.5	08	12.5	64	$\chi^2=0.15$ $df=1$ $p=0.68$
Non alcoholics	322	89.2	39	10.8	361	
<b>Smoking status</b>						
Smokers	38	88.4	05	11.6	43	$\chi^2=0.16$ $df=1$ $p=0.89$
Non smokers	340	89.0	42	11.0	382	

## DISCUSSION

The study was undertaken to learn the factors influence the management of diabetic mellitus among patients attending medical clinics in Teaching hospital Jaffna. The data collection was carried out using interviewer administered questionnaire (IAQ) by pre intern doctors. Though IAQ has its own limitations like loss of privacy technical knowledge was extremely a need to gather information in this study. Response rate was one of the limitations in this study as it is 84.5% compared to the expected 90%.

The study reflected the usual socio demographic pattern of Jaffna district with almost all Tamil ethnicity and great majority of Hindus.

Majority of the patients were males (little more than half) and belong to 40-60 years age group. Amarasinghe et al (2015) also found the prevalence is higher among males than females in a study in Jaffna peninsula and Wicremasinghe et al (2016) found that the mean age of diabetic patients was 56 years among Diabetic Peripheral neuropathy patients attending Sri Jayawardanapura hospital. Findings of the current study are consistent with the findings of these studies.

Majority of the patients (78.7%) were living with DM for more than 5 years and approximately half of them have some other co- morbidities. Considering the risk factor 64.4 % of the patients has family history of diabetes, 10.2% were smokers and 4.5% were heavy alcoholics. This finding is consistent with the risk factors identified by Iynkaran and Satkunanathan (2012) in a study conducted among patients in Teaching hospital Jaffna. The study identified



alcohol dependence and family history as the first two important risk factors.

Considering the patient compliance for the management, 64.7% of the patients follow the clinic regularly and 61.8% took the medication regularly. A study in Muwanza city showed 77 (28.3%) reported non-adherent to clinic attendance which is nearly same as that of current study.

Among the Complementary and Alternative Medicines a small proportion of patients use other therapies like acupuncture and Ayurvedic but a great majority (88.0) of patients take herbals or homemade medicine. Similar findings were demonstrated in a study carried out in Teaching Hospital Peradeniya where 76% admitted as using herbals or homemade therapies such as crepe ginger, bitter gourd and ivy gourd and associated with female sex (Madegama et al 2014).

Clinic attendance and diet modification were significantly higher with female sex and clinic attendance was significantly higher with higher income. No other factors were related with any compliance. Madegama et al (2014) demonstrated that alcohol use was one of the significant contributors to non-adherence ( $p = 0.001$ ) which the current study did not reveal.

## CONCLUSIONS

Approximately two thirds of the patients demonstrated clinic and medication adherence

- Great majority of patients (88.9%) changed into healthy diet while less than 10% changed their physical exercise, alcohol use and smoking habit.
- Clinic attendance and diet modification were significantly higher with female sex and clinic attendance was significantly higher with higher income

- A significant proportion of patients follow herbal and home remedies for DM

## RECOMMENDATIONS

- Interventions to clinic and medical adherence to be carried out further
- Health education on physical exercise, alcohol and smoking reduction to be strengthened
- Further studies could be carried out in depth to identify the advantages and disadvantages in Complementary and Alternative Medicines

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