

MEDICATION KNOWLEDGE AND ADHERENCE AMONG TYPE II DIABETES MELLITUS PATIENTS: A CROSS SECTIONAL STUDY

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ABSTRACT

Diabetes is a chronic complicated disease. For that reason, self-care management and education are necessary to control blood glucose levels to decrease mortality and morbidity rate, the risk of complications and adverse medication related events. Lack of knowledge about a diabetic medication and non-adherence contribute to poor glycemic control among diabetes patients. Therefore, this study aims to assess relationship between medication knowledge and medication adherence among T2DM. A cross sectional study was carried out in outpatient's diabetic clinic in University Malaya Medical Centre via recruiting 250 participants. A set of questionnaires from earlier research were used to collect the data. Descriptive and inferential statistical analysis is used to analyze the data. The inclusive results indicated that, the mean age of the participants was 57.90 ± 13.22 within 56 years. More than half of patients (52.5%) had poor medication knowledge, and 47.5% had good knowledge. In terms of medication adherence, most of the participants (87.0%) had medium medication adherence; whereas, only 1.3% showed high medication adherence. However, there was no correlation between medication knowledge and medication adherence ($p=0.743$). The chi-square results indicated that medication knowledge was associated significantly with gender, educational level, employment status and monthly income (p value < 0.05). In conclusion it can be said that this study provides insight for healthcare professional about medication knowledge and adherence which are important for managing diabetes. Awareness of these factors will allow them to be more effective about medication counseling so that patients can become self-responsible and realize the benefits of prescribed therapies.

Keywords: Medication Knowledge, Medication Adherence, Type II Diabetes Mellitus

INTRODUCTION

Diabetes Mellitus is a worldwide health problem. The number of patients with hyperglycemia is increasing. This is evident from the findings of a sequence of wide-reaching estimates of current and predicted in-future prevalence of diabetes according to the latest update in 2004 (Shaw, Sicree, & Zimmet, 2010). Type II Diabetes Mellitus Patients (T2DM) consist of 90-95% of all the cases of DM that happens

in middle age and influence the existence of the individuals (Chew *et al.*, 2012). Having diabetes is one of the most common endocrine disorders. It is estimated that more than 300 million will subsequently suffer from this disease by 2025, (Nesto, 2004). This developing trend is due to several features such as population growing, aging, urbanization and increasing prevalence of obesity and physical inactivity (Danaei *et al.*, 2011). The occurrence of diabetes in Malaysia continues to increase at an alarming rate from 1-2% in the 1960s and

1970s, 6.3% in 1986 (NHMS I), 8.3% in 1996 to 14.9% in 2006 (NHMS III). According to the Malaysian Burden of Disease and Injury Study, it was estimated that for the year 2000, there were 2,261 deaths attributed to diabetes (857 men and 1404 women) (Chew *et al.*, 2012; Kosek, Bern & Guerrant, 2003).

However, to gain glycemic control, researches advocated that patients must undergo certain oral treatments and/or insulin along with adhering to careful diet plans, exercise regimes and monitor their blood glucose regularly. However, with the development of the disease, patients must take extra medications to manage and prevent microvascular and macrovascular complications. In other words, glycemic control is strictly dependent on the patients' capabilities of self-management and care. Due to the complex nature of the disease, treatment for T2DM can be very complex. So, handling diabetes successfully is challenging amongst diabetic patients. On the other hand, studies that evaluated diabetes-related knowledge at one point of a time have shown a positive correlation with blood glucose control. Hence, those DM patients with little literacy and low knowledge potency might face distress in learning self-care skills on behalf of glycemic regulator, which possibly will be affected by illiteracy, as well as reduced visual and hearing status as an effect of aging progression. Moreover, previous researches on diabetes emphasized that poor glycemic control is associated with non-adherence to prescribed medications (Omar & San, 2014).

World Health Organization (WHO) defines adherence as "the extent to which a person's medication-taking behavior, following a diet, and/or executing lifestyle changes, corresponds with the agreed recommendations from a health-care provider". Positive health outcomes and lower mortality among patients with diabetes have been associated with good adherence compared to those patients with poor adherence (O'Kane *et al.*, 2008). However, non-adherence to the prescribed medication leads to poor diabetic control and infection, which are the causes of frequent hospital admissions and readmissions (Vlasnik, Aliotta & DeLor, 2005). Poor adherence not only decreases the whole efficacy of medications but is also associated with increased complications and higher mortality rates. Furthermore, it has been shown that patients who maintain a high rate of medication compliance have significantly reduced rates of

hospitalization, thus reducing the cost in healthcare (Sokol *et al.*, 2005). Hence, medication knowledge and adherence are the most significant variables disturbing the management of diabetes. The main aims of this study are to assess the relationship between the medication knowledge and adherence among T2DM patients.

RESEARCH METHODOLOGY

Study Design, Setting, Participants and Procedure

A descriptive cross-sectional study was carried out to determine the relationship between medication knowledge and adherence of medication among T2DM patients. Raosoft online software, accessible in website <http://www.raosoft.com/samplesize.html>; was used by direct estimated real sample size of 215 patients. The researcher distributed a set of 250 questionnaires among. The researcher distributed a set of 250 questionnaires among the participants, while only 235 participants participated in the research. In order to reduce inaccurate results and increase the reliability of the study, only (0.12%) sets were excluded from the study because the information given were incomplete. Finally, 223 participants were included in the analysis.

The inclusion criteria of the study were; 1) patients with age >18 years, 2) patient diagnosed >6 months with T2DM, 3) able to understand either English or Bahasa Malaysia language, or 4) patient free from any psychiatric disorders or diseases. Patients with diabetes mellitus complications, and unable to sign informed consent were excluded from the study.

Research Instruments-Questionnaire

Data were collected using close-ended questions and self-administered questionnaire by the researcher. It consisted of 39 items divided into 3 sections. Section (A) consisted of 13 items correlated to socio-demographic characteristics of the participants. Section (B) served to determine medication knowledge level among T2DM patients, that consisted of 18 items in the form of 5-point Likert scale ranged as (1=strongly agree, 2=agree, 3=neutral, 4=disagree and 5=strongly disagree) which was adopted and modified from Burge, Albright & RRNeST, 2005 after taking permission from the author. Point Zero was given for wrong answers in the first 3 statement (strongly agree, agree, and neutral). While one was given for correct answers of 4th and 5th statement (disagree and strongly disagree). Therefore, the total sum of possible scores in this scale ranged from (0 – 18).

Further, score is divided into two groups, (<9) considered as poor medication knowledge and (>9) considered as good medication knowledge. MMAS-8 Morisky scale used to determine the medication adherence level among T2DM patients. Therefore, the total sum of possible scores range from (0 - 8) and divided into 3 groups, (<6) considered as low medication adherence, (6-<8) consider as medium medication adherence and (=8) is considered high medication adherence. The questionnaires were in English and Bahasa Malaysia Language, so that patient has a choice to answer either in English or in Bahasa Malaysia Language.

Data Collection and Ethical Consideration

This study was approved by the Medical Ethics Committee MEC in University Malaya Medical Centre (UMMC). A copy of ethical approval was sent to head of nursing in (UMMC) and outpatient's diabetes clinic. Data collection conducted by self-administer from 5th March until 2nd April 2015.

Statistical Analysis

Data were entered, analyzed and coded into a database using SPSS software ver.21 to maintain confidentiality for all patients. The collective score of the instruments was entered as a continuous data variable to measure and used to analyze performance according to the research questions underlying the study. A descriptive statistics analysis was used to describe socio-demographic and clinical characteristics of the respondent such as frequencies and percentage was used for the categorical variables, whereas the mean and std. deviation were used to calculate the continuous variables. An Inferential statistical analysis was used to determine the association between socio-demographic characteristics, medication knowledge and adherence of medication.

RESULTS

Socio-Demographic Characteristics

The normal distribution test done for 223 participants and the results showed the data are normally distributed for medication knowledge and medication adherence variable were lies within ± 1 (-1.96 – 1.96) of skewness and kurtosis respectively. As shown in Table 1, the mean age of the participants was 57.90 ± 13.22 (n=223) with minimum and maximum age being 31 and 87 respectively. About 35.4% of the participants were between age groups 50 -64. More than half (51.6%)

were female while 48.4% were male. About 47.1% was Malay followed by Indian and Chinese. Furthermore, 50.2% had secondary schooling, 29.1% were retired and 50.2% of the participants had a monthly income of 1000 -3000 RM. Moreover, 76.7% had Family history of DM, while 42.2% of the participants had been diagnosed with DM for 10 -19 years. 57.0% of the participants received DM information from Doctors and 39.5% received information from Nurses. Finally, the BMI of the sample was 25.52 ± 3.0433 with 50.2% of the participants having Ideal BMI.

Table 1: Respondents Characteristics at the Baseline (n=223)

Variables	n	(%)
Age (Year)		
< 49	70	(31.4)
50 - 64	79	(35.4)
≥ 65	74	(33.2)
Gender		
Male	70	(31.4)
Female	79	(35.4)
Ethnicity		
Malay	105	(47.1)
Chinese	47	(21.1)
Indian	64	(28.7)
Others	7	(3.1)
Educational Level		
Not Educated	16	(7.2)
Primary School	25	(11.2)
Secondary School	112	(50.2)
Tertiary (University - College)	70	(31.4)
Marital Status		
Single	15	(6.7)
Married	166	(74.4)
Separated	4	(1.8)
Divorced	6	(2.7)

Widowed	32	(14.3)
Employment Status		
Unemployed	48	(21.5)
Self-employed	17	(7.6)
Government	34	(15.2)
Private Sector	59	(26.5)
Retired	65	(29.1)
Monthly Income (MYR)		
< 1000	54	(24.2)
1000 - 3000	112	(50.2)
>=3000	57	(25.6)
Family History of DM		
Yes	171	(76.7)
No	52	(23.3)
Duration of DM Diseases (Year)		
< 9	64	(28.7)
10 - 19	94	(42.2)
>=20	65	(29.1)
Type of DM Medication		
Oral Hypoglycaemic Agent	54	(24.2)
Insulin only	65	(29.1)
OHA & insulin	104	(46.6)
Number of Oral DM Medication		
1	25	(11.2)
2 - 3	55	(24.7)
>=3	143	(64.1)
Insulin Injection Per Day		
Once a day	34	(15.2)
Twice a day	59	(26.5)
2 - 3 Times a day	110	(49.3)
4 & above	20	(9.0)

Recent HbA1c Value (%)		
< 6.5	55	(24.7)
>=6.5	168	(75.3)
Body Mass Index BMI		
< 18.5 Under weight	25	(11.2)
18.5 - 24.9 Ideal	112	(50.2)
25.0 - 29.9 Over weight	69	(30.9)
> 30 Obese	17	(7.6)

In order to determine the relationship between medication knowledge and medication adherence, Pearson correlation coefficient test was used. The results showed in Table 2 indicated the *p*-value 0.743 which is > 0.05, thus there is no association between medication knowledge and medication adherence among T2DM patients. However, the total number of participants with poor medication knowledge (*n*=117) was greater than the total number of participants with good medication knowledge (*n*=106). In terms, the majority of the participants had medium medication adherence (6 - <8) (*n*=194) followed by low medication adherence (<6). Only (*n*=3) out of 223 participants had high medication adherence.

Table 2: Association between Medication Knowledge and Medication Adherence (*n*=223)

Variables	Education Adherence (MMAS-8)						P value	Total (100)
	< 6 Low		6-< 8 Medium		>=8 High			
	n	(%)	n	(%)	n	(%)		
Poor Medication Knowledge	15	(12.8)	100	(85.5)	2	(1.7)	0.743	117
Good Medication Knowledge	11	(10.4)	94	(88.7)	1	(0.9)		106
Total	26	(11.7)	194	(87.0)	3	(1.3)		223

Association between Socio-Demographic and Medication Knowledge among T2DM

In order to determine the association between socio-demographic and medication knowledge, Chi-square test was used. As showed in Table 3, the majority of participants who had poor medication knowledge were in age groups 50-64. The gender, educational level, employment status, and monthly income were found to be significant factors to medication knowledge (*P*-value <0.05). Lastly, in spite of family history of DM, it was not found to be a significant factor in this study. While the participant with no family history of DM were poorly knowledgeable about their medication (63.5%) in comparison to the participants who had a family history of DM (50.9%), who had good medication knowledge.

Table 3: Association between Socio-Demographic and Medication Knowledge

Variables	Medication Knowledge**				P value
	Poor Knowledge		Good Knowledge		
	n	(%)	n	(%)	
Age (Year)					0.977
< 49	36	(51.4)	34	(48.6)	
50 - 64	42	(53.5)	37	(46.8)	
>=65	39	(52.7)	35	(47.3)	
Gender					0.020*
Male	48	(44.4)	60	(55.6)	
Female	69	(60.0)	46	(40.0)	
Ethnicity					0.736
Malay	54	(51.4)	51	(48.6)	
Chines	23	(48.9)	24	(51.1)	
Indian	37	(57.8)	27	(42.2)	
Others	3	(42.9)	4	(57.1)	
Educational Level					0.045*
Not Educated	10	(62.5)	6	(37.5)	
Primary School	14	(56.0)	11	(44.0)	
Secondary School	66	(58.9)	46	(41.1)	
Tertiary (University_ College)	27	(38.6)	43	(61.4)	

Employment status					0.028*
Unemployed	26	(54.2)	22	(45.8)	
Self-employed	6	(35.3)	11	(64.7)	
Government	14	(41.2)	20	(58.8)	
Private Sector	27	(45.8)	32	(54.2)	
Retired	44	(67.7)	21	(32.3)	
Monthly income (RM)					0.055*
< 1000	34	(63.0)	20	(37.0)	
1000 - 3000	60	(53.6)	52	(46.4)	
≥ 3000	23	(40.4)	34	(59.6)	
Family history of DM					0.070
Yes	84	(49.1)	87	(50.9)	
No	33	(63.5)	19	(36.5)	

RM= Malaysian Ringgit; DM= Diabetes Mellitus

*Significant level *p*<0.05

**Chi-square test

Association between Socio-Demographic and Medication Adherence among T2DM

In order to determine the association between socio-demographic and medication adherence, chi-square test was used as shown in table 4. The mean and standard deviation of medication adherence was 1.90±0.34 respectively. More than half of the participants in age groups of 65 years had high medication adherence. The majority of gender was female (87.0%) with medium medication adherence and 89.4% of them were Chinese patients. Most of the participants (93.8%) who are not educated had medium medication adherence with (94.1%) who are self-employed. Furthermore, the results indicated that monthly income is not a significant factor for medication adherence. Conversely, the majority of the participants (91.2%) with monthly income > 3000 RM had medium medication adherence. This was true with the patients who had family history of DM.

Table 4: Association between Socio-Demographic and Medication Adherence

Variables	Medication Adherence**						P value
	< 6 Low		6 - < 8 Medium		≥8		
	n	(%)	n	(%)	n	(%)	
Age (Year)							0.666
< 49	7	(10.0)	62	(88.6)	1	(1.4)	
50 - 64	10	(12.7)	69	(87.3)	0	(0.0)	
≥ 65	9	(12.2)	63	(85.1)	2	(2.7)	
Gender							0.861
Male	13	(12.0)	94	(87.0)	1	(0.9)	
Female	13	(11.3)	100	(87.0)	2	(1.7)	
Ethnicity							0.880
Malay	12	(11.4)	91	(86.7)	2	(1.9)	
Chinese	5	(10.6)	42	(89.4)	0	(0.0)	
Indian	9	(14.1)	54	(84.4)	1	(1.6)	
Others	0	(0.0)	7	(100.0)	0	(0.0)	
Educational Level							0.419
Not Educated	1	(6.3)	15	(93.8)	0	(0.0)	
Primary School	2	(8.0)	23	(92.0)	0	(0.0)	
Secondary School	17	(15.2)	92	(82.1)	3	(2.7)	
Tertiary (University-College)	6	(8.6)	64	(91.4)	0	(0.0)	
Employment Status							0.900
Unemployed	7	(14.6)	41	(85.4)	0	(0.0)	
Self-employed	1	(5.9)	16	(94.1)	0	(0.0)	
Government	5	(14.7)	28	(82.4)	1	(2.9)	
Private Sector	5	(8.5)	53	(89.8)	1	(1.7)	
Retired	8	(12.3)	56	(86.2)	1	(1.5)	
Monthly Income (RM)							0.209
< 1000	4	(7.4)	48	(88.9)	2	(3.7)	
1000 - 3000	17	(15.2)	94	(83.9)	1	(0.9)	
≥ 3000	5	(8.8)	52	(91.2)	0	(0.0)	
Family History of DM							0.571
Yes	18	(10.5)	151	(88.3)	2	(1.2)	
No	8	(15.4)	43	(82.7)	1	(1.9)	

RM= Malaysian Ringgit; DM= Diabetes Mellitus

*Significant level $p < 0.05$

**Chi-square test

DISCUSSION

Diabetes is a common chronic disease. Self-care managements are obligatory to control blood glucose levels. Therefore, this study aims to assess medication knowledge and adherence as well as determine the relationship between these two variables among 223 T2DM patients. The results showed that the mean age was 57.90 ± 13.22 ($n=223$). However, Letchuman *et al.*, (2010) also indicated that T2DM is more widespread among patients with age groups 50-65 and this finding is further supported by Omar & San (2014) who established that T2DM is projecting in the middle

of early elderly rather than the old aging. In terms of gender, the results revealed that T2DM is more common among female patients than male. This finding is agreed with Hernandez *et al.*, (2012) who did a study in southeastern United States with 378 adults with T2DM.

In terms of medication knowledge, the greater number of participants with poor medication knowledge were in age groups >65 , while 48.6% of the participants who had good medication knowledge were in age <49 . In this study, 60.0% were female participants having poorer medication knowledge which is also supported by Kosek, Bern & Guerrant, (2003). In addition, Mosher

et al., (2012) tested that patients with lower literacy have poorer medication knowledge. In the same context Burge, Albright & RRNeST, (2005) did a study to examine reasons related to medication knowledge and medication adherence in family medicine patients with chronic condition. Their finding indicated that patient education level was associated with better medication knowledge which is consistent to the findings of this study that indicated that educational level was also found to influence medication knowledge score. Good medication knowledge score was only reached by participants having advanced educational level. Therefore, appropriate strategies must be edged to help the poorly educated patients, such as giving them leaflets that are easy to read, professionals who are competent to carry information successfully via verbal communication and recognizing difficulties in communication. Furthermore, the duration of DM plays a significant role in managing of diabetes. The findings of Sajith *et al.*, (2014) study showed that 43.81% patients had a diabetic history of 1-5 years and 76.19% of patients did not have a family history of DM, while in this study the greater number of participants (63.5%) had no family history of DM. In short, the findings on medication knowledge indicated that medication knowledge was associated significantly with gender, educational level, employment status and monthly income, due to p -value < 0.05 . These findings are further supported by previous studies in T2DM (Al-Qazaz *et al.*, 2011; Jimmy *et al.*, 2014; Mastura *et al.*, 2011).

Furthermore, medication adherence has a greater influence on outcomes in chronic diseases. However, as many chronic disease patients often do not experience noticeable symptoms, following treatment recommendations can be difficult. Satisfaction by means of treatment and quality of life are connected by employment status and higher income. People with lower education level and unemployment persons have in general lower satisfaction with life and are less satisfied with diabetes treatment as well as having worse metabolic control (Sajith *et al.*, 2014). Findings of this study indicated that 93.8% of the non-educated participants and government employees were in medium medication adherence. This finding was further supported by Jimmy *et al.*, (2014). Research regarding medication adherence in T2DM emphasized

that patients with a longer history of the disease would be keener to adhere to their medications since complications would have developed, or that they would have a greater awareness and fear of developing them. In short, the results of this study indicated that medication adherence is not associated with socio-demographic features such as age, gender, educational level, ethnicity, employment status and monthly income, due to p -value > 0.05 . These findings are further supported by previous studies (Ciechanowski *et al.*, 2001; Dolder *et al.*, 2002; Horne & Weinman, 1999; Shenolikar *et al.*, 2006; Williams *et al.*, 1998) and these findings do not agree with some literature that found factors (such as gender, educational level and overweight) are significant for medication adherence among T2DM patients (Aljasem *et al.*, 2001; Hauber *et al.*, 2009).

LIMITATION

While this study complements to the present literature on medication knowledge and adherence among patients with T2DM, the data resulting from the study was partial to one hospital of UMMC in Kuala Lumpur, and limited to the outpatient diabetic clinic via convenience sampling method. However, the sample size of the study was large enough to evaluate the expected differences and association between study variables. Furthermore, another limitation of the study was self-report of medication adherence that might be miscalculated by patients. Conversely, self-reported measure for medication knowledge and adherence demonstrated to have respectable reliability and validity with the ease of presentation. Additional point that might limit the generalization of the study results is the choice of patients who recognize their diabetes medications. Those patients might be considered more knowledgeable than those who did not know, and this may confound the knowledge results.

Implication

Given the importance of patient' self-management in managing diabetic. This study contributed to the body of knowledge in addressing the issue of medication knowledge and adherence, in particular the relationship between medication knowledge and adherence among

T2DM patients. The findings of the study have important implication for T2DM patients through giving more of a sense of controlling their treatment so as to be more conscious about what happens to them and the results would be generally better. As more knowledge about DM in diabetic patients is associated with better medication adherence and better glycemic control. Therefore, through promoting and enhancing patient and clinician awareness that other opportunities such as group education sessions and combinatorial behavioral changes may also produce better outcomes. The importance of these alternatives would preferably increase both patient knowledge and the desire to practice self-management of their medication. Overcoming barriers to self-management will help achieve the goal of the integral outcome of growing patient's quality of life.

However, one of the greatest common challenges that healthcare providers face with a patient with poorly controlled diabetes is to try and figure out if the patient's hyperglycemia is due to non-adherence or is happening despite appropriate medication use. Therefore, Poor medication adherence regimens a republic, contributing to considerable worsening of illness, death and amplified health-care costs. Consequently, physicians should continuously look for poor medication adherence and can improve medication adherence by highlighting the importance of a patient's routine, creating a humble regimen and modifying the regimen to the DM patient's lifestyle. Thus, the findings of the study could direct health care providers on which features of diabetes and its management they should focus their patient's education efforts on. In short, healthcare providers should address patient's beliefs about medications in the hope of improving medication adherence and therapeutic outcome. Additionally, healthcare workers need to assess and educate patients about diabetes mellitus to improve the level of medication adherence and consequently therapeutic outcome.

RECOMMENDATIONS

Based on the study results, a few recommendations could be made. Firstly, the study findings exposed the need to develop and direct interventions to improve medication knowledge among T2DM patients. In

general, continuous education is recommended for all patients and pharmacist intervention is very essential as age and educational level were shown to be the influential factors in this study. Assessment on the levels of medication knowledge amongst patients would be approved from period to period to safeguard patient enhancement and intervention efficiency. Second, there is a need for educational programs to improve the self-management with T2DM, especially we recommend interventions that address the reasons of non-adherence that are addressed in this study in order to increase adherence. Nearly all of such interventions comprise of the pharmacists and physicians improving on the zones of educational patients and medication advising, communication between them and patients, encouraging patients to screen their blood glucose level frequently, simplifying drug regimen with decreasing the number of drug occupied, medication assortment attitude in awareness cost and impossible event effects of the medications.

CONCLUSION

Diabetes mellitus is one of the non-communicable diseases which are growing very wild in this recent era. Diabetes and linked complications stance a foremost healthcare burden worldwide and recent key challenge to patients, health care systems and national economies. Self-management is one of the most important ways to control hyperglycemia among T2DM. A cross sectional study was carried out to assess the medication knowledge and medication adherence as well as to determine the association between these two variables with the participants' socio-demographic characteristics. A total of 223 patients with T2DM in UMMC were participated in this study. The general findings from the current study showed that there is no correlation between medication knowledge and medication adherence among study participants. As the total number of patients with poor medication knowledge was higher than those with high medication knowledge, it was conversely in terms of medication adherence. Moreover, the last research objective that aimed to determine the association between participants' socio-demographic factors, medication knowledge and medication adherence, was analyzed using chi-square test with the p -value <0.05 . The chi-square test results showed that gender, educational level, employment status, and monthly income were significant factors with medication

knowledge, while none of the socio-demographic variables was significant in medication adherence due to the p -value >0.05 .

In short, this study gives insight into the numerous factors that affect patient adherence to medication guidelines among Malaysian patients. These factors should be targeted by healthcare professionals. Awareness of these factors will allow healthcare professionals to be more effective in their medication counseling and more self-responsible to regulate and control their blood glucose.

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