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Original Article

DIABETES KNOWLEDGE AND MEDICATION ADHERENCE AMONG GERIATRIC PATIENT WITH TYPE 2 DIABETES MELLITUS

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ABSTRACT

Objective: Previous studies have showed that geriatric patients achieved low knowledge and medication adherence level, causing dissatisfaction in their glycemic control. In this study, we aimed to determine the knowledge level and medication adherence level among type 2 diabetes mellitus geriatric in-patients.

Method: A total of 147 in-patients aged 60 years old and above who had been received treatment for type 2 diabetes mellitus were recruited upon their consent form.

Results: We found that majority of the geriatric participant possessed high levels of knowledge of their medication and disease (53.7%). Their medication adherence was high (66%). The knowledge score was found to be significantly decreased by the increasing age ($r = -0.341$, $p < 0.001$) and lower educational levels ($F = 8.537$, $p < 0.001$). Medication adherence score was increasing significantly with increasing age ($r = 0.268$, $p = 0.001$). The result for the effect of intervention in insulin pen injection techniques was encouraging because there was highly significant difference observed between before and after the counseling ($p < 0.001$).

Conclusion: Our study demonstrated that an effective diabetic education could improve the knowledge and medication adherence among geriatric patients.

Keywords: Elderly, Diabetes, Knowledge, Medication adherence.

INTRODUCTION

Type 2 diabetes mellitus is characterized as hyperglycaemia due to insulin resistance causing reduced tissue response towards insulin [1]. In Malaysia, the prevalence of diabetes mellitus was 22.9%, comprising 10.8% of known diabetes and 12.1% of newly diagnosed diabetes cases [2]. Type 2 diabetes mellitus is very common among geriatrics and that group has a high rate of poor glycaemic control [3,4]. Diabetes in geriatrics is metabolically different from diabetes in younger patient populations, therefore approach to therapy needs to be different in this age group [5].Previous studies have shown that knowledge on disease and medications were essential in effective diabetes self-care [6]. Those diabetic patients who are having low literacy and low knowledge might be facing troubles in learning self-care skill for glycaemic control [7]. This could be caused by illiteracy, cognition influence, decreasing vision and hearing status as a result of aging process [8].Medication adherence is defined as the extent to which patients take medications as prescribed by their health care providers[9]. Persistence of adherence to anti-hyperglycaemic medications has been proven as the main strategy in achieving long term glycaemic control [10]. Medication non-adherence among type 2 diabetes mellitus patients has been shown to reduce therapy effectiveness, increase risk of hospitalization and death rate [11].

This study is aimed to verify the knowledge level and medication adherence level among type 2 diabetes mellitus geriatric in-patients. Further, the relationships between the knowledge and medication adherence scores with its influential factors namely age, educational level, disease duration and HbA_{1c} value were also studied. In this study, we also determined the outcome of intervention in insulin pen injection techniques in participant that were using insulin pen upon recruitment.

MATERIALS AND METHODS

A total of 147 participants were recruited upon their consent from medical wards of a tertiary healthcare facility from March to August 2008. All participants were given a set of questionnaire which were adopted and modified from few sources[12, 13] in order to assess their knowledge on disease and medication. The Morisky Scale [14] was used to assess medication adherence. One mark was given to every correct answer and zero mark was given to every wrong or unsure answer. For assessment of knowledge level, 0 to 40% was considered as low knowledge level, 41% to 60% as intermediate and above 60% as high [15]. For assessment of medication adherence, achievement of 0, 1 or 2 marks were considered as high adherence level while low adherence level was represented by 3 or 4 marks [16]. According to Asian-Pacific Type 2 Diabetes Policy Group [17], the satisfaction level of HbA_{1c} value or glycaemic control was classified as satisfied (< 6.5%), intermediate (6.5% - 7.5%) and unsatisfied (> 7.5%). In this study, five important steps of insulin pen injection technique were asked before the diabetes education session. Those questions were repeated after a subject had been given appropriate information during education session.

Standard descriptive statistics (percentages and frequencies) were used to summarise the demographic data for the study subjects. Any correlation between knowledge level or medication adherence scores with possible influential factors was examined using Pearson correlation test. Student t-test was used to see any differences between the outcome of before and after the intervention in insulin pen injection techniques. SPSS® software (SPSS Inc.) was used in this study and in all analyses, p-value less than 0.05 was taken to indicate a statistically significant association.

RESULTS

This study involved 147 type 2 diabetes mellitus geriatric in-patients and their demographic characteristics(**Table 1)**. The mean age of our participants was 68.17 years old. It was observed that most of the participant were not educated (43.5%) and overweight (43.5%). About 22.4% of our subjects have been diagnosed with Type 2 diabetes mellitus for more than 20 years and only 40.8% of our subjects achieved satisfying glycaemic control.In this study, the mean score of knowledge being achieved was 60.4 ± 18.2%. **Table 2** showed that majority of our subjects demonstrated high knowledge level (53.7%). Interestingly, most of our participant managed to

provide correct answers on diabetes practice (93.2%) and most of them also were able to recognize symptoms of diabetes mellitus correctly (70.6%). Most of our participants also provided correct answers regarding reason to take medications (76.2%) although least of them were able to provide the correct name of medications when asked (15%).

Table 1: Demographic characteristics of subjects (n = 147)

Demographic characteristics	Percentage of Subject, % (n)
Gender	
Male	47.6 (70)
Female	52.4 (77)
Race	
Malay	36.0 (53)
Chinese	55.8 (82)
Indian	8.2 (12)
Range of age (Year)	
60-69	57.8 (85)
70-79	36.7 (54)
≥ 80	5.5 (8)
Educational level	
Not educated	43.5 (64)
Primary school	27.9 (41)
Secondary school	10.2 (15)
High school	15.7 (23)
University / College	2.7 (4)
Body Mass Index (kg/m^2)	
Underweight (< 18.5)	1.4 (2)
Ideal (18.5-24.9)	40.1 (59)
Overweight (25.0-29.9)	43.5 (64)
Obese (≥ 30.0)	15.0 (22)
Duration of disease (Year)	
< 1	6.1 (9)
1-5	19.7 (29)
6-10	15.7 (23)
11-15	17.7 (26)
16-20	18.4 (27)
> 20	22.4 (33)
Type of anti-hyperglycemic medication	
OHA only	55.8 (82)
OHA with insulin	12.2 (18)
Insulin only	32.0 (47)
Satisfaction level of HbA_{1c} value	
Satisfied (< 6.5%)	40.8 (60)
Intermediate (6.5-7.5%)	22.5 (34)
Unsatisfied (> 7.5%)	36.7 (53)

Table 2: Distribution of participants answering correctly or answering "Yes" on disease and medication knowledge and medication adherence (*n* = 147)

Section	Percentage of Subject (%)
Knowledge on disease	
Pathophysiology	34.2
General	83.3
Symptoms of disease	70.6
Complications of disease	53.6
Method on measuring glucose	51.0
Diabetes practice	93.2
Knowledge on medications	
Reason to take medications	76.2
Name of medications	15.0
Description on medications	51.2
Symptoms of hypoglycemia	52.4
Insulin storage (n = 65)	64.6
Ability of insulin injection (n = 41)	63.1
Medication adherence	
Forget to take medications	40.1
Careless when taking medications	31.1
Stop when feeling healthy	15.6
Stop when feeling unhealthy or not well	13.6

Table 3: The relationships between knowledge and medication adherence scores with four influential factors

Influential Factors	p-Value	
	Knowledge	Medication Adherence
Age (Year)	$p < 0.001$ ($r = -0.341$)	$p = 0.001$ ($r = 0.268$)
Educational level	$p < 0.001$ ($F = 8.537$)	$p = 0.275$ ($\chi^2 = 5.125$)
Duration of disease (Year)	$p = 0.140$ ($F = 1.694$)	$p = 0.843$ ($\chi^2 = 2.041$)
HbA_{1c} value (%)	$p = 0.133$ ($r = 0.124$)	$p = 0.909$ ($r = -0.010$)

The other hand, 66 % of our subjects obtained high scores in medication adherence. Less than half of our subjects admitted that they would forget to take medication sometimes (40.1%). In order to identify eligible candidates for consideration of clinical pharmacist intervention, any relationship betweenknowledge or medication adherence scores with certain influential factors wasinvestigated in this study **(Table 3).**It was found that age was significantly associated with knowledge score ($r = -0.341$, $p < 0.001$) and medication adherence ($r = 0.268$, $p = 0.001$). Additionally, the education level was also significantly associated with knowledge score ($F= 8.537$, $p = 0.001$). In this study, neither HbA1c value nor disease duration was an influential factor for medication adherence($r = -0.010$, $p = 0.909$) or knowledge score($F = 1.694$, $p = 0.140$).

In this study, the outcome of intervention in insulin pen injection techniques were assessed among 41 participants. All the participants were able to show all steps correctly before the diabetes education session, except for the second step (82.9% subjects were correct) and the final step (70% subjects were correct). After diabetes education session, all of our subjects were able to show all the five steps correctly. A significant difference in insulin pen injection techniques before and after the diabetes education session ($p < 0.001$) has been observed, implying an important role of clinical pharmacy service.

DISCUSSION

In this current study, we demonstrated that type 2 diabetes mellitus was prominent among young elderly (60–69 years) rather than the old elderly (70–90 years).High prevalence of type 2 diabetes mellitus was also previously reported among people aged 60–64 years [18].The elderly poses a high risk of complications associated with type 2 diabetes mellitus, especially the atherosclerotic macrovascular disease which accountedfor 75% of all mortality in diabetic patients [19]. It has been reported that at least half of the diabetic elderly population do not realize that they have the disease [20]. Typical symptoms of hyperglycaemia in elderly are usually absent due to their physiological changes associated with aging, complicated with other co-morbidity. Diabetes in elderly also increases the risk of developing or worsening of common geriatric syndromes including cognitive impairment, chronic pain and depression [21]. Nevertheless, goals of diabetes care in elderly and younger adults are alike, though managing diabetes in elderly requires individualized approach [22].

Although most of our participants reported to have no formal education background, the mean score of knowledge being achieved was high and majority of the participants were able to provide correct answers on diabetes practice and symptoms of diabetes mellitus. Higher knowledge score observed in this study may be explained by the role of active clinical pharmacist in the medical wards and doctor visiting in diabetic clinics by patients on every scheduled appointment at our study centre.This finding also could be attributed to duration of treatment received as they were already having this disease for 20 years and potentially given continuous counselling during check-up.As diabetes mellitus education is an important component of care for elderly, most patients will benefit from referral to a diabetes mellitus educator for one on one counselling or group classes, a comprehensive disease management program or specialty physician care [21].

Geriatrics normally is associated with low medication adherence due to chronic diseases or age-related physical and mental capabilities [23]. It had been reported that adherence rate to diabetes medication can be influenced by the number of medication administered daily [24]. For instance, a higher rate of adherence in once- and twice-daily regimens was observed when compared to three times daily.Adherence rates were also found to be decreased to 41%, 35%, and 30% in patients who received none, one, and two previous medications, respectively [25]. Thus, higher medication adherence rate observed among geriatrics in this study could be contributed to the fact that majority of our participants were treated only with one type of anti-hyperglycemic medication.

Duration of diabetes was reported to be significantly associated with HbA1c in patients on a stable medication regimen for type 2 diabetes mellitus [26]. Better medication adherence was also reported to be associated with lower HbA1c levels in patients who attended more intervening appointments in one year [27]. Further, those who were using an intensive triple treatment regimen of oral hypoglycemic agents showed the worst level of HbA1c control [28]. In contrary, our study showed that HbA1c value or disease duration was not influence the medication adherence or knowledge score. Earlier, Hartz et al [29] reported that diabetes control was not significantly associated with body mass index, duration of follow-up or HbA1c levels. However, the author did observe that diabetes control was positively associated with understanding of diabetes, adherence to recommendations for meal plan and glucose monitoring.Other factors such as beliefs and attitude, motivation, needs and priority also influenced patients' medication adherence. Thus, diabetes educational program must contain effective methodologies to increase self-confidence and self-effectiveness in self-care management.

Our study also highlighted that age was a factor that influenced both the knowledge and adherence score. Decreasing knowledge with increasing age was illustrated by West and Goldberg [30], which showed that for every ten years increase of age, knowledge score achieved decreased by 3%.

This was because of inevitable decreasing cognitive function among geriatric patients [31]. Educational level was also found to influence knowledge score. Higher knowledge score was also achieved by subjects with higher educational level [32]. Hence, suitable strategies should be framed to benefit those lowly educated patients, such as providing leaflets that were easy to read, professionals that were able to convey information effectively via oral communication and identifying problems in communication.

The success in type 2 diabetes mellitus management requires patient participation and they must be ensured to receive adequate education related to their disease [33]. Correct insulin injection technique was very important for improvement of glycaemic control among type 2 diabetes mellitus patients, subsequently increasing treatment effectiveness and patient medication adherence [34].The effectiveness of pharmacist intervention has been demonstrated to increase knowledge and adherence among geriatric patients, subsequently improving the glycaemic control [35]. In addition, continuous intervention by pharmacists is needed to retain the information within geriatric patients due to age-associated impairments[36].

It is important as type 2 diabetes mellitus management often requires a multidrug regimen that includes insulin therapy; however, concomitant comorbidities such as dementia, vision loss and poor mobility may complicate the management, putting the elderly patients at high risk for hypoglycaemia and other dosing errors that are associated with insulin administration [37].

In general, continuous education is recommended for all geriatric 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 knowledge and medication adherence among geriatric patients should be carried out from time to time to ensure patient improvement and intervention effectiveness.

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