

Impact of Pharmacist Intervention on Improving the Quality of Life of Patients with Type 2 Diabetes Mellitus

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Abstract

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AIM: To analyse the characteristics, and analyse the impact of pharmacist intervention on quality of life (QOL) outpatients with type 2 diabetes mellitus (T2DM).

METHODS: This six-month analytical cohort study was conducted by assessing the patients' characteristics and their quality of life by distributing a questionnaire, and the 36-Item short form instrument to the patients with T2DM (n = 45) admitted to the Tertiary hospital in Tebing Tinggi. Patients who had mental disorders, HIV-AIDS, liver disease, stage 4 chronic kidney disease, and pregnant women were excluded from the study. The patients' quality of life was measured before and after interventions and analysed using the paired t-test. All analyses were performed using the Statistical Package for the Social Sciences (SPSS, version 22, Chicago, IL, USA) (p < 0.05 was considered significant).

RESULTS: The mean age of the patients was 61.96 ± 6.45 (years). Most (66.7%) of them were females. The mean QOL (in the score) of the patients: before the intervention, 61.07 ± 15.13; after the intervention, 70.15 ± 14.23, there was a significant difference between groups with and without interventions, p < 0.001.

CONCLUSION: Active contribution of pharmacists in the management of T2DM patients is urgent and important to improve the patients' QOL.

Introduction

Diabetes mellitus (DM) is a serious and chronic disease that occurs either when the pancreas does not produce enough insulin, or when the body cannot effectively use the insulin produced. The global prevalence of diabetes among adult has increased from 4.7% in 1980 to 8.5% in 2014. A more recent study indicated that as many as 422 million people live with diabetes in 2016 [1]. In Indonesia, there were over 10,276,100 diabetes cases (6.7% of total adult population) in 2017 [2].

Raise in blood glucose level can lead to many serious complications such. Type 2 diabetes called non-insulin-dependent or adult-onset diabetes results from the ineffective use of insulin by the body. When diabetes is not well managed, various complications will develop including diabetic retinopathy, diabetic

nephropathy, diabetic neuropathy, and heart failure that affect the patients' quality of life (QOL). These conditions require complex management and multiple drug therapy, which in turn, may result in increased risk for the patients to experience drug-related problems (DRPs), readmissions, treatment costs, morbidity, and mortality [3]. The disease will accompany the patient's lifetime and worsen over time if not treated properly [4]. Many complicated factors are also associated with the successfulness of treatment of patients with T2DM including age, gender, educational level, socioeconomic status, the disease duration, multiple long-term complications of DM, the ability of the patients to cope with her or his diseases, adherence to the provided medications, and the provided healthcare. These issues are the challenges of the healthcare systems in the international as well as a national level [5], [6].

Management of the T2DM patients requires

the active involvement of many healthcare providers, including a pharmacist. Pharmacists specialised in this growing chronic condition can have a significant and positive impact on the QOL of the patients as well as healthcare systems [7]. Awareness of healthcare providers on the need to assess and monitor the patients' QOLs as an important outcome in diabetes management has increased. The QOL is an important outcome since it influences the patient's self-care activities which can have a positive contribution to diabetes control [8].

Many pharmacist interventions programs have been established in various countries to enhance clinical outcomes and QOL. These programs were implemented by pharmacists, with the cooperation of physicians and other health care providers. Pharmacist interventions and the expanded role of pharmacists are associated with many positive diabetes-related outcomes, including improved clinical measures [9], improved patient and provider satisfaction [10], [11], and reduced the treatment cost [10], [12]. Subsequently, the pharmacist can contribute to an improvement in the QOL of patients with diabetes by informing and educating patients, answering their questions, and, at the same time, monitoring the outcomes of their treatment [13].

About the problems previously described, the present study was undertaken to analyse the impact of pharmacist intervention on QOLs of T2DM patients before and after educations.

Material and Methods

This six-month analytical cohort study was undertaken by assessing the patients' characteristics and their QOLs by distributing a self-designed questionnaire, and the 36-Item Short Form Survey (SF36) instrument [14] to the patients with T2DM (n = 45) admitted to a Tertiary hospital in Tebing Tinggi, Indonesia. The inclusion criteria were T2DM patients with age of 18 years or older and agreed to sign the informed consent. Patients had mental disorders, HIV-AIDS, liver disease, stage 4 of chronic kidney disease and pregnant women were excluded from the study. The study was approved by the Health Research Ethical Committee, Faculty of Medicine, University of Sumatera Utara, Indonesia. The required data were assessed from the three-month periods of admission with and without interventions. Thus, the overall study period was six months. The education provided to the patients comprised lifestyle changes (physical activity and eating habit), adherence to the prescribed medications, and how to use and to store the medications. The patients' characteristics assessed in this study comprised gender, age, education, occupation, duration of the disease, and utilisation of antihyperglycemic drugs from the patients' medical

records. The QOL of each of the patients was assessed using the SF-36 questionnaire filled out by each of the patients in categories good, fair, bad and also divided at groups before and after the intervention to obtain their QOLs under the direction of the researchers.

At the beginning of the last three-month period of the study, leaflet contained materials regarding "Living healthy with diabetes", the guide suggested by American Diabetes Association [15] were also provided to the patients. The leaflet consists of how to take care of diabetes, healthy foods, physical activity, and medicine for diabetes. The researchers followed up the patients' outcome every admission (10 day period). Since the outpatients were insured by Indonesia Universal Health Coverage, they were asked to admit to the hospital every 10 days. At this time the treatment outcomes and laboratory examination were done. The patients' QOLs were recorded during each visit. Data required to analyse the patients' QOLs were collected at the last visit of each patient in each of the three months.

The patients' characteristics and the prescribed antihyperglycemic drugs provided to them were descriptively analysed. The significance of pharmacist intervention was analysed by comparing their QOLs before and after educations using the paired t-test. All analyses were performed using the Statistical Package for the Social Sciences (SPSS, version 22, Chicago, IL, USA) (p-value < 0.05 was considered significant).

Results

In this study, the target population obtained during the study period were 130 patients. Of these population, there were only 45 patients fulfilled the inclusion criteria; then these patients were used as a sample. Characteristics of the patients with T2DM are shown in Table 1.

Table 1: Characteristics of the patients with T2DM (n = 45)

	Percentage (%)	
Age (Years)	46-55	13
	56-65	65
	> 65	22
Gender	Female	67
	Male	33
Education	University	38
	Senior high school	29
	Primary school	18
	Junior high school	15
Duration of the disease (years)	> 5	56
	> 1-5	31
	0-1	13

The mean age of the T2DM patients was 61.69 ± 6.45 (years). By age, more than half (65%) of them were in the age range of 56-65 years, twenty-two per cent of them were above 65 years old, and thirteen per cent were in the age range of 46-55

years. Among the 45 patients, most (67%) of them were females. The T2DM patients had a different level of education. Most (38%) of them graduated from University, twenty-ninth per cent of them graduated from senior high schools. Less than a quarter (18%) of the T2DM patients graduated from primary school, and twenty per cent of them graduated from junior high school.

By duration of the disease, it was found that most of the patients (56%) have suffered from diabetes for more than 6 years. Nearly one third (31%) of them had suffered from diabetes for 1-5 years. Only thirteen per cent of them had suffered from the disease for 0-1 year.

The utilisation of antihyperglycemic drugs in the management of patients with T2DM before and after pharmacist intervention is listed in Table 2. As shown in Table 2, the four antihyperglycemic drugs widely provided to the patients with T2DM before pharmacist intervention in decreasing order were metformin 500 mg (47.3%), glimepiride 2 mg (28.4%), gliclazide (10.5%), and glimepiride 4 mg (4.2%). The same results were obtained in the group with intervention.

Table 2: Utilization of antihyperglycemic drugs in the management of patients with T2DM (n = 45)

Drug utilised	The proportion of the patients (%)	
	Before Pharmacist educations	After pharmacist educations
Metformin 500 mg	47.3	46.1
Glimepiride 2 mg	28.4	26.8
Gliclazide	10.5	11.9
Glimepiride 4 mg	4.2	7.5
Acarbose 50 mg	3.4	0
Glimepiride 3 mg	2.6	3.6
Glimepiride 1 mg	1.6	2.5
Insulin glulisine	1.5	1.0
Insulin glargine	0.4	0.5
Insulin lispro	0	0.1

The least prescribed antidiabetic drugs in the group before intervention were acarbose 50 mg (3.4%), glimepiride 3 mg (2.6%), glimepiride 1 mg (1.6%), Apidra (1.5%), and Lantus (0.4%). Subsequently, the least frequently prescribed antihyperglycemic drugs provided to the patients with T2DM after pharmacist intervention in decreasing order were glimepiride 3 mg (3.6%), glimepiride 1 mg (2.5%), insulin glulisine (1%), insulin glargine (0.5%), and insulin lispro (0.1%).

The QOLs of the patients with T2DM before and after pharmacist interventions is demonstrated in Table 3. There were only 36% of the patients with T2DM had good QOLs in the group before the intervention. However, the proportion of patients with a good category in the group with intervention has increased to 58%. Similarly, as much as twenty per cent of the patients had fair QOLs in the group before pharmacist intervention. The proportion of T2DM patients with fair category has increased to twenty-four per cent. Nearly half (44%) of the T2DM patients had bad QOLs in the group before the intervention while only eighteen per cent of the patients had bad

QOLs in the group after intervention.

Table 3: The QOL of patients with T2DM (n = 45) before and after pharmacist education

Category	Before pharmacist intervention		After pharmacist intervention	
	Number of patients	Percentage (%)	Number of patients	Percentage (%)
Good (> 70)	16	36	26	58
Fair (60-70)	9	20	11	24
Bad (0-60)	20	44	8	18

Overall, the mean value of the patients' QOLs before pharmacist intervention was 61.08 ± 15.13 . While the mean value of the QOL of the patients with T2DM after pharmacist intervention has improved to 70.15 ± 14.23 . There was a significant difference between the patients' QOLs before the intervention and those with the intervention (p-value < 0.001).

Discussion

The present study found that the mean age of the T2DM patients was 61.69 ± 6.45 (years). Most of them (67%) were females. A study on T2DM patients conducted in Indonesia also revealed that most (66%) of T2DM patients were females [16]. Previous studies undertaken in India in the rural areas of Kumarapalayam and Alimosho general hospital, Nigeria revealed that the proportion of female T2DM patients were 60% and 72.4%, respectively [17], [18]. On the other hand, another study conducted in 2016 revealed that there was no significant difference in the prevalence of the disease between male and female [19]. It has been proved that the body mass index is an important contributor to the increase in the prevalence of diabetes [20]. Lastly, a large-scale prospective cohort study was undertaken in Spain also revealed that the incidence of T2DM increased with the increasing incidence of obesity [21].

By age, most of the T2DM patients were at the age range of 56-65 years and older. There was a similar study conducted in Helvetia primary health centre in Medan, Indonesia [16], in the rural areas of Kumarapalayam, India [17] and Alimosho general hospital, Nigeria [18]. This finding also supported the statement of the American Diabetes Association, that people at the age of 45 years or older are more prone to develop T2DM [22]. Ageing affects the pancreatic β cell sensitivity to glucose and delays the mediation of glucose uptake by insulin into the cells. Thus, the incidence of T2DM patients was high in older age [21].

The most frequently antihyperglycemic drugs provided to the patients with T2DM before and after pharmacist educations was metformin. According to the American Diabetes Association, metformin monotherapy should be started for a person initially diagnosed as having T2DM unless there are contraindications [21]. This drug as first-line therapy

has more beneficial effects on A1c, obese person, and cardiovascular mortality event if compared to sulfonylurea. Provision of metformin may be safe in patients with estimated glomerular filtration rate (eGFR) of 30 mL/min/1.73 m². The use of metformin as first-line therapy was supported by findings from a large meta-analysis [23], [24].

The next three antidiabetic drugs provided to the patients in decreasing order were glimepiride 2 mg, glucodex and glimepiride 4 mg. These drugs are included in sulfonylurea class whose mechanism of action to increase insulin secretion by pancreatic beta cells to have a hypoglycemic effect. A sulfonylurea is an option for adult patients with DM with normal weight who have never experienced ketoacidosis. This study is the same as with another study has been conducted, A previous study conducted in a tertiary care teaching hospital in Eastern India indicated that the most widely used antihyperglycemic agent was biguanide followed by sulfonylureas [25]. Another study proved that the most widely used antihyperglycemic agent was metformin followed by the sulfonylurea class of drugs [26].

Quality of life is the main health outcome in the treatment of T2DM [23]. Education and behavioural changes are required to manage the disease conditions properly and to improve the patients' QOLs. Lifestyle changes must incorporate careful dietary planning, appropriate use of antidiabetic drugs, and home blood sugar monitoring techniques for all DM patients [23]. In health care practice, therapeutic outcomes directly influence the physical, psychological and social domains of health. These factors will affect the overall QOL [27].

The present study proved that pharmacist intervention significantly improve QOLs of T2DM patients. Similar studies have been conducted by researchers in several countries. It has also been confirmed that clinical pharmacist mediated intervention on drugs, disease, diet, exercise, lifestyle modifications, and self-care practices in the management of diabetes has significant improvement of QOLs of patients with T2DM [27]. Additionally, a study undertaken toward T2DM patients in a military hospital, Myanmar proved that pharmacist intervention had a significant mean of QOL of the patients compared to those without intervention, $p < 0.001$. The researchers also reported that blood glucose concentration, body mass index, and waist circumference were significantly improved ($p < 0.05$) [28]. Eikenhorst reported in their systematic review and meta-analysis recruited from twenty-four studies from electronic databases from 2004 through 2017 revealed that pharmacist led-self-management interventions improved HbA1c value in the management of diabetes patients [29].

The present finding proved that enough provision of information related to the management of diabetes improved the QOLs of DM patients.

Continuous education programs and counselling should be conducted for diabetic patients to emphasise and re-emphasize the importance of risk factor, prevention, medication, and behavioural changes [30]. The pharmacists' expanded roles in the healthcare sectors should be implemented to improve outcomes of the management of T2DM patients [31].

In conclusion, the present study highlighted that involvement of pharmacists in the management of patients with T2DM significantly improved QOLs of the patients. Metformin 500 mg was the most widely prescribed antihyperglycemic drug to the patients with T2DM. Improvement of the patients' knowledge about their disease, diet control, life style modification, and appropriate use of medications through education and medication counseling by clinical pharmacists have positive effects on the patients' clinical outcome.

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