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

Shofian Syarifuddin, Azizah Nasution*, Aminah Dalimunthe, Khairunnisa

Department of Pharmacology, Faculty of Pharmacy, Universitas Sumatera Utara, Medan, Indonesia

Abstract

AIM: To analyse the characteristics, and analyse the impact of pharmacist intervention on quality of life (QOL) of patients 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].

Rise 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 successfullness 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)

| Age (Years) | Percentage (%) |
|-------------|----------------|
| 46-55       | 13             |
| 56-65       | 12             |
| > 65        | 22             |
| Gender      |                |
| Male        | 33             |
| Female      | 67             |
| 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                               | 48.1                        |
| Glimepiride 2 mg       | 28.4                               | 26.8                        |
| Glimepiride 4 mg       | 10.5                               | 11.9                        |
| Gliclazide             | 4.2                                | 7.5                         |
| Acarbose 50 mg         | 3.4                                | 0                           |
| Glimepiride 1 mg       | 2.6                                | 3.6                         |
| Insulin glargine       | 1.6                                | 2.5                         |
| Insulin lispro         | 0.4                                | 0.5                         |

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          | Number of patients | Percentage (%) | Number of patients | Percentage (%) |
|-------------------|--------------------|----------------|--------------------|----------------|
| Good (> 70)       | 16                 | 36             | 26                 | 58             |
| Fair (60-70)      | 9                  | 20             | 11                 | 24             |
| Bad (0-59)        | 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

Open Access Maced J Med Sci.
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, gludex 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.

References

1. WHO, 2016. Available at: http://www.who.int/features/factfiles/diabetes/en/ (Accessed 25 October 2018).
2. International Diabetes Federation. The IDF Western Pacific Region, 2018. Available at: https://www.idf.org/our-network/regions-members/western-pacific/members/104-indonesia. (Accessed 20 October 2018).
3. WHO. Global Report on Diabetes, 2016. Available at: http://www.who.int/diabetes/global-report/en/ (Accessed 19 October 2018).
4. Lopez JM, Annunziata K, Bailey RA, Rupnow MF, Morisky DE. Impact of hypoglycemia on patients with type 2 diabetes mellitus and their quality of life, work productivity, and medication adherence. Patient preference and adherence. 2014; 8:683. https://doi.org/10.2147/PPA.S58813 PMid:24855344
5. Sutiaiwati M, Nurhaedar J, Yustini. 2013. The influence of diet education on knowledge, eating patterns, and blood glucose level in patients with type 2 diabetes mellitus Lanto’DG Pasewang Jeneponto Hospital. Makassar, 2018. Available at: portalgaruda.org/article.php.article-297486&val=2168. (Assessed 25 October 2018).
6. Ningtyas DW, Purdro W, Irma P. Analysis of quality of life of patients with type 2 diabetes mellitus in Bangil public hospital, district of Pasuruan. Jember, 2013. Available at: http://repository.unej.ac.id/handle/123456789/59225. (Accessed 25 October 2018).
7. Davis TM, Clifford RM, Davis WA, Batt K. The role of pharmaceutical care in diabetes management. Br J Diabetes Vasc Dis. 2005; 5:352-6. https://doi.org/10.1177/14746514050050061001
8. Khan CR, Weir GC, King GL, Moses AC. Joslin's Diabetes Mellitus. (14th ed.). Philadelphia: Lippincott Williams & Wilkins, 2005.
9. Jaber L, Halsap H, Fenret M, et al. Evaluation of a pharmaceutical care model on diabetes management. Ann Pharmacother. 1996; 30:238-43. https://doi.org/10.1177/106002809603000305 PMid:8833557
10. Sadur C, Moline N, Costa M, et al. Diabetes management in a health maintenance organization: efficacy of care management using cluster visits. Diab. Care. 1999; 22:2011-7. https://doi.org/10.2337/diacare.22.12.2011
11. Majumdar S, Guirguis L, Toth E, et al. Controlled trial of a multifaceted intervention for improving quality of care for rural patients with type 2 diabetes. Diab. Care. 2003; 26:3061-6. https://doi.org/10.2337/diacare.26.11.3061

12. Coast-Senior E, Kroner B, Kelley C, Trill L. Management of patients with type 2 diabetes by pharmacists in primary care clinics. Ann Pharmacother. 1998; 32:636-41. https://doi.org/10.1345/aph.17095 PMid:9640480

13. Hawkins D, Bradberry JC, Cziraky MJ, et al. National Pharmacy Cardiovascular Council treatment guidelines for the management of type 2 diabetes mellitus: toward better patient outcomes and new roles for pharmacists. Pharmacotherapy. 2002; 22:436-44. https://doi.org/10.1592/phco.22.7.436.33667 PMid:11996797

14. Rand Health Care, 36-Item Short Form Survey (SF-36), 2017. Available at: https://www.rand.org/survey/healthtools/mos/36-item-short-form.html (Accessed 26 December 2017).

15. American Diabetes Association, 2018. Available at: http://www.diabetes.org/living-with-diabetes/treatment-and-care/seniors/living-healthy-with-diabetes.html (Accessed 11 February 2018).

16. Nasution A, Simbolon RC, Tanjung HR. Characteristics, antihyperglycemics utilization, and quality of life in patients with type 2 diabetes mellitus admitted to primary health center. JPJCR. 2018; 01:01-10.

17. Kandasamy K, Konakalla M, Sam R, et al. A Pilot study on the impact of pharmacist intervention in type 2 diabetes mellitus counselling program in a Rural Community. Indian J Pharm Sci. 2017; 79(5):701-706. https://doi.org/10.4172/pharmaceutical-sciences.100262

18. Awodele O, Osuolale JA. Medication adherence in type 2 diabetes patients: study of patients in Alimosho General Hospital, Irago, Lagos, Nigeria. African health sciences. 2015; 15(2):513-22. https://doi.org/10.4314/ahs.v15i2.26 PMid:26124798

19. Central Agency on Statistics (Badan Pusat statistik). 2016. Total population and sex ratio according to city, 2917. Available at: https://tebingtinggikota.bps.go.id/statisticable/2017/11/21/16/jumlah-penduduk-dan-rasio-jenis-kelamin-menurut-kecamatan-di-kota-tebing-tinggi-2016.html (Accessed 19 October 2018).

20. Menke A, Rust KF, Fradkin J, Cheng YJ, Cowie CC. Associations Between Trends in Race/Ethnicity, Aging, and Body Mass Index With Diabetes Prevalence in the United States. A Series of Cross-sectional Studies Increase in Diabetes Prevalence Over Time. Ann Intern Med. 2014; 161(5):328-35. https://doi.org/10.7326/M14-0286 PMid:25178569

21. Huerta JM, Tormo MJ, Chirleaque MD, Gaviria D, Amiano P, Amiño L, Ardanaz E, Rodriguez L, Sánchez MJ, Mendez M, Salmerón D. Risk of type 2 diabetes according to traditional and emerging anthropometric indices in Spain, a Mediterranean country with high prevalence of obesity: results from a large-scale prospective cohort study. BMC Endocr Disord. 2013; 13(1):7. https://doi.org/10.1186/1472-6823-13-7 PMid:23388074 PMCID:PMC3576248

22. American Diabetes Association. Standards of Medical Care in Diabetes. 2004. Available from: Diabetesjournals.org. Assessed on 25th Sept 2018.

23. American Diabetes Association. Pharmacologic approach to glycemic treatment: Standards of medical care in diabetes. Diab. care; 2018; 41(Suppl.1):S73-S85. https://doi.org/10.2337/dc18-S008

24. Maruthur NM, Tseng E, Hutless S, Wilson LM, Suarez-Cuervo C, Berger Z, Chu Y, yhora E, Segal JB, Bolen S. Diabetias medications as monotherapy or metformin-based combination therapy for type 2 diabetes: a systematic review and meta-analysis. Ann Intern Med. 2016; 164(11):740-51. https://doi.org/10.7326/M15-2650 PMid:27088241

25. Patel B, Oza B, Patel KP, Malhotra SD, Patel VJ. Pattern of antidiabetic drugs use in type-2 diabetic patients in a medicine outpatient clinic of a tertiary care teaching hospital. Int J Basic Clin Pharmacol. 2013; 2(4):85-91. https://doi.org/10.5455/2319-2003.ipbcb20130826

26. Mandal S, Maili T, Das AK, Das A, Mandal A, Sarkar BS, Mandal S. Drug utilization study in patients with type 2 diabetes mellitus attending diabetes clinic of a tertiary care hospital in rural Bengal. Int J Basic Clin Pharmacol. 2016; 5(4):1647-54. https://doi.org/10.18203/2319-2003.ijbcp20162487

27. Shareef J, Fernandez J, Samaga L. Impact of Pharmacist's Intervention on Improving Quality of Life in Patients with Diabetes Mellitus. J Diabetes Metab Disord Control. 2016; 3(4):83-88. https://doi.org/10.15406/jdmd.2016.03.00076

28. Maw, WM, et al. The Effect of Pharmacetical care in the elderly patients with type 2 Diabetes Mellitus. Asian J Pharm Sci II. 2016;33-94. https://doi.org/10.1016/j.ajps.2015.11.119

29. Eikenhorst, L. van, Dijk, L. van, Taxis, K, Gier, H. de. Medications as monotherapy or metformin-based combination therapy for type 2 diabetes: a systematic review and meta-analysis. Frontiers in Pharmacology. 2017; 8(91). https://doi.org/10.3389/ffpar.2017.00891

30. Khan NA, Saxena S, Handa S, Habib A, Abid M, Patra A, et al. Impact of counseling on diabetic patients. Int J Pharm Clin Res. 2010; 2:72-5.

31. Ojeabu WA, Bello SI, Arute JE. Evaluation of pharmacists' educational and counselling impact on patients' clinical outcomes in a diabetic setting. J Diabetol. 2017; 8:7-11. https://doi.org/10.4103/jod.jod_5_17