Global Health
AN ONLINE JOURNAL FOR THE DIGITAL AGE

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PHARMACISTS' INVOLVEMENT IN DIABETIC CARE: REVIEW OF RANDOMIZED CONTROLLED TRIALS

Introduction

Diabetes Mellitus (DM) is a group of metabolic disorders characterized by hyperglycemia due to the impairment in insulin secretion, insulin activity or both. The chronic condition of diabetes is associated with long term damage, dysfunction, and impairment of various organs.[1]Two major types of DM are Type 1 Diabetes Mellitus (T1DM) and Type 2 Diabetes Mellitus (T2DM). T1DM arises from β-cells destruction, resulting in total insulin deficiency, and requires external administration of insulin. T2DM is the result of progressive insulin loss and insulin resistance, which is nothing but ineffective action of insulin. DM is an emerging chronic disease with possibly troubling complexities that affect all ages, around the world.[2]Global prevalence of diabetes has risen to 425 million in 2014, and is projected to rise to 629 million by 2045.[3]

Pharmacist is not only a manufacturer or supplier of medicines, but also a care giver. FIP (International Pharmaceutical Federation) seven star concept of pharmacist assigns multiple roles to the pharmacists, including that of caregiver, communicator, decision maker, teacher, lifelong learner and manager.[4]The patient-centered role of pharmacist is mounting in the context of many emerging new medicines and their negative consequences. Clinical pharmacists are drug specialists; they should work together with other health professionals and plan a scheme to upgrade the well-being of the diabetic community worldwide.[5]Pharmacists are more accessible to patients than other health care professionals in the community and are ideal health care partners for imparting knowledge to the patient and serving them through medication therapy management, health screening, emergency response and immunization programs. These patient-centered activities of pharmacists are collectively known as pharmaceutical care (PC). A recent investigation has reported that the professional value of pharmacists is underutilized. Nonetheless, there were confirmatory reports from many nations that pharmacists have been contributing significantly to management of chronic diseases by monitoring, counselling and providing medication therapy. The profession of clinical pharmacy is new for developing countries. Therefore, patient-centered services by pharmacists were initiated only very recently in countries like India. Indian pharmacists offer very little professional service to the patient, beyond the traditional activities of dispensing. Pharmacists receive training in therapeutics in addition to pharmacological characteristics of drugs such as indication, interactions, ADR, dosing, substitution etc. Extensive training given to pharmacists is wasted because they play a very minor role in pharmacotherapeutic management.[6-8]

The pharmacist can help diabetic patients by different interventions such as monitoring of drug interactions in polypharmacy, assisting and advising patients regarding proper usage of pharmaceuticals and ADR reporting etc. Pharmacists' duties in diabetic care has expanded considerably in the task of

accomplishing the ideal glucose level and other clinical outcomes.[9]This review focuses on diabetic management in the collaborative care involving pharmacists and its potential impact on different outcomes.

We selectively chose papers from literature indexed in PubMed between 2005 and 2019, using the following keywords: diabetes, pharmacist, interventions and complications.

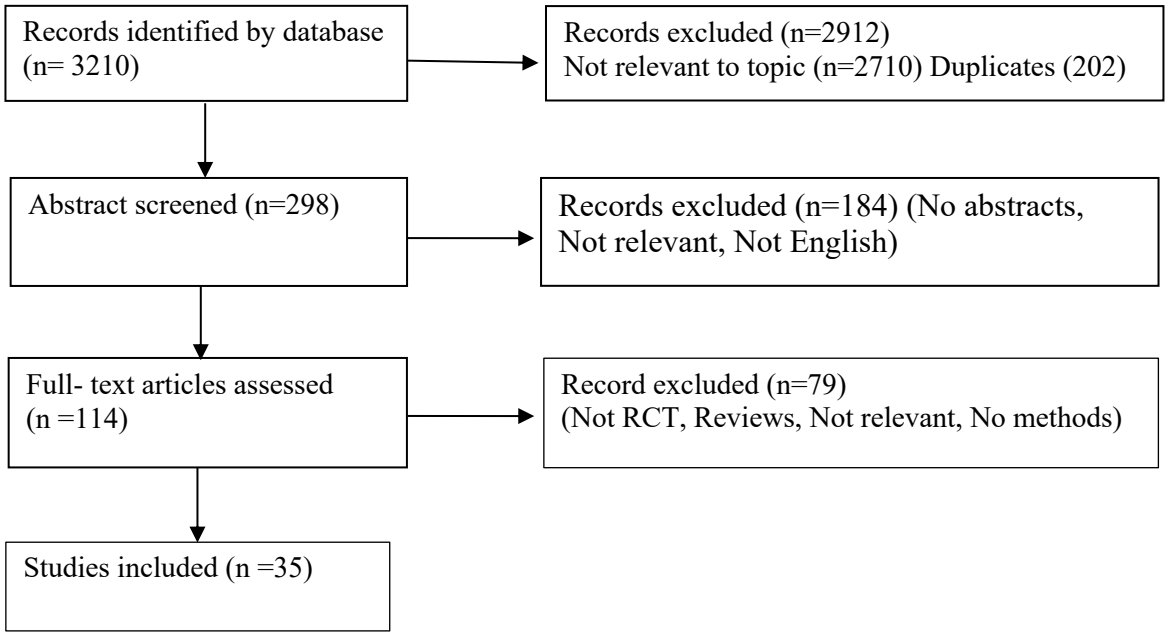

Fig.1 - Study retrieval and selection

Results

Among the 35 selected Randomized Control Trials, 3397 subjects were randomly assigned into two groups; one receiving pharmaceutical care and other usual care. The impact of the pharmacists' interventions and patient-centered services were analyzed on the basis of the following diabetic outcomes:

- Clinical improvement.
- Quality of life (QOL).
- Health care cost effectiveness.
- Medication adherence / compliance.

Clinical improvements and Management of complications in DM

Monitoring and management for complications can significantly affect the quality of life (QOL) of diabetic patients. Early detection of complications can successfully reduce both mortality and seriousness of complications. Diabetic complications can be managed through recommendations for modifying lifestyle, alternative therapy, and pharmacological therapy. Cardiovascular disease (CVD) is a leading source of mortality for diabetic patients.[10,11] Therefore beyond the glycemic control, ideal diabetic management includes blood pressure and cholesterol control as well as monitoring of early neuropathic complications. Foot exams, comprehensive counselling and lifestyle modifications were also found to be critical. Extended pharmacy care improves hyperglycemic condition, in addition to decreasing cardiovascular risk in diabetes.[12] Pharmacists' education program in diabetic patients significantly decreased cardiovascular risk by reducing total cholesterol and Low Density Lipoproteins (LDL) cholesterol.[13]

A Brazilian RCT (2011), in six primary care units, enrolling 200 patients, observed that prevalence of cardiac complications in elderly diabetic patients decreases with three years of pharmaceutical care.[14] The pharmaceutical counselling programs resulted in a marked improvement in HbA1C and BP.[15] A similar study (2011) from Rhode Island, USA revealed that pharmaceutical care was very highly effective for controlling hyperglycemia and hyperlipidemia in diabetic patients, more than those who received standard care by physicians only.[16] A nine month study on 105 diabetic patients in Hong-Kong(2011) compared the impact of pharmacists' counselling with routine medical care. Individuals who received pharmaceutical care had lower CVD risk, LDL cholesterol and stroke.[17]A study(2015) conducted in Germany with 65 T1DM adolescents was reported a marked improvement in HbA1C from pharmacist-led programs.[18] Patients who received pharmacists' services increased their knowledge test score compared with baseline values, suggesting that pharmacists can potentially improve clinical condition.[19-22]

Pharmacists care and QOL of diabetic patients

Patients' adherence to medication and lifestyle modification are key factors in the management of diabetic complications that affect the patient's QOL. The complications of diabetes badly influence the QOL of a patient. Knowledge about disease condition and its management can improve the success of self care in DM and thereby improve QOL. Pharmacists can prevent or postpone diabetic complications by patient counselling about glycemic control.[23, 24]

Randomized study on QOL in 240 T2DM patients (2009), showed that intervention by pharmacists adequately improved QOL when compared to usual care group. This was evaluated with 12-month follow-up by SF36 (ShortForm36) questionnaire.[25] Different tools

were used to evaluate QOL in diabetic patients (e.g. Diabetes Quality of life questionnaire.) Pharmacists based approach to the management of disease were effective and improved the patients QOL.[11] A study conducted on 113 Indian diabetic patients confirmed the improvement in patient's well-being through pharmacist-initiated activities like counselling and education programs. The QOL was assessed by WHO-Bref QOL questionnaire. [26] A 12-month RCT in Nigerian diabetic patients (2013) showed improvement in overall QOL when they received pharmaceutical care.[27]

Health care cost effectiveness

Cost is an important hurdle in the management of chronic diseases such as diabetes. Healthcare cost of diabetic patients includes the cost of continuing medications, complications' management, hospitalization, drug-related problems, hospital visits and frequent follow ups, etc. The clinical improvement from an ideal diabetic care reduces direct medical costs. Selected studies use analytical techniques such as cost-benefit analysis, cost-effectiveness analysis and cost-consequences analysis for economic evaluation in health care.[28-30]

In 2014, 197 diabetic patients in Western Australia, were subjected to a study on cost-effectiveness of a pharmacist-led Diabetes Management Education Program (DMEP) in demonstrating clinical improvement. After 6-months follow-up, days with hyperglycemia decreased by 1.86 days per patient per month, resulting in a savings of US$39 per day of hyperglycemia avoided.[31]A trial with 123 T2DM patients in Canada in 2014, pharmacist involvement in the management of diabetes provided a measurable reduction in the healthcare costs for post-intervention period. Patient-centered services provided by pharmacists have been found to lower the annual over-all health care cost of $190 per patient when compared with usual care.[8] In a US study(2017) with 250 diabetic patients, significant reduction was observed in health care costs of interventional group, after 13-months follow-up. [10] An average cost effectiveness of $91.01 per patient who received collaborative care with pharmacist were found in a six-months study (2017) conducted in Singapore.[33]The Pharmacists' contribution to minimizing healthcare costs of diabetic patients is measured and the intervention group shows a decline in total direct medical costs.[33]

Patient compliance to medication

Medication adherence or compliance is the extent to which patients follow the prescription. Pharmacists can improve patient compliance to medication by various interventions. Different reasons may contribute to non adherence including polypharmacy, adverse reactions, frequency of medication and inconvenience of administration. Non adherence to medication may result in the early onset of diabetic complications and poor QOL. Patient counselling on diabetes medication is the best tool to improve adherence. Pharmacists can provide medication counselling to patient or their caregiver on medication use, storage, precautions, lifestyle modifications, diet and adverse effects. Counselling will improve therapeutic outcomes and ensure the appropriate use of medication.[34-37]

A 12-months study (2018) in France enrolling 377 diabetic patients assessed the effectiveness of counselling provided by pharmacist on medication adherence in DM patients. Patient counselling by clinical pharmacists resulted in a measurable increase in medication adherence score, demonstrating better medication compliance.[38] In Malaysian healthcare system; Diabetic Medication Therapy Adherence

Clinic (DMTAC) provides pharmacists' services to improve the medication adherence. An RCT conducted in Malaysia in 2016, observed that the pharmacist-led group of diabetic patients improved medication adherence compared to control group.[19] Another study in Malaysia (2014) with 241 diabetic patients showed that pharmaceutical care model can improve medication adherence.[39] From an Iranian study(2009) in 172 T2DM patients, An increase in mean Morisky score and medication possession ratio was observed in diabetic patients who received pharmaceutical care.[40] Patient counselling conducted by pharmacist has a significant impact on glycemic control of DM patients. This was strengthened by results of studies conducted in New York with 526 and 170 diabetic patients in 2015 and 2013 respectively.[41,42]

Discussion

This review provides evidence for positive impact of clinical pharmacist in the management of chronic diabetes. Pharmacist-led programs significantly improve the clinical condition, quality of life, cost effectiveness and medication adherence of diabetic patients. Internationally, 35 randomized clinical trials were reviewed among which, 24 studies showed QOL improves with pharmaceutical services. Other 11 studies also revealed that the interventional groups have significant improvement in measured outcomes with compared to control or usual care groups. The studies were conducted in various healthcare facilities in different countries. Results support the pharmacist's involvement as a health care professional in management of diabetes.

Pharmacists' involvement showed a measurable improvement in HbA1C, lipid profiles, blood pressure, BMI of intervention groups. Significant differences have been shown between outcomes of control and intervention groups. Medication adherence rate also increased in patients who were exposed to pharmaceutical services. Pharmaceutical care was cost effective with significant reduction in health care cost of diabetic patients. Every outcome was evaluated by periodic follow-up during the study period and compared to initial baseline. Different interventions made by pharmacists reflected on the various duties and roles of pharmacists in the diabetes management settings. Further studies are needed to establish the exact reason for the rising diabetic prevalence and to plan for effective prevention of complications.

Conclusion

Interventions made by Pharmacists offer a potential benefit in achieving the goal of therapy in diabetes, perhaps by improving medication adherence and minimising diabetes-related complications significantly. Hence this review concludes that pharmacists can potentially play a pivotal role in the management of DM and maintain their QOL. In developing countries with poor record of pharmaceutical services, it is important to highlight the role of pharmacists in achieving rational and evidence-based pharmacotherapy.

Conflicts of interest

There are no conflicts of interest regarding this work of study.

Limitations

This review included studies were evaluated different types of interventions and conducted in various healthcare settings. Therefore, limitations of the study are the following:

- Increased level of heterogeneity of the results.

- Different tools are used for assessment of some outcomes.

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