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Journal of Basic and Clinical Physiology and Pharmacology

ISSN: 2191–0286
Editor-in-chief: Ugo Oliviero
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Review

Ayu Wulan Dwiputri[1] / Liza Pristianty[1] / Andi Hermansyah[1]

Pharmacist contributions in the treatment of diabetes mellitus in Southeast Asia: a narrative review

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Abstract:

Background: The growing burden of diabetes mellitus (DM) in Southeast Asia puts pharmacists in the ideal position to provide management of DM. This narrative review aims to describe the evidence of pharmacist contribution in improving DM in Southeast Asia.

Content: A literature search was conducted to identify relevant research articles published from 2010 to 2018 in four databases (Scopus, Pubmed, MEDLINE, and Springerlink) describing pharmacist roles and activities intended to improve management of DM in Southeast Asian countries. Results were synthesized narratively and divided into three main sections: (1) the role of pharmacist in DM management, (2) the impact of pharmacist role, and (3) the barriers to the implementation of services in DM management. A total of 16 studies were identified, of which ten studies mentioned services that were conducted exclusively by a pharmacist and the remaining collaborated with other health professionals. A number of pharmacist services were reported including prevention, dispensing, medication review, drug information services, patient counselling and education, monitoring, follow-up, and referral. Barriers related to individual, organizational, and public recognition were described.

Summary and outlook: The Pharmacist can contribute to improve DM management in a variety of settings. Action research on pharmacist intervention in DM is recommended.

Keywords: contribution, diabetes mellitus, pharmacist, review, role

Introduction

Diabetes mellitus (DM) is a global health threat. In 2012, there were approximately 1.5 million people who died from diabetes [1]. The prevalence of DM continues to increase. At least one in 10 adults will suffer from diabetes in 2020 compared with that in 2015, which is only one in 11 people [2]. The Southeast Asia region is the second largest region in terms of prevalence of DM globally after the Western Pacific Region [1].

DM is a long-term chronic condition. The increased prevalence of DM is caused by a lack of control over the disease. Uncontrolled conditions can lead to many complications, such as neuropathy, retinopathy, and nephropathy. The aggressive management of these parameters has been proven to reduce the undesirable effects [3]. Therefore DM management is needed.

Pharmacist is one of the healthcare professionals who have an important role in DM management [4]. In many countries, pharmacists are among the most accessible health professional [5]. Pharmacists do not diagnose diabetes, yet they can play an important role in helping individuals to stay in control of their condition [6]. Pharmacists have the ability to provide treatment management services [7].

Pharmacists have an important role to play in health care, which is much more than selling medicines [8]. Thus, in health services, pharmacists have two approaches that can be done as an effort in conducting treatment management services, namely (1) the prescription-focused and (2) the patient-centered approach. The first approach refers to all activities carried out during the dispensing process of medicinal products to patients. Meanwhile, the second approach focuses on patient involvement in the service process [7].

The scope of pharmaceutical care includes educating patients (or people caring for patients) about their treatment and conditions to ensure maximum benefit and safety of the therapy obtained; review the patient's

medical history; continuous monitoring of patient therapy; screening for possible side effects; and monitor the patient's ability to take his medication properly and to comply with prescribed therapies [9].

In relation to diabetes management, pharmacists can play a role in the process of identification, assessment, education, referral, and monitoring [10]. There are seven evidence-based factors needed in diabetes management including cardiovascular disease (CVD) risk, cholesterol, glycemic, medication, blood pressure, lifestyle, and education [11]. In practice, pharmacists also often collaborate with doctors, nurses, or other health professionals. In several studies, this effort was proven to help improve glycemic control [12], [13]. As an effort to increase collaboration between pharmacists, doctors, and other professionals, increase communication between patients and the healthcare team, and optimize the use of drugs to get better outcomes, there is also a model called medication therapy management (MTM). MTM is a patient-focused service, consisting of five main elements: medication therapy review (MTR), personal medication record (PMR), medication-related action plan (MAP), intervention and/or referral, documentation and follow-up [14]. Therefore, the aim of this narrative review is to illustrate the evidence of pharmacists' contribution in increasing DM in Southeast Asia.

Materials and methods

Search strategy

The keywords used in the database search are "pharmacist" and "diabetes." The study is limited to countries in Southeast Asia. The database used includes Scopus, Pubmed, MEDLINE, and Springerlink. Searches were limited to articles in English, published between January 2010 and December 2018, and included type 1 and type 2 diabetes. The findings from the search were presented as narrative reviews.

Inclusion and exclusion criteria

Studies that will be reviewed as well as inclusion criteria include (1) original research, (2) studies in Southeast Asian countries, and (3) availability in full paper form that can be open accessed. The exclusion criteria in this study were no involvement of pharmacists in the service.

Data extraction

The studies were analyzed and categorized by country, sample size and population, study design, pharmacist contribution, outcome measures, and findings in a matrix format (Table 1).

Table 1: Matrix of publication included.

Country	Citation	Sample	Study design	Pharmacist contributions	Measurement of outcomes	Findings
Indonesia	Wibowo et al. [15]	Total: n = 196	Questionnaire survey	Dispensing and education	Type of community pharmacy-based service	Most patients used community pharmacies for dispensing (100%) and education on how to use medications (79.6%)
	Keban et al. [16]	Total: n = 59	Cross sectional	Education by distributing brochures or providing information directly to the samples about diabetic neuropathy	a. Prevalence and risk factors for DN b. The effect of pharmacist intervention toward DN patients	a. 18.6% had DN and the risk factors such as ages, duration of diabetes, sex, cardiovascular disease, and lifestyle b. Pharmacist intervention showed an increase on the patient's knowledge about DN and decrease on the patient's blood glucose level
	Adikusuma and Nurul [17]	Total: n = 40 Intervention: n = 20 Control: n = 20	Quasi-experimental	Counseling and education and SMS as reminder and motivation	The effects of counseling and SMS	Counseling and education and SMS can improve treatment adherence and decrease HbA_{1c} level significantly in the intervention group
Singapore	Siaw et al. [18]	Total: n = 411 Intervention: n = 214 Control: n = 197	Randomized controlled trial	Clinical pharmacists managed CAREPILLS, optimized medications, furnished prescriptions, and followed up regularly with all patients via face-to-face visits or phone calls	a. Clinical outcomes b. Scores from the PAID and the DTSQ, and diabetes-related health service utilization rates and costs	a. A mean decrease in HbA_{1c} of 0.8% (intervention group) with unchanged HbA_{1c} values (control group); the change in mean SBP, LDL, and TG between two arms were insignificant b. Improvements in PAID and DTSQ scores, reduction in physician workload and an average cost savings of US\$91.01 per patient (intervention group)
	Siaw et al. [19]	Total: n = 330 Intervention: n = 141 Control: n = 189	Randomized controlled trial	Multidisciplinary care with regular clinical pharmacist follow-up with all patients via face-to-face visit or telephone call in addition to usual care.	a. HbA_{1c} change b. Total direct outpatient medical costs for diabetes-related care	a. The intervention group had greater improvement in HbA_{1c} b. Lower mean total direct outpatient medical costs per patient in the intervention group

Country	Author	Sample	Study design	Intervention	Outcomes	Results
	Siaw et al. [19]	Total: n = 26	Qualitative study	PMDS services consist of optimizing diabetes treatment and self-management education	Patients' care experiences with PMDS in four themes: a. Fulfilling patients' needs b. Delivery and quality of service c. Changes attributed to the service d. Suggestions for improvement	a. The majority of patients' agree that PMDS successfully fulfilling patients' needs for information on diabetes management such as diabetes and its complications, lifestyle changes, and medication b. Patients are generally satisfied with the structural quality of service (location and appointment system) with the pharmacist c. Some patients report improvements in glucose control and medication adherence d. Suggestions to improve PMDS were minimal because patients are satisfied with almost all aspects of the service
Malaysia	Lim and Lim [20]	Total: n = 43	Retrospective cross sectional	Routine follow-up and meet the pharmacists. Patient received counseling and education through The DMATC program	a. Glycemic control b. Lipid parameters c. Patient adherence	a. A mean reduction in HbA$_{1c}$ and FBG b. A mean reduction in LDL cholesterol but TG and HDL cholesterol were not significant c. Patients' adherence to medication regimens improved significantly from medium to high adherence
	Huri and Lee [21]	Total: n = 208	Retrospective	Assess the DRPs by the pharmacist	a. Types of DRPs b. Factors associated with its occurrence	a. The majority of patients (91.8%) had at least one DRP. The most frequent types of DRP were potential drug–drug interaction, drug not taken or administered, and insufficient awareness of health and diseases b. Male gender, renal impairment, polypharmacy, and poor lipid control were factors that were significantly associated with DRP
	Chung et al. [22]	Total: n = 241 Intervention: n = 120 Control: n = 121	Prospective randomized controlled trial	PC by pharmacist, including medication review, resolve any DRPs and educated patients	a. Medication adherence b. Glycemic levels	a. Medication adherence significantly associated with the provision of PC b. Statistically significant differences were observed between the control and intervention groups in FBG and HbA$_{1c}$ values
	Chan and Mohamed [23]	Total: n = 110 Standard group: n = 35 Font-enlarged group: n = 35 Pictogram-incorporated group: n = 40	Randomized controlled trial	Modified labels through font-enlarged and pictogram-incorporated labels used for long-term medications	a. Patients' adherence b. Patients' comprehension c. Patients' preferences	a. There were an increase of total adherence scores in all three groups b. The repeatedly measured total comprehension score of pictogram-incorporated label group was significantly higher than baseline c. Elderlies and those with a higher number of morbidity preferred pictogram-incorporated label over font-enlarged label
	Butt et al. [24]	Total: n =73 Intervention: n = 37 Control: n = 36	Randomized controlled trial	Patients in intervention group received standard care and PEPP intervention.	a. Clinical outcomes b. Medication adherence	a. HbA$_{1c}$ and BMI values reduced significantly, but lipid profiles were unchanged in both groups b. Morisky modification adherence scale (MMAS) significantly increased

					Clinical outcomes	Mean HbA$_{1c}$, FBG, and LDL cholesterol levels reduced significantly.
	Lim et al. [25]	Total: n = 76 Intervention: n = 39 Control: n = 37	prospective randomized	Patient received DMTAC program on top of their routine clinical follow-up		
Malaysia	Lee et al. [26]	Total: n = 14	Qualitative	Interviews were conducted by ELL (pharmacist and graduate student)	a. Experience and perception of diabetes self-management b. Constraints of the current healthcare system c. Perception of the community pharmacist and community pharmacies d. Perceived roles for community pharmacists in diabetes care e. Challenges in utilizing community pharmacies to provide DSME/S	a. There were many misconceptions among participants about diabetes management that could be attributed to lack of knowledge b. Long waiting hours, overcrowded clinics, short consultation times, and long duration gap between appointments were described by most participants about constraints of the current healthcare system c. Participants seen that some community pharmacists were perceived as prioritizing profit over patient care with little to no discussion of health-related needs d. Most participants acknowledged that community pharmacists could provide information or education for patients on diabetes self-management e. There were challenges including privacy in the community pharmacy and added costs that would incur from using community pharmacies for diabetes care
	Chua et al. [27]	Total: n = 477	Controlled trial	The pharmacist reviewed patient medications and counselled patient, noted any PCIs encountered by the participants and helped to resolve the PCIs	a. Types of PCIs encountered by the participants b. The causes and clinical significance of the PCIs	a. Types of PCI: Drug-use problems, insufficient awareness and knowledge about disease condition and medication, ADR, therapeutic failure, drug-choice problems and dosing problems b. The main causes of PCIs were deterioration of disease state that led to failure of therapy and also presentation of new symptoms or indications. There were 52% with clinically insignificant, 38.9% with minimal clinical significance, 8.9% as definitely clinically significant and could cause patient harm, while one issue (0.2%) was classified as life threatening

Thailand	Dhippayom et al. [28]	Total: n = 397	Descriptive	The pharmacist assessed the participants' risk of diabetes by using the diabetes risk prediction tool as screening. All participants received educational information from pharmacists as health promotion	a. The number of participants with high risk of diabetes b. The number of high risk individuals undertaking a fasting CBG test; individuals with elevated fasting CBG; and confirmed diagnosis of diabetes)	a. There were 49.4% of participants who had a high risk of diabetes (risk score: ≥9) b. There were 48.5% of these high risk individuals undertook fasting CBG. Elevated fasting CBG ($\geq$126 mg/dL) was found in 12 persons (12.7%). Overall, two patients with diabetes were identified during the provision of the program
Thailand	Saengcharoen et al. [29]	Total: n = 143	pre- and post-intervention	a. The pharmacist checked the accuracy of the medications and DRPs and then advised the patient about the drug use b. The pharmacist provided the patients with education using a DVD and then asked them to show how to use insulin injection.	Clinical outcome	a. Significant reductions in HbA$_{1c}$, FBG, systolic BP, triglycerides, and total cholesterol were detected in patients who received the intervention. Increased LDL cholesterol level, but no significant change in HDL cholesterol were found b. Medication adherence, diabetes knowledge, and skill in using insulin injection improved at the end of the study
Cambodia	Otgontuya et al. [30]	Total: n = 5433	Cross sectional	Management with pharmaceutical and lifestyle advice interventions	a. Prevalence of conditions that was associated with CVD factors b. Prevalence of early identification of hypertension and diabetes c. Prevalence of uncontrolled hypertension and diabetes and its possible cause	a. Prevalence respectively in hypertension (12.3%), diabetes (3.1%), hypercholesterolemia (3.2%), and overweight (15.5%) b. There were 45.4% of all hypertensives and 50.3% of all diabetics in the age group 35–64 years that had been previously diagnosed c. Only 28.6% of all hypertensives and 23.9% of all diabetics, respectively, were adequately controlled. Estimates suggest deficits in delivery of important advice for lifestyle interventions

ADR, adverse drug reaction; BMI, Body Mass Index; CAREPILLS, Closer monitoring, Adherence problem, Resistance to drug therapy, Empowerment in patient's own therapy, Polypharmacy, Insulin titration, Lack in drug knowledge, Lack in drug administration techniques and Switching of drugs; CBG, capillary blood glucose; DMTA, Diabetes Medication Therapy Adherence Clinic; DN, diabetic neuropathy; DRP, drug related problem; DSME/S, diabetes self-management education and support; DTSQ, Diabetes Treatment Satisfaction Questionnaires; FBS, fasting blood glucose; HbA$_{1c}$, glycated hemoglobin; HDL–C, high-density lipoprotein; LDL, low-density lipoprotein; PAID, problem areas in diabetes; PC, pharmaceutical care; PCI, pharmaceutical care issue; PEPP, patient education by pharmacist program; PMDS, pharmacist-managed diabetes services; SBP, systolic blood pressure; SMS, short messages service; TG, triglyceride.

Results and discussion

Studies included in this narrative review are shown in Figure 1. There are 142 titles identified and further selected. Exclusion criteria are duplicated titles; review, commentary, or protocol; pharmacists are not involved; and countries that are not located in Southeast Asia. Finally, 16 papers were eligible for the review process (Figure 1).
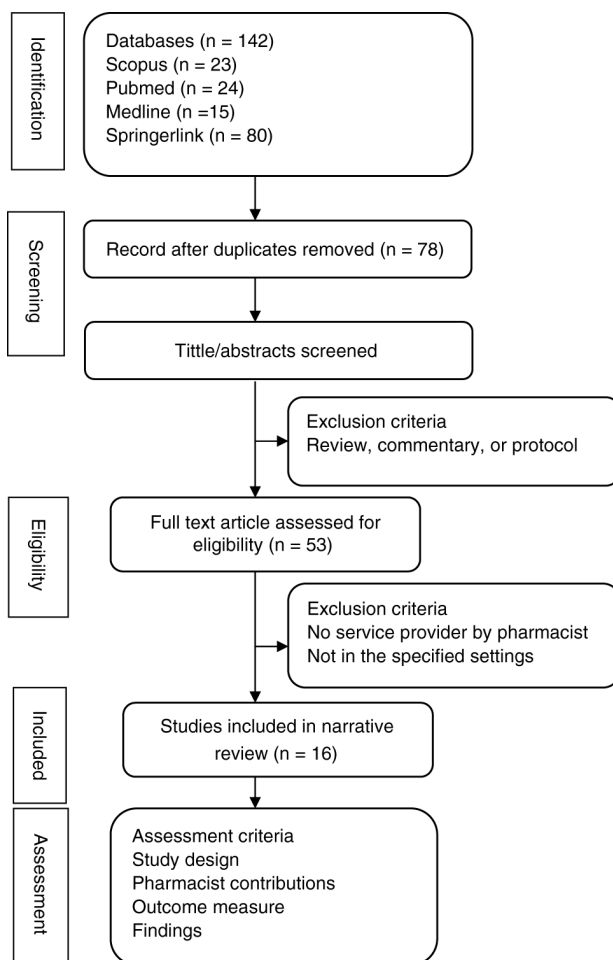

Figure 1: PRISMA Diagram of Literature search strategy and review procedure.

Five countries in Southeast Asia were included in the study, consisting of Indonesia (three studies) [15], [16], [17], Malaysia (eight studies) [20], [21], [22], [23], [24], [25], [26], [27], Singapore (two studies) [18], [19], Thailand (two studies) [28], [29], and Cambodia (one study) [30].

The role of the pharmacist in DM management

The pharmacist contributions found in the study are illustrated in Figure 2 and the references used are summarized in Table 2.

Figure 2: Pharmacist contributions in Southeast Asia.

Table 2: Pharmacist contributions at various setting in Southeast Asia.

Country	Citation	Setting	Services delivery	Type of contributions
Indonesia	Wibowo et al. [15]	Community pharmacy	Exclusively	a. Dispensing b. Counselling and education c. Monitoring d. Referral
	Keban et al. [16]	Hospital	Exclusively	Counselling and education
	Adikusuma and Nurul [17]	Outpatient in hospital	Exclusively	a. Counselling and education b. Follow-up
Singapore	Siaw et al. [18]	Outpatient in healthcare institution	Collaborative	a. Counselling and education b. Monitoring c. Follow-up d. Referral
	Siaw et al. [19]	Ambulatory care and community	Collaborative	a. Counselling and education b. Monitoring
Malaysia	Lim and Lim [20]	Hospital	Collaborative	a. Counselling and education b. Follow-up c. Monitoring
	Chua et al. [27]	Primary care	Collaborative	a. Medication review b. Counselling and education c. Referral
	Huri and Lee [21]	Tertiary care	Collaborative	a. Medication review b. Counselling and education
	Chung et al. [22]	Hospital	Exclusively	a. Medication review b. Counselling and education c. Follow-up
	Chan and Mohamed [23]	Hospital	Exclusively	Dispensing
	Butt et al. [24]	Endocrine clinic	Exclusively	a. Counselling and education b. Follow-up
	Lim et al. [25]	Hospital	Exclusively	a. Medication review b. Counselling and education c. Follow-up d. Monitoring
	Lee et al. [26]	Primary care	Exclusively	a. Dispensing b. Drug Information services

Thailand	Dhippayom et al. [28]	Community pharmacy	Exclusively	a. Prevention b. Education c. Referral
	Saengcharoen et al. [29]	Hospital	Exclusively	a. Medication review b. Counselling and education
Cambodia	Otgontuya et al. [30]	Community	Collaborative	Education

Prevention

The contribution of pharmacists in prevention was found in one study. Prevention is carried out in the form of screening and health promotion. The screening process employed risk prediction tools developed by Aekplakorn et al. to select individuals who are at high risk for capillary blood glucose (CBG). Assessment was based on risk factors for participants, including age, sex, Body Mass Index (BMI), waist circumference, hypertension, and history of diabetes in parent or sibling [28]. The higher the score obtained, the greater the risk of diabetes. Although this tool can be used as a diabetes screening, there is no agreement yet that the tools must be used in all community pharmacies in Thailand [31]. In addition, the type of health promotion to be delivered depending on the diabetes risk score obtained. Those who had a score of ≤5 were informed about lifestyle regarding exercise and weight reduction, and subjects who had a score of ≥6 would receive additional information regarding diet control. Meanwhile, subjects who have a diabetes risk score of 9 will continue the fasting CBG test, and if an increase in fasting CBG is found (≥126 mg/dL), participants will be referred to the hospital [28]. Screening using risk prediction tools is relatively easy to use to measure the risk of diabetes in community settings as compared with glucose measurements that are more costly. The tools have also been developed in other countries such as Western, Oman, India, Japan, and China [28].

Dispensing

The contribution of pharmacists in the dispensing process was found in two studies, one each in Indonesia and Malaysia. Community pharmacists in Indonesia actively play a role in this process [15]. Similarly, pharmacists in Malaysia also contributed in this process, although dispensing of drugs can be carried out by doctors [31]. The results of interviews with the perception of type 2 diabetes patients about pharmacists showed that pharmacists in community pharmacies still prioritize the process of "selling and buying." Based on their experience, the communication that occurs between pharmacists and patients is mostly related to the costs of purchasing certain products, with little or no discussion about health-related needs [26].

The dispensing process actually has an important value in a pharmaceutical care service. Pharmacists have a responsibility to ensure that the drugs received are safe and effective for use. Therefore, pharmacists are required to do prescription screening [3].

Several problems were found, such as inability of patients with type 2 diabetes to read the instructions on the drug label that turned out to be one of the local predisposing factors of patients to poor medication adherence, even though the literacy rate in Malaysia was 93.1%. The instructions contained on the medication label at the hospital have relatively small fonts, making it difficult for patients to read them. Therefore, try to make modifications to the drug label. Drug labels are then made with larger fonts, and some are combining instructions on drug labels with pictograms [23].

Medication review

Medication review is a structured evaluation of patient medicines with the aim of optimizing the use of drugs and improving health outcomes. The scope of medication review includes the process of detecting drug-related problems (DRP) and recommending interventions [32]. Recommended interventions aim to help resolve problems and support patient knowledge and compliance [33]. Such interventions include adding and adjusting medicines. In one study in Malaysia it was found that the pharmacist had received approval from a doctor to adjust the insulin dose in 4 units of the dose determined at a time according to the patient's blood glucose level if needed [25].

Most pharmacists in studies in Malaysia and Thailand conducted a medication review process [21], [22], [27], [29]. In a study conducted by Huri et al. Chung et al. and Chua et al. showed that the identification and assessment of DRPs is a form of pharmaceutical care conducted by pharmacists. Interestingly, pharmaceutical

care services in the Huri et al. and Chua et al. study were conducted collaboratively between clinical apoeker and patients, as well as with other healthcare team members. All of these people are involved in the process of designing, implementing, and monitoring therapeutic plans to produce the desired specific outcomes.

The identification of DRPs in the Huri et al. and Chua et al. studies was carried out based on the Pharmaceutical Care Network Europe (PCNE) tool version 5.01. Pharmacist intervention based on PCNE tool version 5.01 are grouped into no intervention, prescriber level, patient/carer level, drug level, and or other interventions or activities [34].

About 91.8% of participants from the Huri et al. and 53.7% of participants from the Chua et al. studies were identified as having at least one DRP. Meanwhile, the RCT study by Chung et al. proved that the medication review had a positive impact. The results showed that there was a significant difference between the control group compared with the intervention group on the value of fast blood glucose (9.0 vs. 7.2 mmol) and glycated hemoglobin (9.1% vs. 8.0%) and the positive effect on treatment compliance in the group intervention.

Drug information services

Drug Information Service is an activity of providing information on impartial drugs, critically evaluated, and with the best evidence in all aspects of drug use to other health professionals, patients, or the public. Information about medicines includes that of prescription medicines, OTC drugs, and herbs. Drug information usually includes dosage, dosage form, special formulation, route and method of administration, pharmacokinetics, pharmacology, therapeutic and alternatives, efficacy, safety of use in pregnant and lactating women, side effects, interactions, stability, availability, price, and physical or chemical properties of the medicine [35].

Pharmacists are healthcare professionals who have knowledge about drugs, so in practice they can provide information related to it. The study by Lee et al. showed that for people in Malaysia who had interacted with pharmacists, community pharmacists were seen as providers of quality health services and were able to provide professional medical advice. Participants felt that community pharmacists had sufficient knowledge to provide appropriate medical advice, and some recognized that community pharmacists had a better understanding of medicine than doctors [26].

Patient counselling and education

Most of the pharmacists in the study contributed to counseling and education for patients. Counseling is known to be one of the most common interventions (38.8%) compared with other interventions such as patient referral to prescriber (20.8%), educating patients about their disease (12.0%), recommending changes in dosage or frequency drugs or add other drugs (5.8%), and to monitor the patient's condition (5.0%) [27].

Counseling is an interactive process between pharmacists and patients/families to increase knowledge, understanding, awareness, and compliance so that behavior changes occur in the use of drugs and resolve problems faced by patients [35]. Pharmacists play an important role in educating patients through counseling that helps increase patient confidence and compliance [18], [20], [18]. The impact is not only on improving the quality of life but also on the level of patient satisfaction with DM care [18].

It is also emphasized by WHO that educating patients or people caring for patients about their treatment and conditions to ensure maximum benefit and safety of the therapy obtained is one form of pharmaceutical care that can help medication adherence [9]. Adherence to diabetes medications is known to have a significant relationship with glycemic control. Those who did not adhere to treatment had significantly higher fasting blood glucose levels [27].

The counseling process is carried out in a private counseling room [24]. Based on The Pharmaceutical Services Division, Ministry of Health Malaysia, the allocation of counseling space for pharmacists and patients has been established. The counseling area must be a well-appointed, private, and comfortable area, aiming to maintain patient privacy so that more effective communication occurs that helps improve patient comfort [36].

Pharmacists can provide counseling and education on a continuing basis. This education can educate participants to dispel their doubts and misunderstandings, which will lead to understanding and hence better treatment compliance [24], [27]. The educational process not only is a method to resolve DRPs at the patient/carer level but also helps patients recognize complications that may occur due to DM, such as diabetic neuropathy [16], [21], [27].

Types of education provided include the following: (1) disease prevention [15]; (2) knowledge of diseases (diabetes, hypertension, and hyperlipidemia) [19], [20], [21], [22], [24], [28], [29] and their complications [19], [20], [24]; (3) medication knowledge, such as direction for use, common/important side effects and how to overcome them, storage requirements, and use of insulin devices [15], [16], [19], [20], [21], [25], [29]; (4) therapeutic

targets [15], [25]; (5) the importance of medication adherence [17], [19], [21], [22], [24]; (6) how to use pillboxes [19], [21], [22]; (7) the importance of self-monitoring [16], [17], [19], [21], [22], [24]; (8) symptoms of hypo- and hyperglycemia and its treatment [20]; (9) lifestyle modification, such as smoking cessation, diet control, weight control, and exercise [16], [19], [20], [24], [27], [28]; and (10) foot care [15], [16], [20].

The need for education by pharmacists is expected by patients. Pharmacists are considered able to meet the information needs of DM management [19]. Seventy percent of patients who come to pharmacies expect educational services provided by pharmacists [15].

The tools to provide education also varied, starting in the form of booklet guides [25], diagrams [19], leaflets [28], and even DVDs [29], so that they are more easily understood by patients.

Monitoring diabetes care

Monitoring can be carried out on (1) compliance monitoring (including in terms of antidiabetic treatment, exercise and diet plans, chronic complications prevention/treatment plans, and scheduled medical monitoring) [15], [19]; (2) monitoring therapeutic outcomes (including checking records on self-monitoring of blood glucose (SMBG), patient blood glucose test results, BMI measurements, blood pressure measurements, and patient laboratory test results) [15], [18], [20], [25], and (3) monitoring of side effects [15], [27]. Although monitoring services provided by pharmacists are still limited, 50% of patient respondents in community pharmacies support activities related to monitoring and hope that pharmacists can provide more monitoring services [15].

Follow-up

Follow-up by the pharmacist aims to remind the patient to come back at the next appointment or remind to take medicine. Follow-up can be done through face to face visits, telephone calls, or SMS [17], [18], [25]. Every meeting with the pharmacist, patients will be given counseling and education. Follow-up was also carried out to help participants solve pharmaceutical care or DRP problems via telephone [22]. One patient described his experience of hypoglycemic events caused by drugs and how he contacted a pharmacist by telephone. The patient explains how the pharmacist is able to overcome his fear and provide appropriate advice to minimize the side effects of the drug [19].

The timeframe of face to face between patients and pharmacists varies in several studies, ranging from every 1 to 2 months [18], [20], [27] and every 3 to 4 months [22], [24]. Each face to face session with the pharmacist can last for 20–30 min [18].

Referral

Referral is carried out by the pharmacist according to the needs of the patient [15], [18], [19]. Pharmacists can refer patients to prescribers related to treatment and dietitian related to diet and exercise management [27]. The referral can also be carried out by the pharmacist from the preventive efforts made. In a study it was shown that subjects who had a diabetes risk score of 9 based on diabetes risk tools were advised to continue the fasting CBG test, and if an increase in fasting CBG was found ($\geq$126 mg/dL), participants would be referred to the hospital and further examination and enforcement diagnosis by a physician [28].

All services provided by pharmacists are expected to be able to provide empowerment and motivation, thereby strengthening the seven self-management behaviors that are important for diabetes: healthy eating, being physically active, regular self-monitoring of blood glucose, adherence to medications, good problem-solving skills, risk-reduction behaviors, and healthy coping skills [37]. This behavior helps patients achieve their glycemic goals, which are very important for preventing diabetes-related morbidity and mortality [19].

Interestingly, from several studies, it was found that DM management was included in certain programs that were tried in each country, such as the Diabetes Prevention Program in Thailand [28], a pharmacist collaboration program with a doctor called Diabetes Medication Therapy Adherence Clinic (DMTAC) and Patient Education by Pharmacist Program (PEPP) in Malaysia [20], [24], [25], and Pharmacist-Managed Diabetes Services (PMDS) in Singapore [19]. Some studies also show that diabetes management has referred to the Diabetes Management Guidelines that are available. There are also those who develop DM content management such as PEPP, which combines the American Diabetes Association guidelines [38] with the Malaysian Ministry of Health guidelines [36]. At present, a small number of community pharmacies in Indonesia also strengthen DM management efforts through services for chronic diseases funded by the National Health Insurance Scheme [39].

Collaborative care can be performed between physician, dietitians, diabetes nurse educators, and clinical pharmacists. Collaborative and multidisciplinary teams are known to be most suitable for providing care for people with chronic conditions such as diabetes and can help patients to facilitate patient self-management [19]. Continuous and long-term support by health professionals is very important in helping patients sustain their efforts in diabetes self-management. Support for 2 years is shown to have an improvement on the quality of life of diabetic patients [40].

A team-based approach in the form of a visit is a delivery system design that moves from a reactive system to a proactive care delivery system that can optimize the care of patients with chronic illness. This concept has become part of the Chronic Care Model with Six Core Elements, as one of the concepts in diabetes management [41]. The relationship between participants, health care providers, and social support is a fundamental inter-personal factor that is closely related to treatment compliance. Some consultations with pharmacists allow the development and formation of better patient-pharmacist professional relationships. This consultation increases the confidence of the participants and therefore may contribute to improving medication adherence [22].

In Siaw et al.'s study, there is a concept that maps the division of roles between healthcare professionals in providing care to patients. Physicians play a role in diagnosing patients, assessing the severity of diabetes, and prescribing medications; dietitian plays a role in providing dietary counseling such as carbohydrate counting, choosing healthy foods, and weight management; clinical pharmacist plays a role in the management of CAREPILLS (Closer monitoring, Adherence problems, Resistance to drug therapy, Empowerment in patient's own therapy, Polypharmacy, Insulin titration, Lack in drug knowledge, Lack in drug administration techniques, and Switching of drugs), optimization of drug use using SIGN (Symptom-based Insulin adjustment for Glucose Normalization) algorithm, and furnishing prescriptions and telephone follow-up; and diabetes nurse educator plays a role in self-care counseling and basic screening in the feet and eyes [18]. The same division of tasks was carried out in the Chua et al. study of dietitians and nurses.

Other forms of collaboration in the study of Chua et al. and Chung et al. in Malaysia were demonstrated through communication between pharmacists and general practitioners (GPs) to discuss and if possible to assist in solving pharmaceutical care problems that could affect the clinical outcomes of participants. Meanwhile, the role of dietitian and nurse is also similar to the mapping found in a study in Singapore by Siaw et al.

Collaborative care is also carried out not only in managing the patient's diabetes condition but also in other possible risks that can occur due to diabetes. This was demonstrated in the Cardiovascular Risk Factors Intervention Strategies (CORFIS) trial program conducted in Malaysia. GPs, pharmacists, dietitians, and nurses collaborate in the process [27].

The results of collaborative care can help in reducing the average HbA_{1c} value of 0.8% in patients in the intervention group compared with the control group with the HbA_{1c} value that tends to not change, improvement in the Problem Areas in Diabetes (PAID) score and The Diabetes Treatment Satisfaction Questionnaires (DTSQ), a reduction in physician workload, and an average cost savings of US$91.01 per patient were observed in the intervention group for 6 months [18].

The role of pharmacists in the management of DM in this narrative review can be part of the other roles of pharmacists that have been reviewed especially in developing countries in Southeast Asia, relating to pharmacists' contributions to the health of communities [42]

The Impact of the Pharmacist's Role

The impact of pharmacist contributions in DM management includes the following:

a. Pharmacists contribute to the prevention of diabetes through screening people who are at risk of diabetes [28].

b. The process of identifying DRP carried out by pharmacists is able to have an impact not only on the prevention of drug-related problems that may occur but also on the resolution of problems currently being faced by patients [21].

c. Pharmacists are able to significantly increase clinical outcomes by decreasing HbA_{1c} values [20], [22], [24], significantly decreasing FBG values [20], [22], significantly decreasing LDL [20], and decreasing BMI in the intervention group [24].

d. Pharmacists who are able to increase medication adherence are shown by increasing MMAS scores [20], [22], [24].

e. Pharmacists are able to provide service satisfaction for patients. This is because pharmacists are able to meet the information needs of DM management and provide motivation for patients to change lifestyles for

the better, for example, through patient motivation to start exercising and eating healthy foods as well as motivation for routine self-monitoring [19].

Barriers to the implementation of services in DM management

Individual

In a promotive effort, a pharmacist needs to get training on effective approaches to patient education/behavior change so that it does not only focus on diabetes and lifestyle modification [28]. Training is also needed in the process of identifying pharmaceutical care problems, because it requires a long-time process. This can occur due to the lack of pharmacist experience in detecting and resolving pharmaceutical care issues (PCIs) [27]. In addition, the active participation of pharmacists in the treatment of DM cannot be separated from their knowledge, attitudes, and practices toward their current functioning. Therefore, these three components must be a concern for pharmacists in delivering pharmacy services [43].

Meanwhile, from the patient's perspective, the majority of participants were worried about the additional costs to be incurred from using community pharmacies for diabetes care, and for some people, this might prevent them from using the pharmacy despite the perceived benefits. There is also consideration whether this service will be commensurate with the amount charged. [26].

In addition, in several studies, language is one of the obstacles in providing services. Some patients are known to not speak Malay or English [24]. Countries in Southeast Asia are countries with populations of various ethnicities. In Malaysia and Singapore, for example, they consist of three main ethnicities, namely Chinese, Malay, and Indian [18], [22]. And Indonesia itself consists of various ethnic and ethnic groups, so there are diverse cultures in each region. This heterogeneous population is a unique characteristic in Southeast Asian countries. Apparently, this can be one of the considerations in determining appropriate health services, because it will affect the acceptance of a health service. Therefore, further studies are needed to evaluate the impact of ethnic differences, especially on glycemic control in countries in Southeast Asia [24].

Organizational

Community pharmacy in Thailand, for example, has not been formally integrated as part of the healthcare system [28]. Meanwhile, in Malaysia, the application of pharmaceutical care models on a broader scale can be limited by the healthcare infrastructure [22]. The high cost of glucometers and testing supplies that are not subsidized by the government prevents participants from conducting routine SMBG [26]. In the study in Malaysia, other obstacles to the current health system such as the overcrowded clinics, long waiting times, short consultation times, and long intervals for appointments can result in non-compliance with their medicines. As a result of this limitation, the patient-provider relationship also appears to be negatively affected [26].

In connection with professional organizations, negotiations from the Indonesian Pharmacists Association are needed regarding adequate remuneration for pharmacists so that services expected by the community can be implemented more optimally, based on payment schemes including very low prescription fees [15].

Public recognition

People in Thailand have reportedly not felt comfortable accessing health services [28]. In addition, patients in Malaysian community pharmacies do not always feel comfortable about receiving recommendations by community pharmacists to modify their treatment regimens. This is due to concerns about the provision of accurate recommendations by pharmacists because pharmacists do not have access to patient case records and laboratory data. However, another study showed that most participants appreciated the advice of community pharmacists as pharmacists were considered professional and accurate. Pharmacists as medical experts are considered sure to be able to conduct drug reviews, and this can be a step in ensuring the use of drugs that are safe and provide a sense of security for users. It is believed that pharmacists can detect signs of hyperglycemia, hypoglycemia, or early stages of diabetes complications and provide immediate treatment and referral recommendations [26].

Study limitations

Studies on this narrative review were found in only five countries in Southeast Asia based on the database used. Indeed there are still many types of pharmacist contributions in various settings. However, this narrative review is limited to studies based on keywords that are determined, so some contributions may not be summarized.

Most of the studies are also still carried out in a short period of time, so it is not yet possible to detect the complications of long-term diabetes, long-term effects, and the benefits of the contribution made by pharmacists.

Summary and outlook

Pharmacists play a role in contributing to the improvement of DM in various settings from the community pharmacy, the primary care, to the tertiary care. The types of pharmacist contribution included prevention, dispensing, medication review, drug information services, counseling and education, monitoring, follow-up, and referral. Various types of intervention by pharmacists and their impact can provide a broader view of the important role of the pharmacist as a healthcare professional in DM management. The more varied the pharmacist's intervention, the more it is known what approach is most appropriate in managing DM. This intervention is expected to help reduce the prevalence of DM. Therefore, action research on pharmacist intervention in DM management is recommended.

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