RESEARCH ARTICLE

The use of herbal medicines in patients with type-2 diabetes mellitus in indonesia

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ARTICLE INFO	ABSTRACT
Keywords: herbal medicine prevalence patient satisfaction type 2 diabetes mellitus	In Indonesia, the use of herbal medicine as an alternative medicine is increasing. Herbal remedies are used as complementary medicine and self-medication. Diabetes mellitus requires treatment over the long term. This may contribute to the medication adherence problem. Consequently, many patients seek alternative treatments, such as herbal medications. The purpose of this study was to determine the use and type of herbal medicines among diabetic patients in Indonesia. A cross-sectional study with 190 respondents selected at random from multiple cities in Indonesia. A questionnaire was used to determine the most frequently used herbal medicine, the demographic profile of the patients, the health services, and the level of patient satisfaction with the use of herbal medicines. The participants were predominantly female (62.7%), housewives (39.5%), aged between 40 and 65 (84.5%), high school graduates (74.7%), and had low to moderate incomes (74.7%). The use of herbal medicine was 22%, and the combination of herbal medicine and prescription medication was 6%. Bitter leaves (10%), mangosteen peel (8.9%), insulin leaves (7.9%), *mahkota dewa* herbs (6.3%), and bitter melon are used as herbal or traditional medicines (4.7%). In terms of satisfaction, 28.7%, 40.9%, and 14.4% of respondents were quite satisfied, satisfied, and very satisfied with the use of herbal medicines, respectively. Herbal remedies are commonly used in alternative diabetes treatments. Bitter leaves are the most frequently used herb, with over half of respondents expressing satisfaction with the benefits of herbal medicine.

1. Introduction

Most individuals believe that herbal medicines have no side effects, which has led to a rise in their use as an alternative to conventional medicine (Lau and Sunarti, 2018). Globally, the average use of traditional medicine is around 20-28% (Adiyasa and Meiyanti, 2021). Based on Riset Kesehatan Dasar (RISKESDAS), conducted by Ministry of Health, Indonesia, 59.12% of Indonesian households still consume herbal medicine (Ministry of Health, 2018). In addition, self-medication with herbal remedies increased from 63.77 percent to 71.46 percent between 2016 and 2019 (BPS, 2019). This is likely due to the widespread perception that herbal medicine is effective, affordable, and risk-free (Adiyasa and Meiyanti, 2021). Herbal/traditional medicines are typically used for self-medication to treat mild illnesses such as influenza, cough, and colds, as well as chronic diseases such as diabetes mellitus (DM) and hypertension.

Diabetes mellitus (DM) is a metabolic disease characterized by an increase in blood sugar or hyperglycemia caused by abnormalities in insulin secretion, insulin action disorders, or both (Nanda

et al., 2018). More than 90% of DM patients have type 2 diabetes mellitus (T2DM) affected by lifestyle factors and other medical conditions. The International Diabetes Federation (IDF) reports that there were around 88 million cases of DM in Southeast Asia. It is predicted that the prevalence of DM will increase by 74% between 2019 and 2045. In addition, DM causing various macro and microvascular complications, has been associated with higher mortality (Hayyu *et al.*, 2022).

DM may require polytherapy in which the patient is given two or more drugs with hypoglycemic effects to control glucose level. Long term use of multiple drugs can contribute to medication non-adherence, adverse drug-drug interaction, increased costs (Wulandari *et al.*, 2020). Consequently, a great number of patients seek out alternative treatments, such as herbal medicine. This is consistent with the management of DM treatment, which requires multidisciplinary care to enhance the quality of life of the patient. Improving the quality of life of diabetic patients is highly dependent on patient adherence to treatment, nutrition management, and the patient's understanding of the use of complementary and alternative medicines in addition to long-term therapy (Nanda *et al.*, 2018).

Herbal medicine and traditional medicine are types of complementary and alternative medicine utilized by diabetic patients. This is because traditional medicine offers numerous advantages, including a lower risk of side effects from chemical drugs, effectiveness in the treatment of chronic diseases, lower costs, greater accessibility, and cultural acceptance (Alfian *et al.*, 2016). The community has used more than 400 types of medicinal plants to treat DM, including *Mahkota Dewa, ciplukan,* bitter melon, and bitter. In addition, the herbal plants utilized by the community as anti-diabetes are typically plants with astringent properties (avocado, green beans, corn, guava, *lamtoro*, mahogany, etc.). Or as a substance that can speed up the removal of blood sugar from the bloodstream, such as garlic, vile shards, cat whiskers, *jamblang*, etc. Aloe vera, *brotowali*, and *sambiloto* are also antidiabetic herbal plants due to their ability to accelerate the release of sugar into the bloodstream by boosting metabolism (BPOM, 2020; Hayyu *et al.*, 2022).

This study aims to determine the prevalence of traditional medicine use among DM patients, the types of traditional medicine used, and the level of patient satisfaction with the use of traditional medicine as an alternative and complementary treatment for DM.

2.   Materials and Methods

This study was cross-sectional. Between August 2016 and February 2017, the study was conducted in the first and second level health facilities of several Indonesian cities, including Bali, Surakarta, Yogyakarta, Makassar, Bandung, Jember, Jakarta, Purwokerto, and Malang. A minimum sample size of 114 respondents was determined to achieve a 95% confidence interval, assuming a prevalence of 35%. Data were collected from 190 patients who met the inclusion criteria of having type 2 diabetes for at least one year, being between the ages of 18 and 65, regularly taking prescription medications after being diagnosed with type 2 diabetes and using herbal medicines as complementary therapy for type 2 diabetes for at least three months. Research variables included the use of herbal medicines as complementary medicines, respondent characteristics, health services, types of herbal medicines, and satisfaction with drug use. A questionnaire was utilized for data collection. The information will be presented as a percentage. The Health Research Ethics Committee of Diponegoro University/Dr. Kariadi granted ethical approval for protocol No. 969/EC/FK-RSDK/2016.

3.   Results

This study aimed to determine the characteristics of the respondents (age, gender, occupation, education, and income). As shown in Table 1, there were a total of 432 participants in this study, including 190 cases and 242 controls. The majority of diabetes patients were women (62.7%), housewives, and between the ages of 40 and 65. In the case group, the highest level of

Table 1.   Characteristics of the respondent

Variable		Respondent	
		n	%
Gender	female	104	54.7
	male	86	45.3
age	18-25	0	0.0
	26-40	34	17.9
	40-65	156	82,1
Occupation	housewife	66	34.7
	civil servant	7	3,7
	self employed	34	17.9
	farmer	6	3.2
	labor	14	7,4
	jobless	16	8.4
	others	47	24.7
Education	No formal education	6	3.2
	Elementary school	46	24.2
	Junior high school	35	18.4
	Senior high school	55	28.9
	Diploma	7	37
	Undergraduate program	35	18.4
	Master Program	5	2.6
	Doctoral Program	1	0.5
Income	2.5 million (IDR)	123	64.7
	>2.5 million (IDR)	67	35.3

Tabel 2. Types of healthcare and insurance

Variable		Case group	
		n	%
Health care facility	Family doctor	10	5.3
	Clinic	11	5.8
	Primary health center	141	74.2
	Hospital	28	14.7
Cost	No insurance	35	18.4
	BPJS (national health insurance)	144	75.8
	Health insurance	11	5.8

education attained was high school (28.9%), whereas in the control group, the highest level of education was elementary school (30.2%). The majority of respondents (65%) had incomes between $2.5 million and $2.5 million (35%).
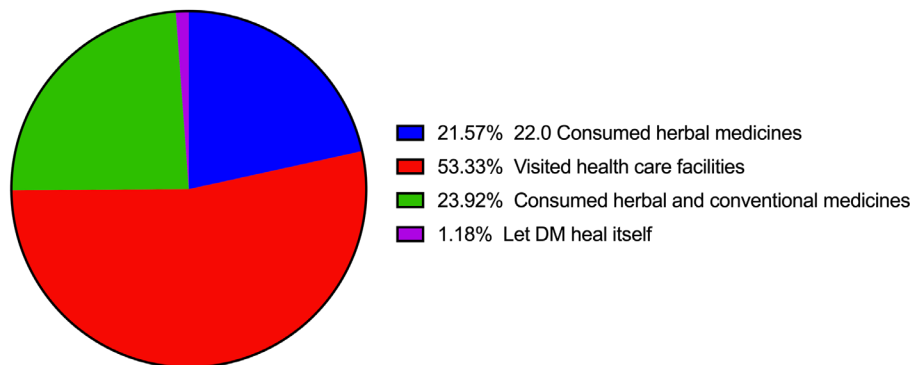
3.1. Healthcare Service Preference

The patient's health care preference is presented in Table 2. It can be seen that >70% of the patients with DM choose *Puskesmas* and health service with national health insurance (BPJS).

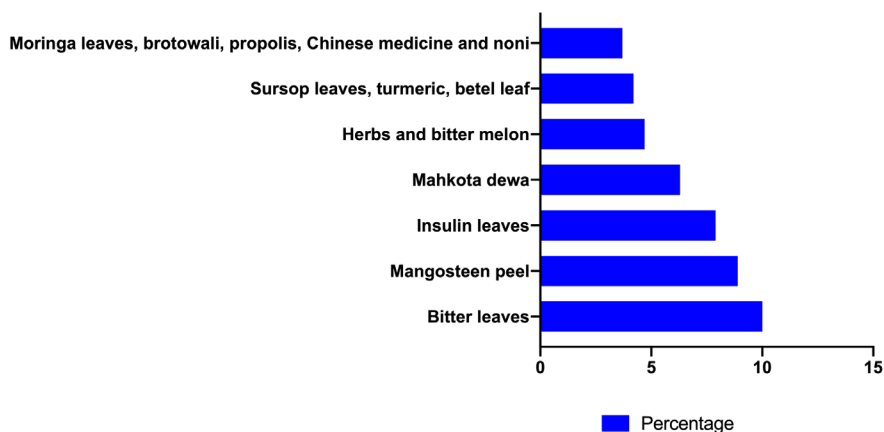### 3.2 The profile of herbal medicine use in type 2 diabetes patients

Table 3 provides a profile of the use of herbal medications by diabetic patients. The majority of

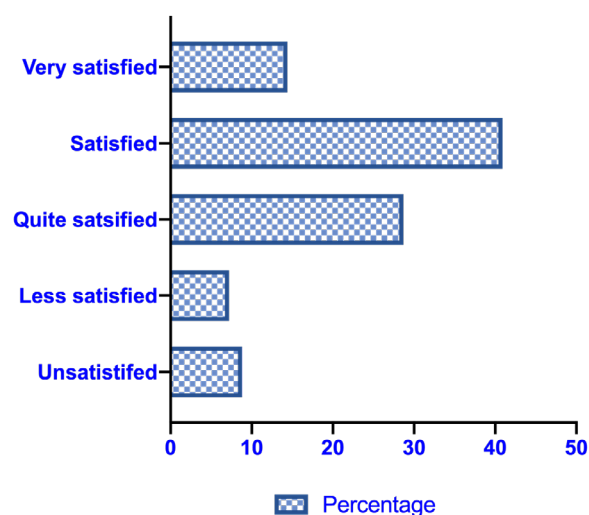**Tabel 3.** The use of herbal medicines based on the purpose, reason, and information source

Variable		Patients with DM	
		n	%
Purpose	treating DM	75	41.7
	controlling sugar levels	86	47.8
	preventing complication of DM	19	10.6
Way to get	*jamu gendong* seller	13	7.2
	concocting from groceries	32	17.8
	concocting	115	63.9
	parent recipe	2	1.1
	healthcare personnel	18	10.0
Reason	made from natural ingredients	71	38.8
	affordable	26	14.2
	relatively fewer side effects	23	12.6
	without medical prescription	6	3.3
	easy to get	15	8.2
	others	42	23.0
Information source	family tradition	13	7.1
	relatives	51	27.9
	mass media	27	14.8
	neighbor/ friend	84	45.9
	healthcare personnel	8	4.4

- 21.57% 22.0 Consumed herbal medicines
- 53.33% Visited health care facilities
- 23.92% Consumed herbal and conventional medicines
- 1.18% Let DM heal itself

Figure 1. Medication

Figure 2. Percentage of the herbal medicine used in patients with DM

Figure 3. Satisfaction Level of Diabetes Mellitus Patients

respondents treated and regulated their blood sugar levels with herbal anti-diabetic medications. Self-preparations were the most commonly used herbal medicine due to several factors, including its natural ingredients, lower price, and side effects (63.9%). The most prevalent sources of information about self-medication were friends and neighbors (45.9%).

3.3. Profile of the patient's use of herbal medicines in DM patients based on the treatment

Figure 1 depicts the profile of herbal medicine use in patients with DM based on medication intervention/action, as determined by this study. After learning the status of DM, the respondent's first action was to visit a medical facility (54.5%). In addition, respondents used herbal medicines (22%), as well as anti-diabetic drugs, herbal medicines, and herbal medicines in combination (22.4%).

3.4. Profile of the use of herbal medicine in patients with DM based on the type of herbal medicine used

Figure 2 depicts the profile of herbal medicine use in patients with diabetes mellitus based on the type of herbal medicine. Bitter leaf (10%), mangosteen peel (8.9%), insulin leaf (7.9%), *mahkota dewa* (6.3%), herbs and bitter melon (4.7%), soursop leaves, turmeric, betel leaf (4.2%), and moringa leaves, *brotowali*, propolis, Chinese medicine and noni (3.7%) were the most common herbal treatments for DM.

3.5. Satisfaction Level of Diabetes Mellitus Patients

Figure 3 showed that 28.7 % of respondents were quite satisfied, 40.9 percent were satisfied, and 14.4 % were very satisfied with the use of herbal medicines and doctor's prescriptions in the treatment of DM.

4. Disscussion

The majority of respondents in this study (69.0%) were women between the ages of 40 and 65, as indicated by their demographic characteristics. This result is consistent with that of Rudi and Kwureh (2017) which demonstrated a correlation between gender and fasting blood sugar levels among laboratory service users at M Djoen Sintang Hospital. According to other studies, women are 2.95 times more likely to have high blood sugar levels (Hidayati and Pibriyanti, 2018). This is likely due to a decrease in estrogen and progesterone during premenopause and menopause, which disrupts fat metabolism and causes insulin resistance. In addition to aging's effects on fat metabolism, decreased sensitivity of pancreatic beta cells slows insulin-mediated glucose uptake (Rahmawati and Fitriani, 2016).

This study was conducted at the first level of health care facilities (private clinics, primary clinics, primary health care, and hospitals) and found that the majority of respondents (64.7%) had a low-to-moderate income and graduated from high school (74.7%). This finding supports previous research indicating that an individual's level of education can influence their ability and knowledge to implement healthy behavior. The greater one's level of education, the greater one's ability to maintain a lifestyle and knowledge (Raghupathi and Raghupathi, 2020). Several factors, including education level, self-motivation, and socioeconomic standing, influence the treatment decisions of individuals. Education level influences one's understanding of health issues, particularly diabetes management (Hayyu *et al.*, 2022). In general, individuals with a higher level of education had a broader perspective when selecting a treatment. Another factor that influences the choice of treatment is the level of income. Arpey *et al.* (2017) found that the clinical perceptions of low-income patients affected clinical decisions and access to health services. In this study, the majority of respondents (74.2%) preferred Puskesmas health services over BPJS services (75.8%). This indicates that respondents with a senior high school education as their highest level of education prefer to have their health checked at easily accessible and reasonably priced health services (Arpey *et al.*, 2017).

The majority (54.5%) of the 190 respondents diagnosed with type 2 DM preferred to visit a health facility to meet with health professionals. 22.4 of patients

preferred a combination of prescription medication and traditional medicine, while 22 preferred traditional medicine alone. This result is consistent with those of previous studies indicating that most respondents adhered to their anti-diabetic medications. Compliance with medication for blood sugar control (Kaaffah *et al.*, 2021). There are three groups of drugs currently used in the therapeutic management of diabetes mellitus. The first group functions by increasing endogenous insulin availability. Glucagon-like peptide 1 (GLP-1) agonists and dipeptidyl peptidase-IV (DPP-IV) inhibitors are examples of sulfonylureas. The second group includes agents that increase insulin sensitivity, such as thiazolidindione, an agonist of peroxisome proliferator-activated receptor gamma (PPARγ), and biguanide metformin. While the third group consists of i-glucosidase inhibitors such as acarbose, which inhibit polysaccharide digestion. However, each of the treatment options has numerous drawbacks, including ineffectiveness, intolerance, and/or adverse effects. Diabetics undergoing oral anti-diabetic drug therapy or insulin injections have reported weight gain, an increased risk of hypoglycemia, and death as adverse effects (Palupi *et al.*, 2019).

He majority of respondents also took anti-diabetic herbal remedies, as patients viewed traditional medicines as safer than synthetic ones due to their relatively fewer side effects (Yudhianto, 2017). This is consistent with previous research indicating that patients were satisfied with herbal medicines (jamu) because they had fewer side effects (Lestari *et al.*, 2020). In addition, other studies explain that one of the reasons for patients' preference for herbal remedies was their concern over kidney problems related to long-term drug use. (Nanda *et al.*, 2018). To ensure their safety, the Indonesian Food and Drug Association also regulates the production of herbal medicines, as well as their correct dosage and application (BPOM, 2020).

This study revealed that most patients with diabetes mellitus self-medicated with herbal remedies and antidiabetic drugs. This finding supports the conclusion of a previous study that self-medication with traditional medicines increased from 15.2% to 38.3% (Adiyasa and Meiyanti, 2021). However, healthcare professionals must be consulted prior to combining herbal and prescription medications to prevent potential medication errors (Hayyu *et al.*, 2022). Medication errors are a significant problem in the healthcare system because they can reduce the efficacy of treatment and raise healthcare costs. Medication error is the occurrence of polypharmacy, which is defined as the use of multiple medications (>5) or more than is medically necessary by a patient. Moreover, polypharmacy results in adverse drug interactions (Tegegn *et al.*, 2019).

The findings of this study indicate that people with diabetes mellitus consume a variety of herbal medicines, including those derived from rhizome, leaves, and fruit. Herbal remedies for diabetics include noni fruit, soursop leaves, turmeric, African leaves, *mahkota dewa, binahong,* bitter, betel leaf, propolis, insulin leaves, black cumin seed, bitter melon, cinnamon, ginger, *brotowali*, and moringa leaves, among others. This is consistent with previous research involving herbal ingredients in interventions for diabetes mellitus. As demonstrated by one study, crown of the god fruit extract can reduce blood glucose levels by up to 46 percent in people with diabetes compared to healthy controls. Additionally, the phytochemical content of crown of the god has an anti-diabetic effect (Fiana and Oktarina, 2016). In addition to research on the crown of the gods, it is also known that bitter melon and bitter fruit have a hypoglycemic effect by increasing insulin secretion and decreasing insulin resistance (Li *et al.*, 2015).

This study revealed that most respondents were pleased with the combination of herbal medicines and prescription drugs. This finding supports the conclusion of a previous study indicating that patients perceive herbal medicine to reduce the side effects of long-term use of chemical drugs. Additionally, herbal medicine can be used as an immune system supplement (Ningsih, 2016; Hayyu *et al.*, 2022). Few studies demonstrated the efficacy of traditional medicine for diabetes. With the widespread use of traditional medicine, however, health practitioners should accommodate it and raise awareness of its proper use by providing patients with relevant information and guidance on how to use it (Alfian *et al.*, 2016).

5. Conclusions

Herbal remedies for diabetes mellitus are commonly used in complementary and alternative medicine. Bitter leaves are the most commonly used herb, with more than half of respondents expressing satisfaction with herbal medicine's benefits.

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