

CHAPTER I

INTRODUCTION

This chapter presents a comprehensive background on *Orthosiphon* as a medicinal plant, focusing in its utilization as an anti-diabetic agent. Also included in this chapter is a section stating the problem that this study explored, as well as the purpose why this study was undertaken and research question that this study aimed to answer. Furthermore, a section that details the theoretical and practical benefits of the knowledge derived from this study is also included in this chapter.

1.1 Background

In developed countries, the use of traditional medicine is a growing advocacy that encourages the people to embrace a “back to nature” approach in healing. The increase in the prevalence of chronic degenerative diseases is contributes to the increasing trend in the utilization of traditional medicine. Although the use traditional medicines is a global trend, it is especially significant in developing countries. The World Health Organization (WHO) claims that 80% of the population in developing countries utilize traditional medicine. In most rural areas of Indonesia, traditional medicine is a practice that remains prevalent today (Kementerian Kesehatan Republik Indonesia [KEMENKES], 2013).

The treatment of chronic degenerative diseases entails prolonged periods of treatment. People tend to prefer more affordable alternative treatments. There is also a prevailing belief that traditional medicines are safer compared to synthetic

drugs. Conventional drugs that uses synthetic chemicals are perceived to be more expensive and is linked with the reduction in the quality of life due to its side effects (KEMENKES, 2013). Currently, many researchers are interested in studying *Orthosiphon* because of its potential to cure several types of diseases, including diabetes. The leaves of this plant contain flavonoids which is known to reduce blood glucose levels (Sumekar & Barawa, 2016).

Kingdom	<i>Plantae</i>
Subkingdom	<i>Tracheobionta</i>
Subdivision	<i>Spermatophyta</i>
Division	<i>Magnoliophyta</i>
Class	<i>Magnoliopsida</i>
Subclass	<i>Asteridae</i>
Order	<i>Lamiales</i>
Family	<i>Lamiaceae</i>
Genus	<i>Orthosiphon</i>
Species	<i>Orthosiphon aristatus</i>
	<i>Orthosiphon stamineus</i>
	<i>Orthosiphon pallidus</i>
	<i>Orthosiphon thymiflorus</i>

Table 1.1 Scientific Classification of *Orthosiphon*.

Orthosiphon is locally known in Indonesia as *kumis kucing*. The Indonesian term *kumis kucing*, when translated to the English language, means cat's whiskers. It is officially listed in the RxList (2019) as Java tea. Table 1.1 shows the scientific classifications of *Orthosiphon*. It is a wet-trunked plant that grows in both dry and wet soils throughout the world. Wet-trunked or *herbaceous* is a type of plant that has wet stems containing water, with no woody trunks growing above the ground (Mongkhonsin, Nakbanpote, Meesungnoen, & Prasad, 2019). A distinguishing characteristic of *Orthosiphon* and other plants belonging to the *Lamiaceae* or *Labiatae* family, is its straight, tube-like flowers. There are two varieties of

Orthosiphon that can be easily distinguished based on the color of its flowers. One variety has purple flowers (see Attachment 2 Picture A) and the other has white flowers (see Attachment 2 Picture B). This plant is also known as *Orthosiphon aristatus*, *Orthosiphon stamineus*, and *Orthosiphon blaetter* (Ashraf, Sultan, & Adam, 2018). Both varieties are used as herbal medicines to decrease blood glucose levels. Published research that compared the effectiveness of the two varieties present contrasting results and conclusions. Keng and Siong (2006) found that the variety of *Orthosiphon* with purple flowers contains higher levels of bio-active compounds. Indariani, Wijaya, Rahminiwati, and Winarno (2014), on the other hand, found that concoctions derived from white *Orthosiphon* flowers have more anti-diabetic effect than those derived from purple *Orthosiphon* flowers.

Orthosiphon is also used by Indonesians to treat glomerulonephritis, kidney stones, albuminuria, and syphilis (Dinas Perkebunan Provinsi Jawa Barat [DISBUN JABAR] West Java Plantation Service, 2017). The Indonesian National Agency of Drug and Food Control (2005) has identified *Orthosiphon* as one of the plants commonly used as alternative medicines to increase urine output and lower blood glucose levels in patients with diabetes (Badan Pengawas Obat dan Makanan Republik Indonesia [BPOM] 2005 & DISBUN JABAR, 2017). Given the many potential benefits of *Orthosiphon*, this study will focus on the effectiveness of this plant as an anti-diabetic agent.

Diabetes is a chronic disease marked by increased blood glucose levels (WHO, 2018). Uncontrolled diabetes affects the heart, blood vessels, eyes, kidneys,

nerves, and can possibly cause death (WHO, 2018). According to WHO (2018), there are approximately 422 million people with diabetes worldwide in 2014. It was noted that the prevalence of diabetes is especially high in developing countries. In Southeast Asia alone, the number of diabetes cases is estimated at 96 million in eleven countries (WHO, 2017). The International Diabetes Federation (IDF) Atlas (2017) cited Indonesia as the sixth country with the highest number of diabetics in the world. There is an estimated ten million cases of diabetes throughout Indonesia. It was also reported that Indonesia ranks as the third country with the highest number of impaired glucose tolerance in the world with 27.7 million cases. The IDF projected that the number of cases of impaired glucose tolerance in Indonesia will increase to 35.6 million cases by the year 2045 (IDF, 2017). In 2014, the Ministry of Health of Indonesia identified diabetes as the third leading cause of death in the country (KEMENKES, 2016).

Despite the serious threats from diabetes complications, this disease can be prevented and controlled through healthy lifestyle and appropriate treatment (IDF, 2017). At present, the conventional treatment for diabetes includes insulin and Oral Hypoglycemic Agents (OHA) such as metformin, glitazones, and sulfonylureas (Tsang, 2012). In addition to the conventional treatment modalities, there are alternative treatment modalities to manage diabetes. Aloe vera, ginseng, bitter melon, ginger, sesame oil, fenugreek, prickly pear cactus, garlic, *Hypericum perforatum*, *Gymnema*, *Astragalus*, *Scutellaria baicalensis*, *Cassia*, *Andrographis paniculata*, and olive leaf are plants that have been found to have anti-diabetic

properties (Gupta et al., 2016). These alternative modes of treatment can offer patients with diabetes more options in controlling their blood glucose levels.

In study conducted among traditional healers in villages in the Rundeng district of Indonesia, *Orthosiphon* was identified as one of the 28 herbs used as anti-diabetic agent (Hasanuddin & Kusyanti, 2016). The potential of *Orthosiphon* as an alternative therapy for patients with diabetes in Indonesia may be enhanced by its acceptability to the majority Muslim population of Indonesia. Ching et al. (2013) found that *Orthosiphon*, along with bitter melon, garlic, and *Clinacanthus nutans* Lindau are complementary and alternative medicines (CAM) that are accepted by the Muslim population. A study conducted in Malaysia found that Islamic faith is a significant factor that influences acceptance of CAM among Muslims (Ching, Zakaria, Paimin, & Jalalian, 2013). Islam prohibits the consumption of substances that are considered as *haram* (Qureshi, 2002). The Great Dictionary of the Indonesian Language (KBBI) defines *haram* as pertaining to all things forbidden by Islam (Setiawan, 2012). Islamic scripture forbids its followers from consuming specific foods such as pork, blood, carcass, and others that are considered *haram* (Al Qur'an, Al baqarah verse 173). Thus, following Islamic belief that strictly forbid the consumption of pork, the use of porcine-based insulin and porcine-derived synthetic insulin are considered *haram*. Non-porcine insulin is available and is commonly used today. The use of non-porcine insulin derived from humans is more accepted and is widely used by the Muslim population. However, some Muslim patients remain concerned about the origin of insulin and believe it is derived from pig (Rebolledo & Arellano, 2016; Qureshi, 2002). Ahmed et al.

(2010) found that reluctance to the use insulin in diabetes treatment is common among the Muslim communities in South Asia. Insulin treatment is perceived to cause negative effect in the performance of Islamic religious obligation. Some Muslims are concerned that insulin use could interrupt fasting in the month of Ramadan and the fulfillment of the five daily prayers prescribed by Islam (Ahmed et al., 2010).

Studies show that, in general, patients are more likely to follow treatment regimens that are accessible, affordable, and culturally acceptable for them (Sudan Journal of Rational Use of Medicine, 2014). Thus, it is important to explore the effectiveness of alternative treatment modalities used by Indonesians, such as the use of *Orthosiphon* or *kumis kucing* as an anti-diabetic agent. Currently, several published studies have examined the benefits of *Orthosiphon* plants as alternative medicine that can manage various types of diseases including diabetes (Ashraf et al., 2018). Thus, the researchers are interested in conducting a literature study on *Orthosiphon* plants and their function as an alternative anti-diabetic agent.

1.2 Statement of the Problem

Indonesia is a country with a rich cultural heritage (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2016). Different tribes in Indonesia have a wealth of indigenous knowledge that includes knowledge of medicinal plants that have been passed on from one generation to another. At present, Indonesia has laws that aim to promote research on the development and production of traditional medicines. The Indonesian government envisions that

traditional medicines that are scientifically proven to be safe and effective be integrated into the mainstream healthcare system (KEMENKES, 2010).

Kementerian Kesehatan Republik Indonesia (Ministry of Health, Republic of Indonesia) promulgated KEMENKES Regulation number 88 of 2013. This regulation aims to promote Indonesia's independence in producing quality traditional medicine to support domestic demands. The Ministry of Health also aims for Indonesian traditional medicines to be introduced to the global market (KEMENKES, 2013).

According to the result of the 2013 census, there are more than 1,340 ethnic groups in Indonesia. Each ethnic group has an abundance of inherited information on ethnobiology which involves the utilization of different types of plants and animals for human needs. Traditional treatment and knowledge in the use medicinal plants for health are inherent in many ethnic groups in Indonesia. As of 2013, there are approximately 90,000 identified plant species in Indonesia, 9,600 of which are considered medicinal plants. However, a significant number of these medicinal plants are wild and uncultivated. In most regions, processing and storage techniques for medicinal plants still utilize unrefined methods that may be unhygienic and are not at par with the generally accepted standards of drug processing and production (KEMENKES, 2013).

The primary aims of developing traditional medicine are (1) to encourage the use of traditional medicine to improve the affordability of health services, (2) to ensure the management of biological resources across different sectors, (3) to

guarantee the availability of quality, effective, and safe traditional medicines to be utilized in both household and mainstream healthcare setting, and (4) to improve the national economy of Indonesia through traditional medicine industries (KEMENKES, 2013).

To maximize the potential of Indonesia's rich natural resources, several sectors are working collaboratively to further the discovery, development, and utilization of traditional medicines. The implementation of KEMENKES regulation number 88 of 2013 is dependent upon the following factors: (1) a strong structure for traditional medicine in the national market, (2) the tradition of traditional medicine utilization among the people due positive perceptions regarding traditional medicine, (3) the rich biodiversity and well-established traditional knowledge possessed by various tribes in Indonesia, (4) sufficient research workforce, and (5) substantial support from academic and research institutions (KEMENKES, 2013).

There are three main obstacles identified that decrease the competitiveness of traditional medicine in the mainstream healthcare system. Among these obstacles are (1) the lack of availability of raw materials for traditional medicine, (2) the lack of competitiveness of traditional medicines against conventional treatment modalities, and (3) the resistance on the part of physicians to the use of traditional medicine in mainstream health services. The Indonesian Ministry of Health has also identified other obstacles to traditional medicine utilization, including the lack of quality research, the high number of medicinal plants that remain uncultivated, and the lack of knowledge and technologies at the farming and small

business levels. Furthermore, it was noted that the traditional medicine industry cannot compete nationally and globally due to its lack of integration to the formal health service system (KEMENKES, 2013).

Despite the prevailing practice of using *Orthosiphon* as an anti-diabetic agent among Indonesians, scientific evidence is required before it can be offered to patients with diabetes as a treatment option (Ashraf et al., 2018 & KEMENKES, 2019). Today, many research have been conducted to examine the effects of *Orthosiphon*. However, there remains a scarcity of research that consolidates the results of the individual research on *Orthosiphon*. Thus, this study will be conducted to review and synthesize the existing scientific evidences from published research studies on *Orthosiphon* as an anti-diabetic agent.

1.3 Statement of the Purpose

The objective of this research was to examine the effectiveness of *Orthosiphon* as an anti-diabetic agent. This study included the review, analysis, and synthesis of published evidences on the use of *Orthosiphon* as an anti-diabetic agent.

1.4 Research Questions

This study focused on answering two main questions: (1) “Does *Orthosiphon* have anti-diabetic properties?” and (2) “How does *Orthosiphon* lower blood glucose levels?”.

1.5 The Benefits of The Study

1.5.1 Theoretical

The results of this study can enhance the public's knowledge regarding *Orthosiphon* as a complementary and alternative medicine for diabetes. It may also serve as a reference for researchers conducting studies on other medicinal plants believed to possess anti-diabetic properties such as Aloe vera, ginseng, bitter melon, ginger, sesame oil, fenugreek, prickly pear cactus, garlic, *Hypericum perforatum*, *Gymnema*, *Astragalus*, *Scutellaria baicalensis*, *Cassia*, *Andrographis paniculata*, and olive leaf (Gupta et al., 2016).

1.5.2 Practice

With the increasing trend of alternative treatment utilization in healthcare, it is important to recognize that a strong scientific evidence base for some alternative treatment modalities are yet to be established. Scientific evidences derived from research are vital in creating public health policies that will protect the wellbeing of the people. Understanding the effects and mechanisms of action of *Orthosiphon* as an anti-diabetic agent can aid the healthcare system in the proper utilization and processing of *Orthosiphon*. This research study can offer additional evidences for the government as it designs regulations to support and promote the use of scientifically proven alternative treatment modalities for patients with diabetes.