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Ubar Kampung: indigenous knowledge and practice of medicinal, aromatic and cosmetic (MAC) plants used for the treatment of diabetes mellitus in the Tatar Sunda Region of West Java, Indonesia

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Chapter I INTRODUCTION

Indonesia, as the fourth most populous country in the world, is now facing a demographic as well as an epidemiological transition^[1] (*cf.* Soewondo *et al.* 2013). Like other developing countries, Indonesia is struggling with the double burden of non-communicable diseases (NCDs) as well as infectious diseases. Disease epidemiology patterns in the country show a rapid growth of NCDs including cardiovascular disease, cancer, diabetes mellitus and chronic lung disease as four leading causes of death, while infectious diseases remain at high rates. The country is among the ten countries in the world which have the highest burden of diabetes mellitus as well as tuberculosis (*cf.* Soewondo *et al.* 2013; Mboi *et al.* 2016).

In 2018, NCDs were estimated to account for 71% of all deaths in Indonesia, of which cardiovascular disease contributed to 35% of the total number of deaths followed by cancer (12%), chronic respiratory disease (6%) and diabetes mellitus (6%) respectively (*cf.* WHO 2018). It is important to note that these numbers substantially increased from the previous report in 2011, in which NCDs accounted for 63% of all deaths and diabetes-related deaths doubled from 3% to 6% (*cf.* WHO 2011; WHO 2018). However, disease patterns in Indonesia vary geographically; while some provinces in the eastern part of Indonesia present a high prevalence of infectious diseases and child mortality, the western part, i.e. West Java and Bali, are experiencing a high prevalence of NCDs including diabetes mellitus (*cf.* Rokx *et al.* 2011).

The International Diabetes Federation Western Pacific (IDF WP) documents that 10.3 million of 159 million cases of diabetes mellitus in the Western Pacific region is recorded in Indonesia (*cf.* IDF 2017). In line with the high prevalence of diabetes mellitus in Indonesia, the prevalence of diabetes mellitus is also gradually increasing in West Java, as one of the most developed and most populated provinces in Indonesia (*cf.* Statistic Indonesia 2015). Diabetes mellitus is the fourth cause of most deaths in West Java in 2017, with a 49.1% increase compared to 2007 (*cf.* IHME 2017).

Several studies report that the pattern of incidence and prevalence of diabetes mellitus originated from a complex interaction between genetic factors, lifestyles and environment, including misguided cultural beliefs and urbanisation (*cf.* Shaw *et al.* 2010; King *et al.* 2010; Wareham 2016). Poorly managed and untreated diabetes mellitus leads to several severe complications such as glaucoma, blindness, renal impairment, cardiovascular disease (CVD), heart attack, renal failure, stroke, psychological stress and gangrene, which sometimes requires amputation (*cf.* Shaw *et al.* 2010; Trapp & Levin 2012; Jones *et al.* 2015).

As diabetes is a multifactorial disease which leads to several complications, this disease demands multiple pharmacological and non-pharmacological approaches. Various antidiabetic agents with a different mechanism of action have been developed including sulfonylureas, biguanides, meglitinides, biguanides, thiazolidinediones, and acarbose (*cf.* Patel *et al.* 2012). However, long-term use of oral hypoglycaemic agents may cause several side effects such as severe hypoglycaemia, gastrointestinal disturbance and lactic acidosis (*cf.* Surya *et al.* 2014; Aadhan & Anand 2017; Omodanisi *et al.* 2017). Additionally, in remote areas, those medicines are not affordable nor easily accessible.

The President of the International Diabetes Federation (IDF) argues that governments should participate to help people with diabetes and their families. Based on the survey conducted by IDF, 44% of people worldwide believe that the government has the responsibility to provide diabetes care (*cf.* Cho 2018). However, the health care system in Indonesia is still under-prepared to adequately manage diabetes mellitus. From the side of health care providers, there are serious problems in the supply of medicines in public primary health centres and rural areas. This problem is caused mainly by the geographical barriers or supplies chain due to

underfunding (cf. Soewondo *et al.* 2013). Medicines to treat diabetes are not accessible by everyone due to limited affordability and availability (cf. Skalli *et al.* 2019).

Lans (2006) argues that most of the problem in the delivery of primary health care services, particularly in developing countries, is the lack of knowledge and sensitivity toward local health care practices and related cultures. Following, Slikkerveer (2006) describes several approaches and strategies of health care delivery in developing countries by integrating traditional medicine into the primary health care system. The major arguments for this integrative strategy include: increased failures of modern medicine to comply with patients' expectations; high prices of modern/prescription medicines; increased *chemophobia* among patients against bio-medical interventions; non-effective modern care for mental, chronic and allergic disorders; failure to link up with the socio-cultural background of patients; positive reorientation towards indigenous knowledge systems and the traditional medical system; and readily available, culturally appropriate and financially affordable traditional medicines for the more substantial part of the population (cf. Slikkerveer 2006). Along with public awareness of the side effects and increasing prices of conventional medicine, utilisation of traditional medicines has also become more popular in Indonesia (Pengpid & Peltzer 2019; Skalli *et al.* 2019).

In the past decades, there has been growing interest in the consumption of medicinal plants because of their natural origin, ease of use, and lower cost (cf. Modak *et al.* 2007; Skalli *et al.* 2019). Consequently, medicinal plants are being looked up to for the treatment of diabetes mellitus and its complications. Slikkerveer (2006) states that the amount of biomedicine derived from medicinal and poisonous plants has advanced recently. Numerous medicinal plants around the world have been evaluated for their anti-diabetic properties (cf. Kooti *et al.* 2016; Skalli *et al.* 2019).

Since the 20th century, several precursors for therapeutic purposes have been synthesised from the secondary metabolites of medicinal plants. Despite advanced technology in the development of synthetic medicine, plants are still major sources of medicinal preparations. The role of medicinal plants in the development of new medicine has been documented since the isolation of quinine from the bark of the cinchona tree in 1820 (cf. Achan *et al.* 2011). To date, a vast number of pharmaceuticals which are derived from medicinal plants have been used in clinical care (cf. Grover *et al.* 2002; Yuan *et al.* 2016). In the case of diabetes mellitus, *metformin* exemplifies an efficacious oral glucose-lowering agent which has been developed based on indigenous peoples' use of *Galega officinalis* for the treatment of diabetes (cf. Modak *et al.* 2007).

The prevalence of medicinal plants used among people living with diabetes ranges from 17% to 80% (cf. Ocvirk *et al.* 2013). Several studies on indigenous medicine for diabetes mellitus have been conducted worldwide, mostly in developing countries (cf. Matheka & Alkizim 2012; Kooti *et al.* 2016; Baharvand-Ahmadi *et al.* 2016; Bindu & Narendhirakanan 2019). While most of the studies on medicinal plants tend to examine the role of medicinal plants in one culture, only a few compare the use of medicinal plants in the setting of medical pluralism (cf. Slikkerveer 2006).

In his study on *Plural Medical Systems in The Horn of Africa*, Slikkerveer (1990) introduced the model of transcultural health care utilisation in the setting of medical pluralism in order to document and analyse the cultural context of health and healing of indigenous peoples' medical knowledge and practices. The related methodology of the study and analysis of these patterns of interaction behaviour has further successfully been operationalised for the comparative analysis of different forms of behaviour, and recent focus on local knowledge, such as biocultural diversity conservation behaviour in Bali, Indonesia by Agung (2005); wild medicinal plant utilisation behaviour in Meru, Kenya by Ibui (2007); medicinal, aromatic and cosmetic plant utilisation behaviour in Bali, Indonesia by Leurs (2010); communication

systems utilisation behaviour in Lembang, Indonesia by Djen Amar (2010); partnership cooperation behaviour among traditional and modern birth attendants in Rancaekek, Indonesia by Ambaretnani (2012); medicinal, aromatic and cosmetic plant utilisation behaviour in Crete, Greece by Aiglsperger (2014); health information and communication system utilisation behaviour in West Java, Indonesia by Erwina (2019); financial institution utilisation behaviour in West Java, Indonesia by Saefullah (2019); and transcultural health care utilisation in Serengeti, Tanzania by De Bekker (2020).

Given its theoretical and empirical significance, the importance of traditional medicine provides a sound basis for the study of local people's medical knowledge systems as well as their related patterns of health care utilisation behaviour for the treatment of diabetes mellitus in West Java, Indonesia. The Sundanese people, the largest ethnic group in West Java, have been using traditional medicine for a long time. Known as *ubar kampung*, Sundanese indigenous knowledge, beliefs and practices of traditional medicine are based on local people's knowledge and use of Medicinal, Aromatic, and Cosmetic (MAC) plants. MAC plants have continuously provided the Sundanese community with practical and readily available traditional medicine. The use of plants in religious ceremonies and medicinal purposes is very common and widespread among the Sundanese community.

Most Sundanese, especially in rural areas, rely on traditional medicine or traditional healers for the treatment of common illnesses. Medicinal plants are easily obtained from their home garden which is called *Apotek Hidup* (Living Pharmacy) or from the nearby forest. Slikkerveer & Slikkerveer (1995) describe that the use and cultivation of medicinal plants for the family (*tanaman obat keluarga* or TOGA), which supports the concept of self-reliance in family health, has contributed to building up knowledge of medicinal plants among the local people. The conversion of local traditions and indigenous knowledge into livelihoods has the benefit of preserving indigenous knowledge which is gradually vanishing (*cf.* Negi *et al.* 2010).

Roosita *et al.* (2008) document that there are about 117 species of plants in West Java which have been used by the villagers in the Tatar Sunda region for the treatment of 96 cases of illness. Additionally, research conducted by Nisyapuri *et al.* (2018) regarding the use of traditional medicines in West Java reveals that various medicinal plants used among local people are in accordance with the scientific literature. Thus, local knowledge about the types and uses of medicinal plants can be integrated with scientific studies to support the development of disease treatments and improvement of public health in the future.

To address the lack of studies on indigenous knowledge and its role in patterns of health care utilisation, this study aims to document, describe, and analyse knowledge of, beliefs in, and practices with MAC plants among the Sundanese community members in the environment where the modern and traditional medical systems are co-existing. While most studies on health care utilisation are currently limited by the use of one medical system - generally speaking, the modern medical system - the present study has a primary focus on utilisation across medical systems. The broad objective of this study is to explore the utilisation of the plural medical system with particular attention to the role of knowledge and practice of *ubar kampung* by the Sundanese community for the treatment of diabetes mellitus. A household survey in this study aimed to collect and document local medical knowledge, practices and beliefs in relation to the utilisation of not only traditional but also transitional and modern medical systems in the research area comparatively. The study employs the adapted analytical model developed by Slikkerveer (1990) to analyse the health care utilisation behaviour in the research area from the *emic* perspective.

1.1 Diabetes Mellitus as a Public Health Problem

1.1.1 Diabetes Mellitus: Overview

As briefly discussed in the previous discussion, this section will further elaborate strategies for the treatment and prevention of diabetes mellitus, which is a chronic disease characterised by a metabolism disorder of carbohydrates, fats, and proteins in the body (*cf.* Kumar & Clark 2002). The World Health Organization (WHO) (2016:11) defines diabetes mellitus as: ‘a serious, chronic disease that occurs either when the pancreas does not produce enough insulin (a hormone that regulates blood glucose), or when the body cannot effectively use the insulin it produces’. Characteristic symptoms of diabetes mellitus include polyuria, polyphagia, polydipsia, and blurred vision (*cf.* WHO 1999).

According to its etiological type, diabetes mellitus is classified into four main groups: type 1, type 2, gestational, and other types (*cf.* WHO 2016). Common types of diabetes mellitus are Type 1 Diabetes mellitus (T1DM) and Type 2 Diabetes mellitus (T2DM). T1DM is characterised by the deficiency of insulin due to the destruction of beta cells (β -cells) in the pancreas, while T2DM by a decrease in insulin production causing insulin resistance. While T1DM is typically the result of an autoimmune attack and not preventable, T2DM is preventable because it is mostly caused by lifestyle and environmental factors (*cf.* Kumar *et al.* 2012). Since T2DM is making up 90% of diabetes cases, this study focuses on the treatment and prevention of T2DM.

Diabetes mellitus is a disease involving numerous factors, including behavioural, environmental, and genetic. Smoking, less exercise, a sedentary lifestyle, and poor dietary habits (low-fibre intake, high cholesterol, and high sodium intake) are identified as major risk factors for diabetes and its complications (*cf.* Alberti *et al.* 2007). In addition to mentioning direct factors, aspects of globalisation and urbanisation are also strongly related to the high incidence of obesity, diabetes and other NCDs (*cf.* WHO 2016). Poorly managed and untreated diabetes mellitus leads to several severe complications such as glaucoma, blindness, renal impairment, cardiovascular disease (CVD), heart attack, renal failure, stroke, psychological stress and gangrene, which sometimes require amputation (*cf.* Shaw *et al.* 2010; Trapp & Levin 2012; Jones *et al.* 2015). It is reported that 50% to 80% of diabetes patients are developing chronic complications because of delayed detection of the prediabetes condition (*cf.* Bergman *et al.* 2012). Early detection of diabetes mellitus allows intensive treatment of the disease and accordingly prevents its complications (*cf.* Bergman *et al.* 2012).

Given its complex definitions, causes, and complications, multiple processes and resources involving both health care provider and patient are required for the treatment of diabetes mellitus ^[2] (*cf.* ADA 2000). It is essential that patients have adequate knowledge about the disease and its treatment which includes a combination of diet, exercise, and medications. A multidisciplinary health professional including a doctor, nurse, pharmacist and dietitian need to cooperate to give the patient the best outcome. According to WHO recommendations, treatment of chronic disease such as diabetes should focus on prevention rather than intervention. WHO recommends promotion of a healthy lifestyle, regular exercise, avoidance of smoking and surveillance of risk factor patterns as ways to prevent this disease (*cf.* WHO 2016).

Given those reasons, diabetes mellitus unquestionably represents a challenge in the treatment of non-communicable diseases. The need to understand the policy, health system and community response against this illness is important in order to manage and prevent the rising prevalence of diabetes mellitus.

1.1.2 Diabetes Mellitus: Global and National Burden

Diabetes mellitus poses a major threat to human health in the present century. Its prevalence is increasing rapidly, particularly in Asia, the Middle East, Africa, and developing countries around the world (*cf. Wild et al. 2004; Nandhita et al. 2016*). WHO reported that more than 75% of deaths caused by NCDs, including diabetes, occur in low- and middle-income countries (LMICs) with about 46% of deaths occurring before the age of 70 in these countries (*cf. WHO 2016*). It is important to note that Southeast Asia experienced the highest increase in NCD-related deaths (*cf. WHO 2014*).

In a comprehensive review of the incidence and prevalence of the disease worldwide, Zimmet *et al.* (2001) report that the number of people with diabetes had almost doubled in most continents from 2000 to 2010. Recent estimates indicate that 415 million people worldwide have diabetes mellitus and this is projected to increase to 642 million by 2040 (*cf. IDF 2017*). This number could be higher considering that there are some underprivileged populations who did not have access to health care and individuals who were unaware of the disease (*cf. Campos 2006; King et al. 2010*). IDF (2017) estimates that 30% to 80% of people with diabetes are undiagnosed.

Studies on the global estimate of diabetes prevalence reveal that most diabetes patients are living in LIMCs. It is predicted that there will be a 69% increase in the numbers of patients in developing countries between 2010 and 2030 (*cf. Shaw et al. 2010; Guariguata 2014; IDF 2017*). As a result of global urbanisation, the number of people living with diabetes in urban areas is predicted to reach 472,6 million in 2045 (*cf. IDF 2017*). In 2017, the ratio of prevalence of diabetes mellitus between urban and rural areas was 1.1 and projected to increase to an estimated 1.6 by 2045 (*cf. IDF 2017*). Studies indicate that diabetes, which was once considered a disease of the developed countries, is a worldwide epidemic today (*cf. Tabish 2007*).

Similarly, the number of patients diagnosed with diabetes mellitus in Indonesia has increased rapidly in the last two decades. Indonesia is recorded as the seventh country in the world and second in the Western Pacific region with the most people living with diabetes. The number of people with diabetes in Indonesia is over 10.3 million, while more than 73.7% of cases are undiagnosed (*cf. IDF 2017*). The rapid increase of diabetes mellitus incidence occurs in not only urban but also rural areas (*cf. PUSDATIN 2014*). Diabetes is the leading cause of death after stroke and hypertension, which is higher than cancer and chronic obstructive pulmonary disease in Indonesia (*cf. WHO 2018*). In a recent report, cases of diabetes mellitus are also found in the younger age group (*cf. PUSDATIN 2014*). That high prevalence consequently places diabetes as one of the major public health problems in Indonesia.

In a review regarding the global burden of diabetes, Narayan *et al.* (2000) discuss that T2DM is associated with remarkable mortality, morbidity, and loss of quality of life. The burden of diabetes complications is similarly large worldwide (*cf. Nandhita et al. 2007; IDF 2017*). T2DM is equally burdensome to individuals and society, yet unequally affects disadvantaged people and nations. Diabetes mellitus patients have to change their lifestyle, monitor their blood glucose, use certain medications and injections, and deal with the complications of diseases and the complexity of the treatment (*cf. Narayan et al. 2006*). Additionally, diabetes patients are more susceptible to the development of cardiovascular disorders such as hypertension, dyslipidaemia, and obesity. In a global report about diabetes mellitus, it is revealed that 30%-45% of people with diabetes have retinopathy, 20%-35% have neuropathy, 10%-25% have CVD, and 10%-25% have nephropathy (*cf. WHO 2016*).

Diabetes mellitus is not only affecting patients' quality of life but also causing a significant economic loss to the patients and their families, as well as to national economies. Worldwide estimates of the annual total health care expenditure for diabetes is US\$727 billion in 2017 and this is predicted to increase up to US\$776 billion in 2045. Based on regional burden health care

spending on diabetes care, the Western Pacific is the third-highest region for diabetes-related health care expenditure with a total of USD 120.3 billion (IDR 178.7 billion) or 17% of the total global spending (*cf.* IDF 2017). Consequently, the economic burden of diabetes becomes a social problem and is affecting sustainable development (*cf.* Wareham 2016). As Wild *et al.* (2004) argue: ‘... *type 2 diabetes mellitus is emerging as a leading cause of death and disability and is straining health care systems.*’

The burden of diabetes and its complications continue to rise worldwide, particularly in LMICs (*cf.* IDF 2017). Shaw *et al.* (2010) conclude that future diabetes treatment in developing countries could be better targeted with the support of proper research such as community-based studies. However, data on community-based studies are still inadequate, and implementation of the prevention strategies are unclear. Similarly, policymakers in Indonesia also have not paid special attention to the social determinants of health in the treatment of NCDs. This situation creates difficulties in formulating and implementing actions to lessen the burden of NCDs (*cf.* Schroders 2017).

As a multifactorial disease which leads to several complications, diabetes control demands multiple approaches. The limitations of the currently available therapies have encouraged alternative treatment which can manage diabetes more efficiently, safely and accessibly by each community. Indigenous and local communities who have strong cultural beliefs but have rather limited access to western medicine need culturally appropriate alternative therapies. It is important to gain a deeper understanding of the communities’ points of view to develop more context-adaptive interventions for their prevention and treatment. Collaborative research is also required in the development of an indigenous, safe, and affordable antidiabetic policy (*cf.* Marles & Farnsworth 1995).

1.1.3 Challenges in the Treatment of Diabetes Mellitus in Developing Countries

Treatment of diabetes mellitus requires attention to the systemic interactions and collaborative interdisciplinary team of providers (*cf.* Wagner *et al.* 2001; Phelps *et al.* 2009; Nam *et al.* 2011), social support (*cf.* van Dam *et al.* 2005), along with an empowered patient (*cf.* Wagner *et al.* 1996). In his review, van Dam *et al.* (2005) conclude that social support has a positive effect on the improvement of quality of life in diabetes patients. Furthermore, population-wide lifestyle changes, early detection, diagnosis and cost-effective treatment of diabetes are required to prevent or postpone diabetes-related complications (*cf.* Tuso 2014; Chong *et al.* 2017).

Almost every country has developed and applied various models of care and intervention to control diabetes. Bodenheimer (2002) identifies that most developed countries have reorganised their health care services with better-designed delivery systems to support self-treatment by patients, appropriate clinical decisions by a doctor through guidelines and clinical information flows, and patient care provided by health care organisations and other agencies which can support patient care (*cf.* Bodenheimer 2002). In the United Nations meetings of 2011 and 2014, all participating countries committed to addressing diabetes and other NCDs as a priority in their national targets for the year 2025 (*cf.* Al-Lawati 2017).

In developed countries, diabetes can be best managed by using algorithms for the disease, easily accessible medications, and also a greater understanding of the mechanism of the disease. However, those conditions are rather difficult to be met in developing countries (*cf.* Grant 2013). In an environment where infectious diseases are prevalent, such as in most developing countries, treatment of chronic diseases is often being set aside by health care professionals and policymakers, despite the fact that chronic diseases, including diabetes mellitus, demand effective treatment (*cf.* Debussche 2009; Grant 2013). Furthermore, socio-demographic and cultural barriers increase the challenges in the treatment of the disease in such settings (*cf.* Shrivastava *et al.* 2013). Thus, facing the double burden of controlling

communicable and non-communicable diseases, the country needs greater investment in the development of sustainable solutions which narrow down inequalities, are economically affordable, and are culturally acceptable (*cf.* Wareham 2016).

However, in many developing countries, diabetes care is not stated as one of the roles and responsibilities of health care professionals in rural areas (*cf.* Cohen *et al.* 2010; Grant 2013). The private sector provides health care services with huge variations in the quality and type of care. Moreover, most of the health care facilities are centered in urban areas (*cf.* Venkataraman 2009). Likewise, the provision of quality care for diabetes in Indonesia is not supported by a strong national health system. The efficiency and quality of health services are greatly affected by the deficiencies of health care professionals in terms of quantity and quality. Diabetes care is provided mostly at the secondary and tertiary care levels, which increases the costs of accessing the services. Furthermore, laws on pricing and quality of services are not strictly regulated, leading to unnecessary treatment and overcharging (*cf.* Soewondo 2013).

At the individual level, there are still barriers to getting effective diabetes treatment which include both provider- and patient-related issues (*cf.* Hofer *et al.* 2004). Generally, obstacles to improving diabetes care at the individual level are attributed to the problems of changing human behaviour (*cf.* Chin *et al.* 2001). The American Diabetes Association (ADA) emphasizes that to attain optimal health outcomes, diabetes self-care should also address the social determinants of health^[3] which have been shown to influence individuals with chronic illness including those diagnosed with T2DM (*cf.* Walker *et al.* 2015). However, not all social determinants of health have been intensively explored at the national level in Indonesia. While age, gender and socioeconomic status have been included in the various analyses, ethnicity is rarely included, despite the fact that Indonesia has a great number of indigenous and ethnic groups (*cf.* Schroders 2017).

Given its chronic nature, the study of self-care practices from the patient's perspective is important in order to understand factors affecting diabetes treatment. Thus, this study aims to unfold the complexity of diabetes treatment and to analyse how patients cope with diabetes mellitus in rural settings in Indonesia where the services and facilities to control diabetes are limited. Furthermore, this study will also explore cultural beliefs and practices in the treatment of diabetes mellitus. Previous research shows that the beliefs, practices, and attitudes of a culture have been shown to have an important role in diabetes self-management behaviour among African Americans, Asian Americans, and Mexican Americans (*cf.* Joo 2014). Likewise, an ethnographic study conducted by Tripp-Reimer *et al.* (2001) shows that cultural assessment is important to provide a culturally appropriate health care intervention. Consequently, understanding knowledge, beliefs and behaviour in the health and illness of patients are important steps in delivering culturally competent care to the community (*cf.* Tripp-Reimer *et al.* 2001). Earlier, Slikkerveer (1990) underscored that social and cultural factors are crucial determinants in the entire process of health care development.

In the same context, this study examines diabetes care and utilisation of health services in the Sundanese community, including traditional medicine, to provide an emic understanding of diabetes treatment among this population. The results of this study will be important, particularly for health care providers, in formulating culturally appropriate diabetes mellitus care and intervention in the community.

1.2 Health Care Utilisation in the Medical Pluralism Paradigm

1.2.1 Medical Pluralism in Indonesia

In the field of medical anthropology, disease and illness are defined differently. While disease is seen as a fault in the functioning of the human body, often from the perspective of a doctor, the term ‘illness’ is based on a patient’s perspective and is more socially influenced. Illness is defined as the subjective response of an individual and is affected by a person’s environment (cf. Helman 2007). Generally, understanding and responding to illness are determined culturally and biologically (cf. Baer *et al.* 2002). Pelto & Pelto (1997) argue that both doctors and patients have cultural beliefs upon which they act towards the illness. This definition means that health and illness, as perceived and experienced by humans, have biological and sociocultural determinants (cf. Singer 2004). Within this context, the ideas of illness and the practice of healing are culture-related and this creates a medical system (cf. Anderson 1992; Baer *et al.* 2002).

Dunn (1976) defines medical pluralism as: *‘the pattern of social institutions and cultural traditions that evolves from deliberate behaviour to enhance health whether or not the outcome of particular items of behaviour is ill health’*. Although a medical system is considered empirical, it is a belief system which renews gradually. Interaction between different types of medical systems thus force patients to work with different belief systems. As medical systems are complex, one community generally adopts more than one medical system. The health care practices of more than one medical system are then defined as medical pluralism (cf. Leslie 1976).

Medical pluralism has been evident throughout the world. The idea of medical pluralism was developed in the context of research on countries where different kinds of healing systems exist alongside each other and interact with each other; this encompasses how patients and their relatives make decisions about what kind of healers to use. This phenomenon is particularly prevalent in societies where one medical system alone cannot adequately meet the health needs of the entire population (cf. Leslie 1976; Bates 2002; Baer 2008). As Slikkerveer (1990: 13) points out: *‘...co-existence and utilisation of a wide range of traditional and modern healing systems in many parts of Africa, Asia, and Latin America has generally been regarded as a typical phenomenon in the developing world’*. In such societies, it is not possible to study biomedical health care without awareness of other medical systems.

Indonesia is a relevant example for the study of medical pluralism where several medical systems are co-existing alongside each other. In the country, a community member is offered a range of medical services in the different systems, which can all be adopted equally. Patients are engaged in different therapies for the same illness. The use of herbal medicine, either in combination or separately with biomedicine, seems to be a common phenomenon in Indonesia (cf. Leurs 2012). This phenomenon contrasts with the majority of people living in developed countries who prefer to only use a single medical system (*medical monism*), the bio-medical system^[4]. In addition to the two main medical systems, the modern and traditional medical system, it is also noteworthy that over-the-counter (OTC) medicines – categorised as transitional medicine^[5] - also have remarkable persistence in the community. As in many developing countries, pharmaceutical medicines can be obtained easily at local markets or in small shops (*kiosk*). Consequently, three available medical systems in Indonesia have established the current plural medical configuration, which is reflected in the co-existence of the traditional, transitional, and modern medical systems (cf. Aiglsperger 2014). Adapting the previous studies on health care utilisation which distinguish medical systems in three categories (cf. Slikkerveer 1990; Aiglsperger 2014; de Bekker 2020), the present study also documents the utilisation of three medical systems by Sundanese people in West Java, Indonesia.

Based on Kleinman's concepts of health care sectors, there are three overlapping health care systems, namely the popular sector, the professional sector, and the folk sector (*cf.* Kleinman 1980). The popular sector is the largest and consists of several layers. It includes the lay, non-professional, non-specialist options for health care which include individuals, their family and other social networks, as well as incorporating community beliefs and activities. The professional sector consists of organised healing professions. In Indonesia, including West Java, modern medicine as performed in clinics and hospitals can be classified as a professional sector. The last sector is the folk sector which consists of non-professional and non-bureaucratic specialists. These specialists can be spiritual or secular and frequently work in conjunction with both the popular and professional sectors. The utilisation of these sectors is not mutually exclusive; in a study in Africa, Bierlichs (2007) demonstrates that the use of these sectors sometimes overlaps. In Indonesia, traditional healers, herbalists, and traditional birth attendants (*paraji*) exemplify this sector.

In addition to the reference of the co-existence of the three categories of the medical system, medical pluralism also applies to multiple concepts of disease and illness, multiple categories of healer and health care providers, and multiple choices of therapy within and among systems (*cf.* Slikkerveer 1995). Within this context, health and healing practices among the Sundanese community members are not restricted to a single medical system. The Sundanese community in West Java, who also use different forms of health providers for disease treatment and view the traditional, transitional, and modern medical systems as equal and interchangeable healing practices, is suitable for the study of health care utilisation behaviour in the setting of medical pluralism.

As an ethnographic study in medical traditions, this study examines how the character of the Sundanese community is reflected in the health care-seeking process within social institutions of popular and cosmopolitan medicine. Accordingly, by positioning the indigenous knowledge of herbal medicine and healing practices in relation to the utilisation of the plural medical system, the present study seeks to provide an insight into the overall patterns of health care utilisation in the Sunda region in West Java. This study presents the dynamics of medical pluralism and utilisation of the medical system in Kabupaten Bandung, a rural district in West Java which is experiencing the impact of rapid urbanisation from its surrounding districts.

1.2.2 Determinants in Health Care Utilisation Behaviour for the Treatment of Diabetes Mellitus

In the context of diabetes mellitus, health care for chronic conditions requires the active involvement of not only patients but also the environment and community. After its clinical manifestation, patients are required to adhere to the continuation of care and change their lifestyle. Thus, understanding the diabetes health care-seeking process is crucial for encouraging the continuity of care and strengthening it in the communities in general.

Winkelman (2008) recommends a cultural system approach in the treatment of disease which considers health care within the context of the local, social and cultural systems. He states that economic, political and other social conditions such as cultural beliefs are affecting the utilisation of therapy and their interaction in creating patterns of health care utilisation behaviours (*cf.* Winkelman 2008). Studies show that communities which have used traditional medicine for a long time are less likely to use modern medical services (*cf.* MacPhee 2012). Cultural belief is identified as an important factor for patients to choose the specific treatment. In addition to the influence of cultural beliefs about illnesses and treatments, the process of the choice of medical treatment is also influenced by the limitations of the environment. In this context, Garro (1998) provides examples that medical decision-making may be associated with the cost of a particular treatment or the unavailability or inaccessibility of certain treatments.

In a setting where several modern medical services are offered, the community also preserves their indigenous medical knowledge and practices, presenting variations in health care utilisation behaviour. The present study investigates which determinants influence people's health care utilisation in the Sunda region. Slikkerveer (1990: 2) notes that health behaviour, illness behaviour and the utilisation of health care are significant elements in the study of medicine, culture, and community. Furthermore, Slikkerveer & Slikkerveer (1995: 13) state that: '*indigenous Indonesian medicine has evolved over the ages... a body of knowledge of health and healing, relying upon the balanced interaction of the community with the natural environment*'. While pluralism gives people chances to choose which medical system they would like to use, people's choice is always influenced by a complex set of factors and variables.

According to the concept of medical pluralism, there are meaningful patterns related to the utilisation of different medical systems from various communities. In his research in the Horn of Africa, Slikkerveer (1990) designed a theoretical model for the description and explanation of transcultural health care utilisation. This model examines the relationship among and between various predisposing, enabling and dependent factors and determines their importance in differential utilisation patterns. This analytical model, using bivariate and multivariate analysis, is able to identify significant relationships as a basis for future health care policy planning and implementation (*cf.* Slikkerveer 1990; 2011). The analytical model of transcultural health care utilisation has been adapted in several international studies on the provision and consumption behaviour of clients/services and consumers within the context of indigenous knowledge (*cf.* Slikkerveer 1990; Agung 2005; Ibui 2007; Leurs 2010; Djen Amar 2010; Ambaretnani 2012; Chirangi 2013; Aiglsperger 2014; Erwina 2019; Saefullah 2019; de Bekker 2020).

Different studies on health care utilisation suggest that peoples' responses to diabetes mellitus depend on their perceptions about the illness's symptoms and their aetiologies (*cf.* Atwine & Hjelm 2016); perceived severity of the illness (*cf.* Dominguez 2010); perceptions on the quality and effectiveness of the treatments (*cf.* Atwine & Hjelm 2016); access to health care services (*cf.* Basity & Iravani 2014; Atwine & Hjelm 2016; Perreira 2017); and household socioeconomic characteristics (*cf.* Basity & Iravani 2014; Perreira 2017). In addition, most people with diabetes in the developing countries practice self-medication and only consult with a physician when the symptoms persist or worsen, resulting in a delay in initiating prompt, appropriate and effective treatments (*cf.* Metta 2016).

However, studies on health care utilisation in the context of medical pluralism particularly for diabetes mellitus are still limited in Indonesia. Available information on the health care-seeking process of patients with diabetes mellitus and what factors influence their medical decision-making is still insufficient. Lack of information on health care utilisation behaviour poses a challenge in identifying potential gaps and designing programs which can effectively control diabetes.

This study aims to fill the research gap by analysing diabetes patients' health care-seeking process, which contributes to the development of context-adaptive interventions for disease control and strengthening community responses to the disease in Indonesia. In order to develop more context-adaptive interventions for their prevention and control, it is important to gain a deeper understanding of the communities' points of view (*emic* view) on how these diseases are perceived in the community and the experiences which are encountered as well as the reasons for the responses which are made.

In the study of people's behaviour, it is important to consider the implications associated with the types of study conducted to obtain this data. While other studies only focus on medical treatment choice patterns, ignoring individual treatment choices within and between different medical systems, studies which highlight health care utilisation patterns in medically pluralistic

regions are still limited. Based on that framework, a specific ethnoscience methodology, the ‘Leiden Ethnosystems’ Approach’ has been selected for the study of patterns of health care utilisation behaviour by the Sundanese in West Java, Indonesia. This approach attempts to identify people’s preferences in the utilisation of medical systems in the medical pluralism environment and encompasses three major principles: the ‘Historical Dimension’ (HD), the ‘Participant’s View’ (PV) and the ‘Field of Ethnological Study’ (FES) (*cf.* Slikkerveer 1990). Both the selected research methodology and the analytical model elaborate on the specific ethnoscience-based research methods and techniques used for data collection and analysis in both the qualitative and quantitative parts of the study. The methodology seeks to answer the research question: *what kind of people use what kind of medical system for the treatment of diabetes mellitus?*

1.3 Indigenous Knowledge and Practice of MAC Plants

In the implementation of the ‘Leiden Ethnosystems’ Approach’ in the context of medical pluralism, it is important to understand the context of indigenous medical knowledge or ethnomedicine. Warren, Slikkerveer & Brokensha (1995) define ‘Indigenous Knowledge’ as: *‘the local knowledge which is unique to a given culture or society [and] contrasts with the international knowledge system which is generated through the global network of universities and research institutes.’* Focusing on Indigenous Knowledge Systems (IKS), this research distinguishes knowledge systems between indigenous or local knowledge and modern knowledge.

Since the mid 20th century, there has been a shift in the development perspective from ‘top-down’ intervention to grassroots or ‘bottom-up’ participatory (*cf.* Sillitoe 2002). Consequently, a variety of disciplines such as anthropology, ecology and medicine conduct multidisciplinary research focusing on indigenous or local knowledge to provide improvement for community development, bio-cultural diversity conservation and health care delivery. Research on IKS has been carried out in several developing countries, particularly in Indonesia (*cf.* Agung 2005; Leurs 2010; Djen Amar 2010; Ambaretnani 2012; Erwina 2019; Saefullah 2019) and East Africa (*cf.* Slikkerveer 1982; Slikkerveer 1990; Ibui 2007; Chirangi 2013; de Bekker 2020).

Ethnobotany, as a research field of ethnoscience, has been widely applied for the documentation of indigenous knowledge on the use of plants in Asian countries (*cf.* Sheng-Ji 2001). While ethnobotany puts special emphasis on the study of plants, indigenous healing methods and practices using medicinal plants are studied under the field of ethnomedicine. Ethnomedicine, as an indigenous or culturally based form of medicine, covers the utilisation of several health-promoting cultural practices and/or the use of minimally processed naturally occurring products for the preventive and curative purpose for the disease, as well as for the maintenance of optimal physical and emotional health (*cf.* Barsh 1999; Iwu 2002). Both ethnobotany and ethnomedicine are multidisciplinary fields of study involving anthropologists, chemists, pharmacologists, and botanists. Those fields have contributed to providing information on many plant species used by indigenous communities which have shown to provide satisfactory treatment and cure (*cf.* Slikkerveer 2006). Rivier & Bruhn (1979) argue that an ‘interdisciplinary approach is essential’; ethnobotanical studies, usually completed with ethnopharmacological or ethnomedicine studies, have been used for the discovery of new drugs and new drug development. Recently, a study on ethnomedicine focused on the utilization of different medical systems in a particular culture, or the utilization of particular forms of medical systems among different cultures (*cf.* Slikkerveer 2003).

From around the mid-1980s, indigenous medical practices are reported to have regained their importance among the people in Indonesia, due to the deteriorating access and trust in the available modern medical system (*cf.* Zaenuddin 2005). Despite their importance for local people, the role of indigenous medical systems has not been sufficiently understood.

Indigenous medical practices have often been considered superstitious, non-scientific, and less valuable compared to the modern medical system. However, suggesting that indigenous medical practices contain no rational elements would be misleading. The indigenous community has shown to recognise some physical causes of illness and has its own illness classification, and thus responds to illness accordingly.

Medicinal plants are an important resource in the traditional medical system. It is estimated that 70–80% of the rural population in developing Asian nations has been adopting traditional medicine for their primary health care, despite the availability of conventional medicine in many places in the region (*cf.* Sheng-Ji 2001). This practice is also prevailing among people in Indonesia, including the Sundanese community. The Sundanese use herbs and plants not only for treatment of specific illnesses but also for other enhancing health functions such as medicinal plants for women after giving birth, aromatic and cosmetic plants for teenage girls in their puberty to enhance womanhood, and medicinal herbs used by men to increase their physical strength (*cf.* Ambaretnani 2012).

Within the context where plants also serve as cosmetic use for health and beauty, Quah & Slikkerveer (2003) introduce the concept of MAC plants as an extension of the concept of medicinal and aromatic plants (MAP). The extended concept of MAC plants is not solely based on consideration of the overlapping definition and use of medicinal plants, but also on the ethnomedical point of view. The concept of MAC plants provides a better understanding of the indigenous classification of useful plants (*cf.* Slikkerveer 2006). This concept has been shown to further substantiate the emic view on indigenous plants' knowledge, beliefs, and practices for several regions including Bali (*cf.* Agung 2005, Leurs 2005), Mara Region (*cf.* Ibui 2006), and Crete (*cf.* Aiglsperger 2012).

To date, several comprehensive reviews on the botany, phytochemistry, and pharmacology of medicinal plants for the treatment of diabetes mellitus have been published. A systematic review by Kooti *et al.* (2016) listed 40 species of plants reported to have been used to treat diabetes and investigated for antidiabetic activity. Furthermore, in a more recent review, 81 species of medicinal plants in Asian countries are reported to have hypoglycaemic, anti-hyperglycaemic, insulin-mimicking, anti-lipidemic properties and hence when administered in proper dosages can be beneficial for the treatment of diabetes mellitus (*cf.* Bindu & Narendhirakanan 2019). The ethnomedical and ethnobotanical approach which involves the study of plants used in traditional societies can be proposed as an alternative to identify and prioritise plants for the development of new antidiabetics (*cf.* Oubre *et al.* 1997). The role of ethnobotany and ethnomedicine in drug development with specific references to the treatment of diabetes mellitus will be discussed further in the following section.

1.3.1 The role of Ethnomedicine in the Treatment of T2DM

The use of complementary therapy is increasing in the regions where access to conventional care is limited, especially for the treatment of cardiovascular disease and diabetes mellitus (*cf.* Grant *et al.* 2012; Matheka & Demaió 2013; Rabito & Kaye 2013). Research also indicates that patients choose to use traditional or alternative medicine over conventional medicine because conventional medicine is considered as giving worse side effects, is too invasive, and only treats symptoms rather than the cause of an illness (*cf.* Mendenhall *et al.* 2016).

Ethnomedicine and medicinal plants have been widely recognised in the local health care system and local communities; however, the study of its synergism is still ignored (*cf.* Adams *et al.* 2005). Its practice has been represented over a long history (*cf.* Adedapo *et al.* 2013). Likewise, diabetes mellitus has also been known for a long time since ancient human history. Several studies on ethnomedicine and ethnobotany worldwide have shown that T2DM has been recognised by the traditional healer as a pathological condition which can be treated with specific medicinal plants. The conditions and botanical remedies for T2DM are listed in several

ancient medical texts. The *Ebers Papyrus*, as part of a collection of ancient Egyptian medical textbooks written about 1500 BC, described the pathology of a clinical condition similar to diabetes such as excessive thirst and high frequency of urination.

Furthermore, the *Sushruta Samhita*, an Ayurvedic textbook written between the fourth and fifth centuries B.C. in India, describes two types of diabetes. In this textbook, healers identified two causes of diabetes which are genetic disorder and imbalanced diets. The pharmacopoeia of ancient India listed specific treatments for diabetes, including dietary modifications, medicinal plant remedies, and minerals. Likewise, Chinese medical books written in 3000 B.C. gave explanations about diabetes mellitus and its therapies (*cf. Oubre et al. 1997; Karamanou 2016*). These historical pieces of literature reveal that T2DM is recognised by ancient healers and treated with medicinal plants (*cf. Oubre et al. 1997*).

Over the past several decades, ethnobotany and ethnomedicine have been considered as a more appropriate interdisciplinary approach to drug discovery, involving interdisciplinary collaboration (*cf. Oubre et al. 1997*). The starting point in an ethno-directed search for anti-diabetic plants is the identification of plant species used by local healers for this purpose. Traditional cultures throughout the world have access to thousands of plants used for medicine. The ethnobotanical and ethnomedical information obtained from the study provides the potential to identify which plants are most likely to be useful for further study of antidiabetic treatment. Research shows that 40 out of 70 plants (57%) which are ethnomedically used to treat diabetes in tropical countries exhibited antidiabetic activity in tested animals (*cf. Cox & Balick 1994*). Likewise, Marles & Farnsworth (1995) document that 81% of plants used traditionally to treat diabetes give positive test results in anti-diabetes tests, while plants selected based on chemotaxonomy (not used traditionally) only give 47% positive results. These results clearly show that the ethno-directed approach in the search for new anti-diabetes treatment provides excellent results.

Although diagnostic criteria and assumed causes might vary significantly, the pathophysiology of diabetes mellitus appears to be similar across cultures (*cf. Oubre et al. 1997*). Once diagnosed, patients may be effectively treated by traditional healers for a variety of symptoms associated with T2DM. Some countries use the same type of plant to treat the same symptoms. Most of these plants have been intensively studied and their active compounds are known. Several reviews of antidiabetic activities of traditional medicines have been published elsewhere (*cf. Matheka & Alkizim 2012; Nazarian-Samani et al. 2018; Bindu & Narendhirakanan 2019*).

A systematic review on medicinal plants used for diabetes mellitus and its complications listed more than 70 plant species which have multiple pharmacological activities. Those medicinal plants are not only effective for diabetes mellitus, but also its complications, such as dyslipidaemia and cardiovascular disease. Plants with multiple pharmacological activities may be potential candidates as alternatives or supplementary to available antidiabetic medications (*cf. Nazarian-Samani et al. 2018*). Earlier, Kesari *et al.* (2007) conducted the survey and listed more than 1200 plants used ethnopharmacologically as antidiabetics. They found that indigenous medicine and diet may not have activity in reducing blood sugar levels such as antidiabetic drugs or insulin, but those plants are still useful in disease treatment and complications (*cf. Kesari et al 2007*).

Given a reasonable likelihood, the qualitative part of this study seeks the indigenous medical knowledge, beliefs and practices of the Sundanese, namely *ubar kampung* for the treatment of diabetes mellitus. As Oubre *et al.* 1997 state : [...] *'This approach seems likely to increase the chances for discovering new drugs for the treatment of diabetes mellitus, while simultaneously enhancing the quality and integrity of affordable traditional medicine available in the developing world'*.

1.3.2 *Ubar Kampung*: Indigenous Knowledge of MAC plants in Tatar Sunda, West Java

Indonesia is known as the country with the largest ethnic groups and cultures in the world. Having a large tropical forest area, Indonesia is one of the world's centers of biodiversity. Conservation International listed two centers of biodiversity in Indonesia which are Wallacea and Sundaland. It is reported that there are about 28.000 species of flowering plants in Indonesia.

Over the centuries, medicinal plants have been used by most Indonesian people, especially in rural areas (*cf. Roosita et al. 2008*). About 40 million Indonesians have historically utilised around 6000 plant species for health enhancement and the treatment of diseases (*cf. Elfahmi et al. 2014*). Yusro *et al.* (2014) report that 78 species of plants have been used by 34 ethnic groups in Indonesia for the treatment of malaria; 133 species are used by 30 ethnic groups for the treatment of common fever, and 110 species have been used by 30 ethnic groups for the treatment of gastrointestinal disorders. This rich potential of biological resources in Indonesia, integrated with knowledge of plant utilisation by various ethnic groups in Indonesia, creates a knowledge system including traditional medical knowledge or ethnomedicine (*cf. Ramdhan et al. 2015*). Different environments, traditions, manners and behaviours establish variation in the traditional medical knowledge among each ethnic group in Indonesia (*cf. Waluyo 2004*).

Every community and ethnic group in a certain area has its local knowledge and wisdom in utilising biological resources to support their life. One of the examples is the indigenous medical knowledge of Tetun ethnic, one of the indigenous ethnic groups on the island of Timor. When the people of Tetun ethnic experience malaria, they create a concept and ways to prevent and treat the disease. People of the Tetun ethnic perceive that malaria is caused by naturalistic factors which affect the hot-cold balance in the body and use various local medicinal plants for the treatment of malaria. This knowledge can then be incorporated with the existing conventional malaria eradication programs to make them more culturally acceptable and effective (*cf. Taek et al. 2019*).

The Sundanese, the second largest ethnic group in Indonesia, considered West Java as their homeland and called most of the part of West Java *Tatar Sunda*. The region is located in the western part of Java and has a mountainous geographic feature. Blessed with fertile volcanic soil and tropical climate, the Tatar Sunda region has heterogeneous vegetation. Gunung Halimun Salak, a National Park in West Java, is reported to have 700 species of flowering plants belonging to 390 genera and 119 families (*cf. Priyadi et al. 2010*).

Sundanese traditional medical knowledge, *ubar kampung*, has been used by the Sundanese in their livelihood to maintain well-being for many generations. The Sundanese use *ubar kampung* in several ways, generally based on the severity of the illness. Medicinal plants are the major component of *ubar kampung*. Roosita *et al.* (2008) document that there are about 117 species of plants in West Java which have been used by traditional healers for the treatment of 96 cases of illness. An example of *ubar kampung* is the use of guava leaves (*Psidium guajava*) for the treatment of diarrhoea or crushed red onion (*Allium cepa*) mixed with coconut oil for relieving fever.

Despite the remarkable contribution of indigenous medical knowledge in society, the practical utilisation of indigenous resources at the community level have hardly ever been the focus of research. The practice of Sundanese traditional medicine in West Java is at risk of being lost. Theoretical and contextual problems have been hampering the comparative study of the relationship between medicine, culture, and society, resulting in a lack of understanding of health service delivery in Indonesia (*cf. Slikkerveer & Slikkerveer 1995*).

In this light, this study seeks to determine the significance of indigenous medical knowledge, particularly used by the Sundanese community in the configuration of the plural medical system.

A better understanding of the role of traditional medical knowledge and practices will potentially improve primary health care outcomes, particularly for the Sundanese people in West Java.

1.4 The Need for Integrating the Traditional Medical System

Along with globalisation, major changes are also experienced in the practice of traditional medicine or indigenous medicine and health care delivery. Increased cross-cultural communications have resulted in the exposure of many forms of traditional medical practices to more modern medical environments (*cf.* WHO 2000). Traditional medicine has been widely recognised as an important part of health care systems in several countries (*cf.* Iwu 2002; Lunyera *et al.* 2016). Medicinal plants are not only used in the traditional medical system but are also recommended for the therapy of degenerative disorders and chronic conditions in the modern medical system where conventional medicine cannot provide adequate results. Furthermore, research on traditional plant-based medicine has continued to make a considerable contribution in the development of the pharmaceutical industry.

The utilisation of herbal-based therapy in standard health care delivery resulted in a dilemma in the development of public health policy in terms of fulfilling the needs of the population. It is a great challenge to make traditional medicine available to a wider population while preserving the cultural basis of the healing systems. Traditional and modern medicine view health, disease, and the cause of disease from different perspectives. Both systems were developed by different philosophies and cultural backgrounds. Those different philosophies have created different approaches in the health and healing processes. However, both systems deal with the same subject, namely human health. Harmonisation of traditional and modern medicine emphasises the need for the respectful co-existence of both medical systems. Iwu *et al.* (2002) identify two approaches to meet these challenges: one is to adopt and integrate both traditional medicine and modern medicine, and the other is to recognise both systems as legitimate but as different types of health care.

Integrated health care is generally defined as the integration of the traditional medical system into formal services to encourage and facilitate health care services in terms of accessibility, cost-effectiveness and participation to provide patient satisfaction. The conceptualisation of integrated health care has further developed into the integration of traditional, transitional and modern medical systems in order to respond to the situation of health care delivery in developing countries where 70% to 80% of the population rely on traditional medicine (*cf.* Slikkerveer 1990; Warren, Slikkerveer & Brokensha 1995; Slikkerveer 2003; WHO 2007, 2008; Ambaretnani 2012; Chirangi 2013). As Slikkerveer (2003) argues, traditional medicine contributes to primary health care as less costly and locally available medicine, particularly in developing countries where modern health care is scarce. The significance of the concept of 'Integrative Medicine' results from the thoughtful incorporation of values, knowledge and practices from traditional, alternative, complementary and conventional medicines. In its Traditional Medicine Strategy, WHO adopted resolutions which formally recognised traditional medicine as part of the health service delivery, and also recommended governments to integrate the traditional medical system into their national health system based on innovation and research (*cf.* WHO 2002).

Despite the extensive use of traditional medicine, the integration of the traditional medical system into the formal health care system has not been fully implemented. In 2007, the Ministry of Health launched Regulation No. 1109/2007 to legalise the implementation of alternative and complementary medicine in health facilities. However, incorporating traditional medicine into the biomedical system is not an easy task because of the domination of modern medicine over traditional medicine (Broom *et al.* 2009; Gale 2014; Ijaz *et al.* 2016). Krah *et al.* (2017) identify the challenges of integrating traditional healers into the health care system such as insufficient

knowledge of traditional medicine, a discriminatory approach towards traditional medicine, and limited establishment of trust between traditional healers and biomedical health staff. In this context, the health care community needs to know which designs of institutional incorporation can contribute to health care developments.

Following the distinction of the integrated approach of the traditional and modern medical systems, the 'Leiden Ethnosystems' Approach' provides a better perspective to integrate the utilisation of traditional medicine by the local people with the public health service. This study employs a similar concept with the study on the integration of community-based institutions with existing community institutions (*cf.* Saefullah 2019). In his study in Kabupaten Subang, Saefullah (2019) highlights the potential of the contribution of indigenous institutions to sustainable community-based development using the concept of 'Integrated Community-Managed Development (ICMD)' developed by Slikkerveer (2019). As cited in Saefullah (2019): '*the approaches encompass not only the economic dimensions of the community, but also education, health, communication, and socio-cultural factors*'.

1.5 General Aim and Specific Objectives

The general aim of this research is to document, study and analyse the knowledge, beliefs, and practices of *ubar kampung* as the Sundanese indigenous medical system for the treatment of diabetes mellitus in the Tatar Sunda region of West Java as part of the overall utilisation of traditional, transitional, and modern medical systems. The present study seeks to answer the following general research question: '*What kind of people with what kind of knowledge of MAC plants use what kind of medicine for diabetes mellitus?*' In addition to the collection of a rather substantial amount of research data on local patterns of health care utilisation and related factors, the present research places particular emphasis on the general understanding of local systems of knowledge, practices and beliefs associated with the indigenous knowledge of *ubar kampung* as part of the traditional medical system.

In order to execute the above-mentioned General Aim, this is further operationalised into the following Specific Objectives:

- *firstly*, to present a theoretical overview of the treatment of diabetes mellitus, the plural medical system and the National Health care System in Indonesia, as well as the role of Indigenous Knowledge Systems in the treatment of diabetes mellitus;
- *secondly*, to present the appropriate ethnoscience research methodology for the study of health care utilisation in the setting of medical pluralism and selected statistical analysis to identify the determinants in health care utilisation;
- *thirdly*, to select the target population of the respondents in the communities and design the appropriate sampling technique for collecting the quantitative data through household surveys in the communities in the research area of Kabupaten Bandung;
- *fourthly*, to present the description of the Tatar Sunda region as the homeland for the Sundanese and a general profile of the communities in the five research villages based on the results of the qualitative study;
- *fifthly*, to present the provision of the traditional, transitional, and modern medical systems in Indonesia, as a wider scope of the Sunda region and the utilisation of the plural medical system in the five villages;

- *sixthly*, to describe the indigenous knowledge, beliefs and practices of *ubar kampung* for the treatment of diabetes mellitus in Tatar Sunda;
- *seventhly*, to conduct a *household survey* to collect data on the background characteristics of the community members as well as their reported health care utilisation behaviour, leading up to the distribution of the rates of utilisation of traditional, transitional, and modern medical systems;
- *eighthly*, to present the results of the stepwise bivariate, mutual relation, and multivariate analysis and interactions among significant factors and variables in order to measure the influence of the determinants of use of the traditional, transitional and modern medical systems in the research area; and
- *ninthly*, to describe the theoretical, methodological and practical implications of the complementary study for both the integration of traditional medicine into the formal health care system, as well as the development of plant-based medicines for the treatment of diabetes mellitus among the people of the Tatar Sunda region and elsewhere in Indonesia.

1.6 Structure of the Study

In order to meet the general aim and specific objectives of this study, this dissertation is organised into nine chapters. These nine chapters include the introduction, theoretical orientation, research methodology, research setting, plural medical system in West Java, results of the qualitative study on the livelihood of the Sundanese in the Tatar Sunda region, execution of household surveys, results of the stepwise bivariate, mutual relation, multivariate and multiple regression analysis, and finally the conclusion. Each chapter is described as follows:

Chapter I, as the Introduction, presents the background of the study which is the burden and complexity of the treatment of diabetes mellitus, particularly in developing countries where health care services are not accessible by all populations. This section is followed by a description of medical pluralism where the co-existence of several medical systems is a common phenomenon. Furthermore, this chapter also highlights the roles of indigenous medical knowledge and ethnomedicine in the treatment of diabetes mellitus. In addition, this chapter also introduces *ubar kampung* as an indigenous medical system of the Sundanese community.

Chapter II, as the Theoretical Orientation, reviews the literature and research relevant to the concerns of the study. This chapter begins with the treatment, intervention, and prevention of diabetes mellitus as a global and national burden. Afterwards, the conceptual framework of medical pluralism and its components, namely the traditional, transitional, and modern medical systems, are elaborated in this chapter. Finally, the relevant concepts and theory of Indigenous Knowledge Systems and their components are presented at the end of this chapter.

Chapter III presents a detailed description of the research methodology of this study. This chapter describes the methods of data collection and statistical analysis, and the phase of conducting the study. The study involves two different methods in the data collection (qualitative and quantitative) to adequately answer the research questions: following a description of the appropriate 'Leiden Ethnosystems' Approach', the multivariate model of transcultural health care utilisation is introduced, which forms the analytical basis of this study. Thereafter, the procedure of adopting the model to the present research is further explained. After identification of the research methodology, the processes, which have been involved in the selection of the research area and the population as well as in the development of qualitative

and quantitative research instruments, are further described. Finally, the chapter concludes with an outline of the practical application of the research instruments used during the fieldwork as well as during the following phase of the statistical data analysis.

Chapter IV presents the results of the qualitative and quantitative data collection. This chapter provides the general background information about Indonesia as a developing country and the Tatar Sunda region as the research setting of the study. The chapter starts with a description of Indonesia and its National Health care System, particularly in the treatment of non-communicable diseases. A more detail description of the livelihood of the Sundanese community in Tatar Sunda is presented in the next section. The chapter provides comprehensive information about the geography, ecological diversity and the people, and their history, culture, and socio-economic situation, as well as the social institutions of the five research villages.

Chapter V explains the medical system available in Indonesia as a wider scope of West Java, the province where the study was conducted. Each medical system, namely the traditional, transitional, and modern medical system, is explained in detail with attention to its historical background, development, and provision. Furthermore, this chapter presents the knowledge, beliefs, and accessibility of each medical system in the five villages under study.

Chapter VI presents the results of an ethnobotanical study on *ubar kampung* for the treatment of diabetes mellitus. This chapter begins with the knowledge, beliefs, and practices of *ubar kampung* by traditional healers in the Sundanese community. The most frequent use of MAC plants is listed in the table, presenting the local name, vernacular/Latin name, and family/genera. On the basis of this literature research, each MAC plant was complemented by its pharmacological activities.

Chapter VII presents the health profile and prevalence of the diseases in Kabupaten Bandung as well as in the five research villages. Results of the transcultural health care utilisation reported by the ‘patients’ in the research area are presented in the next section. In particular, this chapter explains the patterns of utilisation of each medical system and the overall utilisation rate of the plural medical systems.

Chapter VIII presents the results of the stepwise statistical analyses of the quantitative data from the household surveys. On the basis of the utilisation rates as presented in Chapter VII, the results of stepwise bivariate, mutual relation, multivariate and multiple regression analysis are explained comprehensively in this chapter. The quantitative findings of the study are also supported with evidence from the qualitative study in Kabupaten Bandung.

Finally, Chapter IX presents the conclusions of the present study and formulates a number of recommendations, as well as the theoretical, methodological and practical implications of this research on local patterns of health care utilisation behaviour, particularly in the treatment of diabetes mellitus in the Tatar Sunda region.

Notes:

1. Epidemiological transition is defined as the change in patterns and cause of diseases from acute infectious and deficiency diseases to chronic non-communicable diseases (NCDs).
2. Since the vast majority of diabetes patients in Indonesia have Type 2 Diabetes Mellitus, hereafter the term diabetes in this book refers to type 2 diabetes mellitus.
3. As defined by CDC, social determinants of health are economic and social conditions which influence the health of people and the wider community.
4. The bio-medical system, modern medicine, and modern medical system are used interchangeably in this book.
5. As will be elaborated further in Chapter II, the transitional medical system is defined as the use of pharmaceuticals without seeking advice from professional health care (self-care) or health services, and are provided by untrained personnel.