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Research Article

Influence of Antidiabetic Herbal Medicine to a Decrease Blood Glucose Levels of Diabetes Mellitus Patients at The 'Hortus Medicus' Scientification of Jamu Clinic Tawangmangu, Karanganyar

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Abstract
Diabetes mellitus (DM) was an annual disease characterized by parennials of blood glucose levels exceeding normal and impaired metabolism of carbohydrates, fat and protein caused by defficiency of insulin hormone relative as well as absolute. Management of patients with DM can be done by some effort, among others was consume an antidiabetic drug or antidiabetics herbal medicine. Antidiabetic herbal medicine were consisting of bitter, brotowali, salam leaf, and AAI (analegtic, antiinflamation, and immunomodulator). The resesarch aimed to know the influence of antidiabetic herbal medicine to decrese blood glucose levels in patient with DM at The 'Hortus Medicus' Scientification of Jamu Clinic, Tawangmangu, Karanganyar. The method was quasi experimental with one group pre-post test. The samples were 37 people of the patients with DM diagnose with purposive sampling technique methode. The research report that among 37 respondents, 32 (86.5%) of respondent got a decreased blood glucose levels. The mean value of blood glucose level before consuming antidiabetic herbal medicine was 290.30 mg/dl and the mean value after consuming the herbal medicine was 241.78 mg/dl with difference of the mean value before and after consuming the herbal medicine was 48.52 mg/dl. There were influence of antidiabetic herbal medicine to decrease blood glucose levels of diabetes mellitus patients at the clinic with p-value=0.00 ($p<0.05$).

Key words: Blood glucose, brotowali, diabetes mellitus, herbal medicine, salam leaf, sambiloto

Pengaruh Obat Herbal Antidiabetes untuk Menurunkan Kadar Glukosa Darah pada Pasien Klinik Jamu *Scientific* "Hortus Medicus" Tawangmangu, Karanganyar

Abstract
Diabetes melitus (DM) adalah penyakit menahun yang ditandai dengan peningkatan kadar glukosa darah melebihi normal dan gangguan metabolisme karbohidrat, lemak, dan protein yang disebabkan oleh kekurangan hormon insulin secara relatif maupun mutlak. Manajemen pasien dengan DM dapat dilakukan dengan beberapa upaya, antara lain adalah mengonsumsi obat atau obat herbal antidiabetes (jamu). Jamu antidiabetes yang digunakan terdiri dari sambiloto, brotowali, daun salam, dan AAI (analgesik, antiinflamasi, dan imunomodulator). Penelitian ini bertujuan untuk mengetahui pengaruh jamu antidiabetes untuk menurunkan kadar glukosa darah pada pasien DM di klinik Saintifikasi Jamu 'Hortus Medicus', Tawangmangu, Karanganyar. Metode penelitian ini adalah kuasi eksperimental dengan *one group pre-post test*. Sampel yang digunakan adalah 37 orang pasien terdiagnosis DM dengan teknik pengambilan sampel *purposive method sampling*. Data penelitian menunjukkan bahwa di antara 37 responden, 32 (86,5%) dari responden mengalami penurunan kadar glukosa darah. Kadar glukosa darah sebelum mengonsumsi jamu antidiabetes adalah 290,30 mg/dl dan nilai rata-rata setelah mengkonsumsi jamu antidiabetes adalah 241,78 mg/dl dengan perbedaan nilai rata-rata sebelum dan setelah mengkonsumsi jamu adalah 48,52 mg/dl. Terdapat pengaruh jamu antidiabetes terhadap penurunan kadar glukosa darah pada pasien DM di klinik dengan p-*value*= 0.00 ($p <0,05$)

Kata kunci: Brotowali, daun salam, diabetes mellitus, jamu, kadar glukosa, sambiloto

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Introduction

Number of patients with Diabetes Mellitus (DM) in the world was increased year by year. It was associated with an increase in population, life expectancy increased and urbanization that change the traditional lifestyle to a modern lifestyle, the increasing prevalence of obesity and reduced physical activity.[1] The results of a survey that conducted by the World Health Organization (WHO) stated that the number of people with diabetes in Indonesia in 2000 were 8.4 million people, the number was on fourth ranks in the world, while the above sequence was India (31.7 million), China (20.8 million) and the United States (17.7 million).[2]

A person who affected by diabetes mellitus cannot use glucose normally and glucose will remain on blood circulation which will damage tissue. The severe damage will cause complications, such as cardiovascular disease, nephropathy, retinopathy, neuropathy and ulcers pedis.[3] Management in patients with DM can be done by some effort, among others were providing education, sport, healthy lifestyle, avoid fast food, as well as taking medication or traditional medicine with antidiabetic effect.[4] Basic Health Research 2010 showed that 50% of Indonesia's population used traditional or herbal medicine to maintain health or treat the disease5. In order to provide the scientific evidence related to the quality, safety and benefits of traditional medicine (jamu), the Indonesian government in this case the Ministry of Health of the Republic of Indonesia superbly Ministry of Health issued Regulation Number 03/Menkes/Per/2010 on 'Saintifikasi Jamu'. Saintifikasi Jamu (Scientification of Indonesian traditional medicine) is scientific evidence through research-based health care.

One of the aim was to provide the evidenced base of herbs with empiricall using through research-based health care, particularly in preventive and promotive efforts. There are some scientification of jamu clinics in Indonesia and one of them is The 'Hortus Medicus' Scientification of Jamu Clinic.[6]

The results of preliminary studies that have been conducted in the 'Hortus Medicus' Scientification of Jamu Clinical Laboratory Tawangmangu, Karanganyar on March 7th, 2014 through interviews with clinics' health workers, showed that the number of diabetic patients who check blood glucose levels in the month of December 2013 were 74 patients, there were 61 patients in January 2014. In the month of February 2014 as many as 57 patients. The average number of patients with DM that checking blood glucose levels are as much as 60–70 patients/month. Antidiabetic herbal medicine that used in the 'Hortus Medicus' Scientification of Jamu Clinic consists of the preparation simplicia and capsules containing bitter (*Andrographis paniculata* (Burm. F). Wall. Ex Nees), brotowali (*Tinospora crispa* (L) Miers ex. Hoff. I), salam/Indonesian bay leaf (*Eugenia polyantha* Wight), and herb for analgesic, anti-inflammatory-immunomodulatory (AAI) which consists of turmeric (*Curcuma longa* Linn), ginger (*Curcuma xanthoriza* Roxb), and meniran (*Phyllanthus niruri* L.). The research based on the description above. Researchers interested in conducting research to determine the effect of antidiabetic herbal medicine to decrease blood glucose levels in diabetic patients in the 'Hortus Medicus' Scientification of Jamu Clinic, Tawangmangu, Karanganyar. This study aims to determine the mean value of blood glucose levels in diabetic patients before and after taking antidiabetic herbal medicine and analyze the effect of antidiabetic herbal medicine to decrease the patient's blood glucose levels.

Methods

This study is a quasi-experimental research

design with one group pre-post test design that tests conducted on a group without a control group, however it made by the first measurements (pretest) was the measurement of blood glucose levels before taking antidiabetic herbal medicine that allows the test for changes occurred after the consumption of antidiabetic herbal medicine form blood glucose levels that were lower or higher than before. The study was conducted in The 'Hortus Medicus' Scientification of Jamu Clinic Tawangmangu Karanganyar on February to April, 2014.

Population of this research was all patients who seek treatment at the 'Hortus Medicus' Scientification of Jamu Clinic Tawangmangu who have been diagnosed with diabetes and checking blood glucose levels in clinical laboratories. The average number of patients with diabetes who checked blood glucose levels were 64 patients of month based on the recapitulation: a) 74 patients on December 2013, b) 61 patients on January 2014 and c) 57 patients in February 2014.

Sample of the research were patients with diabetes who meet the following inclusion criteria: a) It have been diagnosed with diabetes mellitus, b) It has conducted measurements of blood glucose levels before taking antidiabetic herbal medicine, c) they have been taking antidiabetic herbal medicine for a month , and d) they have done blood glucose level checks every month. The sampling technique was purposive sampling that be done in order to get the number of samples in accordance with the purpose of research and meet the inclusion criteria as many as 37 people.

The data in this research is secondary data. The data obtained from the medical records of the patient in the form of the status of the name, address and age of the patient as well as data from clinical laboratories in the form of blood glucose levels of patients at the time before and after taking antidiabetic herbal medicine. The data collection tool was the data recapitulation sheet.

Early research conducted by the orientation of the existing problems then conducted a preliminary study of literature and to develop a research proposal. Proposals repairment was necessary for the perfection of the study and received approval for a seminar. The study was conducted after obtaining research permission. Permission was got from the 'Hortus Medicus' Scientification of Jamu Clinic in this case is submitted to the Director of Medicinal Plant and Traditional Medicine Research and Development Center (Balai Besar Penelitian dan Pengembangan Tanaman Obat dan Obat Tradisional/B2P2TOOT), Tawangmangu, Karanganyar. The first study was to determine the description of research location and observation of antidiabetic herbal formulas are given. Second study was the medical records observation of patients with a diagnosis of DM in accordance with the predetermined inclusion criteria. Data was collected to study the characteristics of respondents by age, sex, and blood sugar levels of patients before and after taking antidiabetic herbal medicine.

Table 1 Frequency Distribution of Respondents by Age

Age Category (years old)	Frequency	Percentage (%)
31–40	3	8.1
41–50	9	24.3
51–60	18	48.6
61–70	4	10.8
>70	3	8.1
Total	37	100

Table 2 Frequency Distribution of Respondents by Gender

Gender	Frequency	Percentage
Man	20	54.1%
Woman	17	45.9 %
Total	37	100%

Once the data was obtained and then the processing and analysis can be done for the data in a way to reexamine the validity of data. The data encodes for each data classification and enter into a computer database for simple frequency distributions. At last, data was grouped such that the data was aggregated and compiled to be presented and analyzed in the form of the master table. Analysis of the data was the bivariate analysis, a paired sample T-test with a level of confidence of 95%.

Results

Characteristics of respondents by age can be seen in Table 1. Characteristics of respondents by sex can be seen in Table 2. Risk factors for diabetes is not based on those genders, but based on genetic opportunities derived by parents or relatives.

The effect of antidiabetic herbal medicine to decrease blood glucose in diabetic patients at The 'Hortus Medicus' Scientification of Jamu Clinic, Tawangmangu analyzed by bivariate test and presented in Table 3.

The effect of antidiabetic herbal medicine to decrease blood glucose levels can be seen from the difference between the mean value of blood glucose levels before and after consuming antidiabetic herbal medicine was equal to 48.52 mg/dl. The results of bivarate test analysis using Paired Sample T-test showed p-value=0.00 ($p < 0.05$) so that it can be concluded that there was antidiabetic effect ot the herbal on reducing blood glucose levels in diabetic patients of the clinic.

Discussions

The 'Hortus Medicus' Scientification of Jamu Clinic is type A clinic under the agency of Medicinal Plant and Traditional Medicine Research and Development Center (Balai Besar Penelitian dan Pengembangan Tanaman Obat dan Obat Tradisional/BBPPTOOT), Tawangmangu, Karanganyar. The clinic is an implementation of the regulation of the Minister of Health No. 003/Menkes/Per/2010 on saintifikasi Jamu in research-based health care through research and development from upstream to downstream of the safe, quality and efficacious herbs. Research and development of herbal medicine from upstream to downstream was started from exploration, aquaculture, post-harvest, pre-clinical research, clinical research to the formulation and preparation technology.

Since April 20, 2012, the clinic into the new building as a preclinical trials and equipped by the inpatient facility. The developments have been done since 2009. It showed an interest and appreciation of the greater

Table 3 The Effect of Antidiabetic Herbal Medicine to Decrease Blood Glucose of Respondents

	Mean Value	p
The blood glucose levels of respondents before taking antidiabetic herbal medicine	290.30 mg/dL	
The blood glucose levels of respondents after taking antidiabetic herbal medicine	241.78 mg/dL	0.00
The difference of mean values	48.52 mg/dL	

community for service program that outcome by Scientification of herbal medicine. The number of patients was increasing year by year. Initially in 2007, the number of patients less than 10 persons a day and in 2014 reached more than 150 patients a day.

Clinical's activity includes research-based clinical services to patients consisting of two patients, ie patients as research subjects and patients generally. General patient care was given after the patient get an explanation from the clerk and signed informed consent and request consent. All of herbal formulas that been used were listed on the 'Saintifikasi Jamu' Vademecum or upon the recommendation of the National Commission of 'Saintifikasi Jamu'. Diagnosis was established based on the conventional diagnosis equipped with laboratory analysis.

Antidiabetic herbs that be used in The 'Hortus Medicus' Scientification of Jamu Clinic consists of a crude drug preparation or capsule containing bitter, brotowali, salam/Indonesian bay leaf and herbs formula for analgesic, anti-inflammatory, immunomodulatory (AAI) which comprises of turmeric, curcuma, and meniran.

Sambiloto or bitter have andrographolid as antidiabetic compounds. The research with male and female rats that given oral suspension with bitter leaf powder of 2 g/kg of bodyweight, bitter leaf ethanol extract of 2.4 g/kg of bodyweight, and andrographolide of 3 g/kg of bodyweight did not give a toxic effect 6. Bitter was combined with brotowali and bay leaves for interact synergistically to hypoglycemic effect.

Infusion with levels of 10% w/v brotowali's rod that given to rabbit due parenteral administration can decrease blood glucose levels compared with glibenclamide. The insulinotropic mechanism of brotowali studied in vitro using insulin secreting clonal β-cell line, HIT T15. The Water extract sensitated β cells on Ca2 intracellular and increased insulin release. Ca2 cytosolic increasing because of Ca2 extracellular uptake simulation and efflux inhibition of Ca2 cytosolic.[6] Bay leaf water extract that insoluble ethanol at a dose of 700 mg/kg of bodyweight to male white mice strains showed the effect of lowering blood glucose concentration to normal mice and lowers blood glucose concentration alloxan-induced diabetic mice and accelerate glucose tolerance in diabetic mice induced by alloxan.[6]

In antidiabetic herb medicine, turmeric is used as an anti-inflammatory. Essensial oil in turmeric consisting of cynnamyl tiglate, eucalypton, metylol pinene and bicylo. The compounds can inhibit the release of 1L1-β and TNF-α in joint inflammation.[7] Curcuma rhizome can be used as an analgesic. Curcuma can reduce the occurrence of peptic ulcer at gastric mice that have induced by Indomethacin. The content of the active ingredient in turmeric which gives as an analgesic effects of curcumin and essential oil is mainly flavonoids that work by inhibiting the cyclooxygenase enzyme so that the conversion of arachidonic acid to prostaglandins did not happen and did not cause pain.[8]

Pre-clinical study to test the activity of meniran are conducted on rats and mice to determine the safety and immunomodulatory characteristics. The results showed that the meniran extract can modulate the immune system through the proliferation and activation of T and B lymphocytes, the secretion of some cytokines such as interferon-gamma specific, tumor necrosis factor alpha and some interleukins, activation of the complement system, activation of phagocytic cells such as macrophages and monocytes. Cytotoxic cells such as natural destruction of cells 'natural killer cells' increased. The results of clinical trials to see immunomodulating effects in patients with certain conditions it is concluded that the extract meniran can be used as adjuvant therapy (support) for several

infectious diseases.[9]

The results showed that the majority of respondents were 51–60 years old as many as 48.6%, while respondents were 41–50 years old by 24.3%. These results indicate that the majority of respondents were in middle age to elderly. Hasdianah[10], explains that the age factor affected the incidence of DM. Age is directly proportional to the risk of the onset of DM. This is due in middle age to old age began to increase glucose intolerance. The aging process causes a reduction in the ability of pancreatic β cells to produce insulin. In addition to the older individual impairment of mitokondira activity in muscle cells by 30%. The decline of mitochondrial activity is associated with increased fat level in the muscles as much as 30% and stimulate the insulin resistance.

Novita[4], argued that based on the science of genetics, using the DM seed symbol 'D' for the normal and the symbol 'm' for the recessive. DM is one of the diseases related to sex chromosomes, so a normal father and mother with the symbol DD also normal but carry the DM gene with symbol 'Dd', their offspring or their children is DD normal for men and Dd suffering from diabetes for men, and Dd normal for women but carries the DM gene. The situation would be different if the father suffering from diabetes using symbol mm and the mother is normal but carry the DM gene using symbol Dd. The offspring are suffering DM for men and normal women with DM gene carrier (DD) and men want any women suffering DM with symbol mm. However, the weakness of this study is a family disease history of patients wasn't studied.

The data showed that 5 respondents (13.5%) of 37 respondents experienced an increase in blood glucose levels. This may be due to the knowledge and lifestyles of respondents who have not focused on controlling the disease condition. It can be caused that respondents suffered Insulin Dependent Diabetes Mellitus (IDDM). Insulin always needed every day by patients with IDDM less than optimal antidiabetic drugs to lower blood glucose levels.[11] However, the weakness of this study was not examined would also categorize the respondent based on the type of diabetes that affects. Things that affect blood glucose levels, which are the factors that cause disease DM itself, namely the lifestyle of respondent including physical activity, knowledge of DM that was based on the level of education and herbs or other drugs are consumed by the respondent.[12] People with diabetes who have sufficient knowledge of the DM will change their behavior to control the condition of the disease so that they can live longer by preventing other factors that affect blood glucose rise as pay attention to the content of fiber in the diet, digestion, way presentation of food, feeding speed and the effect of glucose intolerance and food concentration.[13,14]

Conclusions

From the research that conducted in April 2014 on The 'Hortus Medicus' Scientification of Jamu Clinic, Tawangmangu, Karanganyar showed that antidiabetic herbal medicine that be used consist of Brotowali, Bitter, Bay leaf, Turmeric, Ginger and Meniran. The mean value of diabetic patients' blood glucose levels before consuming antidiabetic herbal medicine was 290.30 mg/dl while the mean value of blood glucose levels of diabetic patients after taking antidiabetic herbal medicine was 241.78 mg/dl. The difference in mean values before and after taking antidiabetic herbal medicine was 48.52 mg/dl. There were influence of antidiabetic medicine effect on reducing blood glucose levels of DM patients with $p= 0.00$ ($p <0.05$).

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Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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