International Journal of Multidisciplinary Education and Research
ISSN: 2455-4588; Impact Factor: RJIF 5.12
Received: 09-11-2019; Accepted: 10-12-2019
www.educationjournal.in
Volume 5; Issue 1; Jan 2020; Page No. 37-42

Combination of alkaline water consumption and acupressure for fasting blood sugar levels in patients diabetes mellitus type II

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Abstract
Background: diabetes mellitus is characterized by increased blood sugar levels. One complementary used to control blood sugar levels of diabetics mellitus is alkaline water consumption and acupressure.
Purpose: To analyze the effectiveness of the combination of alkaline water consumption and acupressure to lower fasting blood sugar levels of type II diabetes mellitus.
Method: This study true exsperimental research approach using pre-test and post-test control group design involving 56 patients who seek treatment at the Public Health Center Kediri, West Lombok drawn at random by stratified random sampling combination permuted block. 28 respondents into groups has been the combination and control groups. Data were analyzed by t-Test Dependent and Independent t-Test
Results: The results showed that the mean fasting blood glucose levels in the combination group experienced a decrease of 148.36 mg / dl to 104.54 mg / dl with a mean value of delta -43.8214 mg / dl (p = 0.000). The mean fasting blood sugar control group also decreased from 142.75 mg / dl to 124.93 mg / dl with a mean value of delta -17.8214 mg / dl (p = 0.000). Statistical test results showed that the mean fasting blood glucose levels in the combination group and control after being given treatment there is a significant difference (p = 0.000).
Conclusion: The combination of alkaline water consumption and acupressure effective in lowering fasting blood sugar levels of type II diabetes mellitus.

Keywords: alkalin water, acupressure, fasting blood sugar, diabetes mellitus

Introduction

Diabetes mellitus is a group of metabolic disorders characterized by increased levels of glucose in the blood or hyperglycemi [1]. Am*erican Diabetes Association* (ADA) (the Standards of Medical Care in Diabetes 2017) classifies into three namely diabetes mellitus type I diabetes mellitus, type II diabetes mellitus, and gestational diabetes mellitus. Diabetes mellitus type 2 clinical cases (90-95% of all cases of diabetes in the World) [2].

International Diabetes Federation (IDF) said the prevalence of diabetes in 2017, as many as 425 million people by the age of 20-79 years suffer from diabetes mellitus. From these figures, Indonesia was ranked the sixth world with as many as 10.3 million people with diabetes [3]. Data from the Health Research (Riskesdas, 2018) diabetics in Indonesia increased from 6.9% in 2013 to 10.9% in 2018. Patients with diabetes mellitus in West Nusa Tenggara also increased from 0.9% in Year 2013 to 1.6% in 2018 [4].

Chronic complications of diabetes into a series of complex events. Keeping control of glucose levels is seen as an effective preventative measure to reduce the risk and the development of chronic complications. Long-term complications of diabetes mellitus associated with vascular disease can be classified as a disease microvascular diseases such as retinopathy, nephropathy, neuropathy, and macrovascular disease involving large blood vessels such as blood vessels of the heart, brain and peripheral vascular [5].

Hyperglycemia in patients with diabetes mellitus is one of the factors that can increase the formation of free radicals [6, 7]. Excessive free radical formation in the body will cause oxidative stress. Furthermore, oxidative stress will increase lipid peroxidation will generate malondialdehyde (MDA). MDA concentration increased in patients with diabetes mellitus, cause damage to the vascular endothelial cells, endothelial cell damage will cause proatherogenik pro-inflammatory and blood vessels to cause complications both macrovascular and microvascular [8].

Various measures taken to prevent and control blood sugar levels, namely the 5 pillars of the management of DM. In addition to the 5 pillars of the management of diabetes, other therapies that can be done is a complementary therapy. Complementary therapies used to lower blood sugar levels and diabetes mellitus type II, one of which is the consumption of alkaline water and acupressure.

Alkaline water is water that is alkaline or have a pH above 7. The alkaline water also contains oxygen, and contains very small molecules such as sodium, potasium, calcium, and magnesium. alkaline water also contains high hydroxida, the ORP value (Oxydation Reduction Potential) negative can reach -600 Mv [9]. ORP is the ability of water to act as an antioxidant. Antioxidants are compounds electron donor, which can reduce the negative impact oxidant and reduce the adverse effects of reactive oxygen species, reactive nitrogen compounds or both under conditions of normal physiological function in humans.[10, 11]Role as an antioxidant alkaline water to lower blood sugar levels in the body that helps the organs, especially the pancreas to return to work optimally in producing the insulin needed by the body [12].

Previous research showed that alkaline water rich in hydrogen molecules provide benefits for health with an antioxidant mechanism. Research Siswantoro, *et al* (2018)

on the effectiveness of alkaline water intake to decrease blood sugar levels in patients randomized type 2 diabetes mellitus who do sver 14 daysin 28 respondents with the result that there are differences between the mean blood sugar levels before and after therapy alkaline water dith the average value blood sugar levels after consumption of alkaline water amounted to 239.85, with value (p value = 0.001) [12].

Provision of alkaline water to total cholesterol, carried out for 3 weeks at 24 sparague Dawley rats. The result showed that introducing alkaline water effect on total cholesterol male rats induced Dawley strain sparague high-fat diet with a value to an average value of total cholesterol 144.47 mg / dL and p value = <0.05 [13].

Research conducted by Ostojic, *et al* (2014) concerning the effects of hydrogen-rich water to blood alkalinity (pH, Bicarbonate) in men who are physically active. The study was conducted over 14 days in 52 male respondents were physically active. The result showed that an increase in pH and bicarbonate after administration of alkaline water with an average value pH after alkaline water consumption amounted to 7.44, and the average value of bicarbonate after alkaline water consumption of 30.5 with p value <0.001 [14].

Acupressure is an act done to give stimulation to specific points using a finger [15]. Acupressure is one of the actions that are recognized as an act of nursing in the Nursing Intervention classifications. The basic mechanism of acupressure therapy is to lower blood sugar levels and increase the value of ABI in diabetes is to provide stimulus to the points accupoint are also associated with the pancreas to produce insulin. The main point of useful acupressure to stimulate insulin is the point LR3, KI3, SP6, ST36 and SP10 [16].

Previous research has shown that acupressure is effective for addressing health issues, especially in patients with diabetes mellitus. Rousdy, *et al* (2016) in his research the effectiveness of acupressure to reduce blood sugar levels in people with diabetes mellitus result: acupressure on point (ST-36) in the treatment group may lower blood sugar levels significantly by an average of blood sugar levels after treatment in the intervention group amounted to 111.07 with significant values (p = 0.000) [17]. Research same is done by Zarvasi,*et al* (2018) showed that the effective lowering akupresure blood sugar levels penderita diabetes mellitus with an average value of blood sugar sesudah treatment in the intervention group at 122.23 with a significant value (P value = 0.001) [18]. The above data show previous studies of acupressure alkaline water and statistically significant on blood sugar levels. Although the value statistically significant ecara but clinical research have not shown the achievement of the normal value of the examination of blood sugar levels and improve the health of people with diabetes mellitus intervention is required is the provision of a combination of alkaline water and acupressure.

Material and Method

Study design

This research uses True-Experimental research design with pretest-posttest control group design. Paired comparative analytic design was also used.

Settings

This research was conducted in Public Health Center Kediri, District of Kediri, West Lombok regency, West Nusa Tenggara province.

Population and Sample

The population in this study were all patients with type II diabetes mellitus who do care in Public Health Center Kediri for one year (2018). The sample size for each group is 28 respondents for the combination group and the control group in the study inclusion criteria were patients who suffer from diabetes mellitus type II patients aged 45-65 years, patients suffering from type II diabetes mellitus is more than 5 years, patients who have never been exposed to alkaline water and acupressure, yet ulceration DM (ABI mild medium-: 0.05 to 0.09), treated with oral diabetes drugs. The exclusion criteria in the study were patients with co-morbidities such as hypertension, renal failure, heart failure, dyslipidemia, and remathoid arthritis, type II diabetes mellitus patients who smoke> 25 years, respondents who resign, respondents were uncooperative.

Intervention

The provision of the acupressure intervention is performed by the researcher who has the competence to perform acupressure acupressure after following the training and has been graduated from the Certified chiropractors and Acupressure Association of Indonesia (ACASI). The combination therapy group consumption of alkaline water with pH 9.5 of 1200 ml and acupressure while the control group received acupressure is being done as much as nine times with a duration of 20 minutes at 5 points, namely accupoint LR3, KI3, SP6, ST36 and SP10.

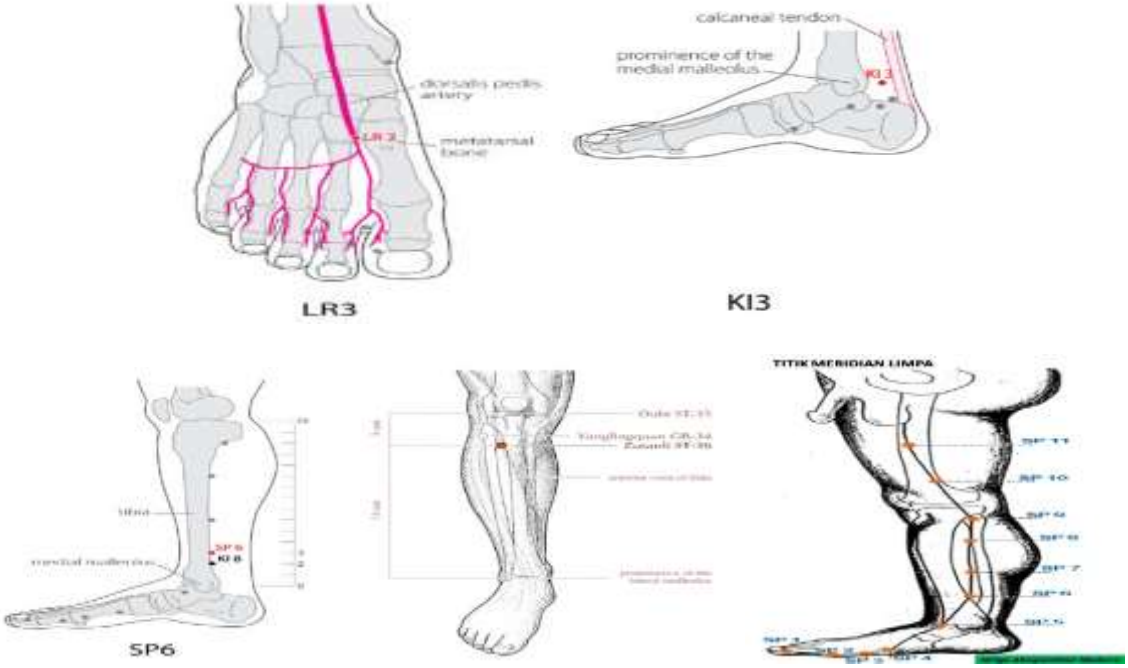

Fig 1: acupressure point to lower fasting blood glucose levels

Instrument

The instrument used in this study for the examination of fasting blood sugar levels is to use venous blood, which was conducted by a team of Kediri Public Health Care laboratory using spectrophotometry using a photometer. By category fasting blood sugar value 80-109 mg / dl (good), 110-125 mg/dl (moderate) and> 125 mg/dl (bad) (Perkeni, 2011).

Ethical considerations

This study has been approved by the one public health center to a data collection. Each respondent was given and signed informed consent regarding the purpose, benefits and research procedures.

Data Analysis

Shapiro-Wilk test was used to test the normality of the data. Dependent t test and independent t test was used to analyze the effect of alkaline consumption and acupressure for lowering blood glucose levels.

Result

Table 1: demographic characteristics in the combination group and control group

Characteristics	Combination (N = 28) n %	Control (N = 28) n %	*p*
Age (mean ± SD)	58.71 ± 3.526	58.82 ± 2,667	0377
Gender			
a. Male	14 50	14 50	1,000
b. Female	14 50	14 50	
Total	28 100	28 100	
Education			
a. Primary School	16 57.1	15 53.7	0648
b. Junior High School	2 7.1	5 17.9	
c. Senior High School	7 25.0	4 14.3	
d. College	3 10.8	4 14.3	
e. Total	28 100	28 100	
Profession			
a. Entrepreneur	3 10.7	1 3.6	
b. Farmer	3 10.7	1 3.6	
c. Trader	5 17.9	2 7.1	0028
d. House Wife	10 35.7	10 35.7	
e. Does not work	3 10.7	10 35.7	
f. Retired	4 14.3	4 14.3	
Total	28 100	28 100	
old DM			
a. DM 5-10 years	19 67.9	17 60.7	0286
b. DM> 10 years	9 32.1	11 39.3	
Total	28 100	28 100	
Smoking history			
a. Yes	4 14.3	3 10.7	0428

b. No	24 85.7	25 89.3	
Total	28 100	28 100	

Table 1 shows that the average age in each group are statistically equal or homogeneous (p = 0377) with a mean age in the combination group was 58.71 (n = 28) and 58.82 in the control group. Gender of respondents statistically in both groups were also similar or homogeneous (p = 1.000) in which the gender of men and women amounted to 28 (n = 56) with a history of recent education Most are elementary as many as 31 respondents from both groups (n = 56) and mostly work as a Housewife of 20 respondents (n = 56). Most of the respondents suffered from diabetes for 5-10 years with the number of respondents was 36 (n = 56) and most of the respondents did not have a history of smoking and the number of 49 respondents (n = 56).

Table 2 Differences in mean fasting blood sugar levels before (pre-test) and after *(Post-test)* treatment in the combination group and a control group

Group	Pre test	Post Test	t	p
	mean ±SD	mean ±SD		
K Combination	14148.36±12 508	10104.54±8.500	2020.724	0 0.000
K Controls	141422.75±9147	12124.93±8981	1111.891	0 0.000

Dependent t test (p <0.05)

Table 2 shows that the mean fasting blood sugar levels in both groups before and after treatment changes. The value of fasting blood glucose levels in the combination group experienced a decline after being given treatment and included in the category of fasting blood sugar levels better (p = 0.000), whereas the mean value of fasting blood glucose levels in the control group was included in the category of fasting blood sugar levels were (p = 0.000).\

Table 3 Delta mean difference of fasting blood sugar levels before (pretest) and after (post-test) in the treatment group combination and control groups

Group	Pre test	Post Test	^mean ± SD
	mean ±SD	mean ±SD	
Combination	148.36 ± 12 508	104.54 ± 8.500	-43.8214 11.18880
Control	142.75 ± 9147	124.93 ± 8981	-17.8214 7.93050

Table 3 shows that the average decline in fasting blood sugar levels after a given intervention in the combination group is -43.8214 mg / dL, while the mean decrease in fasting blood sugar levels after a given intervention in the control group is -17.8214 mg / dL.

Table 4: Differences in mean fasting blood sugar levels after treatment between the combination group and the group kontrol

Variables	Combination group	Control group	mean Difference	t	*p*
	mean ±SD	mean ±SD			
Fasting blood sugar levels	104.54 ± 8.500	124.93 ± 8981	-20 393	-8726	0000
Delta fasting blood sugar levels	± 11.18880 -43.8214	-17.8214 7.93050	-26,000	-10,032	0000

Independent t test (p <0.05)

Table 4 shows that the average value of fasting blood sugar levels between the combination group and the control group after receiving a combination of consumption of alkaline water and acupressure for 21 days, which acupressure done as much as 9x with a duration of 4 minutes for each point showed a significant difference with p = 0.000, with a mean value of delta for fasting blood glucose levels in the combination group more than the control group is -43.8214 mg / dl in the combination group and -17.8214 mg / dl in the control group, with p = 0.000.

Discussion

The bivariate analysis were used in this study is to test the Independent t tests showed that the average value of fasting blood glucose levels in the combination group and the control group there were significant differences p = 0.000, which means that the combination of the consumption of alkaline water and acupressure effective for lowering blood sugar levels fasting in patients with type II diabetes mellitus. Research on the combination of alkaline water consumption and acupressure done regularly for 21 days (3 weeks). Alkaline water with a pH of 9.5 are consumed on a regular basis for 21 days 1200 ml one day. While acupressure given as much as 9 times for 3 weeks (3 times a week) with a duration of 4 minutes for each point.

Alkaline water is the result of the electrolysis process, the process of cation is a positive ion converge on the negative cathode electrolysis unit to form ion hydroksida.[10] Alkaline water has a pH which is more alkaline than regular water. pH alkaline water used in this research is 9.5. Alkaline water is also disebut as electrolyzed reduced water (ERW), through this process produced water with hydrogen ions in large amounts or also called hydrogen rich water (HRW). Hydrogen ions in alkaline water works as an antioxidant in the body and be able to improve the performance of the metabolism of the body cells of diabetes mellitus. value, containing oxygen, a smaller molecular size (micro pcluster) and contain small molecules such assodium, potasium, calcium, and magnesium [11].

Alkaline water also contain ORP (Oxydation Reduction Potential) negative that can reach -600 mV, has the ability to donate electrons and can effectively neutralize and block damaging free radicals in the body. Besides known as an antioxidant, because the content of the water molecules are relatively small makes alkaline water is easy to diffuse into the cell. Alkaline water as an antioxidant mechanism for lowering blood sugar levels which help the organs in the body, especially the pancreas by protecting DNA, RNA, and kidney cells against oxidative stress in order to return to work optimally in producing the insulin needed by the body. Insulin produced by the pancreas is used by the body to store excess glucose in the blood into muscle tissue, resulting in a lowering of blood sugar levels of patients [12, 19, 20].

In addition to other therapies alkaline water consumption can also be used to reduce levels of fasting blood sugar is acupressure. Acupressure is a traditional therapy that comes from china which is believed to help the process penyebuhan disease. Acupressure is derived from the science of acupuncture which in principle is the same, but the difference is the treatment of acupressure uses the fingers while acupuncture uses needles, but carried out at

the same point called acupoint which is located along the meridian line [21]. Stimulation is given on the acupressure points can enable glucose-6-phosphate (one enzyme of carbohydrate metabolism) and may have an effect on the hypothalamus. Acupressure at SP6 point, ST36 and SP10 work on the pancreas to increase insulin synthesis, increasing one receptor on the target cell, and accelerate the use of glucose inside the cell, so that it can lower blood sugar levels in people with diabetes mellitus [16]. Research combination of alkaline water consumption and acupressure is more effective in reducing fasting blood glucose levels compared with study alkaline water consumption to lower blood sugar levels performed by Siswantoro, *et al* (2018) and studies of acupressure for lowering fasting blood sugar levels were conducted by Zarvasi (2018) [18]. Research alkaline water for lowering blood sugar levels using alkaline water pH of 9.5 sver 21 days (dikonversi of 14 days). The statistical test show effectiveness of alkaline water consumption on blood sugar levels of people with diabetes mellitus are randomly paired t test with significance value of 0.001, dith a mean value of a random blood sugar levels before treatment is 246.71 mg / dl (Converted into a fasting blood sugar levels are 184.54 mg / dl) be 239.85 mg / dl (Converted into a fasting blood sugar levels are 169.41 mg / dl) after being given treatment meaning that alkaline water is effective for lowering blood sugar levels of diabetics mellitus type II [12]. Research acupressure to lower fasting blood glucose levels were performed by Zarvasi (2018) showed that administration of acupressureat 4 (four) points dith the duration of suppression 5 minutes can reduce fasting blood sugar levels of type II diabetes mellitus patients with significant value = 0.001. The mean fasting blood sugar levelsin the combination groupdecreased from 128.30 mg / dl menjadi 122.23 mg / dl with a mean value of delta of -6.07 mg / dl, sedangkan in the control group's levels of fasting blood sugarfter treatment increased from 139.63 mg / dl to 142.53 mg / dl with a mean value of delta is 2.9 mg / dl [18]. As for the combination of research alkaline water consumption and acupressure conducted for 21 days (9 times acupressure with a duration of 4 minutes each point) lower average value of fasting blood sugar levels with p = 0.000. The average value of fasting blood sugar levels in the combination group before being given treatment was 148.36 mg / dl and the mean fasting blood sugar levels after a given treatment is 104.54 mg / dl (normal categories), with a mean value of delta that is -43.8214 mg / dl. While the control group mean fasting blood sugar levels before treatment was 142.75 mg / dl and the mean fasting blood sugar levels after a given treatment is 124.93 mg / dl (medium category) with a mean value of delta that is -17.8214 mg / dl.

Conclusion

The combination of alkaline water consumption and acupressure effective in lowering fasting blood sugar levels of type II diabetes mellitus. The combination of alkaline water consumption and acupressure can be used as non-pharmacological treatment for lowering fasting blood sugar levels of type II diabetes mellitus.

Acknowledegment

Thank you for lecturers and teaching staff of the nursing study program postgraduate of the master of applied health in the health polytechnic of the ministry of health semarang who have provided motivation and knowledge as long as researchers follow education, and thank you to your beloved family who provided a lot of material and spiritual support and prayers that have been offered for the success and success of researchers.

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