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Physical activity had relationship with hyperglicemia on kyai and teacher in pondok pesantren area in Yogyakarta

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ABSTRACT

Background: *Riskesdas 2013 showed that 15 provinces had the prevalence above national prevalence of diabetes mellitus. Yogyakarta Province is one of the provinces with high prevalence rates of diabetes disease, that was 3.0%. Hyperglycemia is a sign of diabetes mellitus disease. Physical activity is one of the management programs in hyperglycemic patients. Physical activity plays a role in controlling blood sugar or control body by converting glucose into energy.*
Objectives*: To know the relationship between physical activity with hyperglycemia in kyai and teacher at boarding school of Yogyakarta.*
Methods*: Research was an observational analytic study with cross-sectional design. Population in this research was a teacher at boarding school of Yogyakarta which the amount of 579 people. Minimum sample size obtained as many as 184 respondents with probability proportional to size (PPS) sampling technique. Data blood glucose levels were collected using the Easy Touch and physical activity data using questionnaires International Physical Activity Questionnaire (IPAQ). Data analysis were frequency distribution, mean difference test (T-test) and Chi Square test is done by using SPSS software .*
Results: *Based on T-test showed that there was a difference blood glucose levels between group of less physical activity with enough activity group, but the difference was not significant with value t = 0.446 and p- value = 0.656 and mean different = 3.127. The result of chi-square test showed that there was no significant relationship between physical activity with hyperglycemia and p- value = 0.969.*
Conclusions*: There was no significant relationship between physical activity and hyperglycemia.*

KEYWORDS: *boarding schools*, *hyperglycemia, kyai, physical activity, teacher*

INTRODUCTION

Hyperglycemia is a medical condition in the form of elevated blood glucose levels exceeding normal. This condition is one of the most distinctive signs of diabetes mellitus (DM) (1). Blood glucose levels in impaired glucose tolerance will lead to hyperglycemia with fasting blood glucose levels 100-125 mg/dl and 140-199 mg/dl at 2 h after meals (2). The proportion of impaired blood glucose tolerance (TGT) in Indonesia was 29. 9 % and fasting blood glucose was disturbed (GPT) of 36.6% (3).

DM is a group of metabolic diseases with characteristics of hyperglycemia that occurs due to abnormalities of insulin secretion, insulin work or both (1). The incidence of DM in Indonesia according to Riskesdas data (3). An increase of 1.1% in 2007, rising to 2.1% in 2013 which means more and more Indonesians are suffering from DM. Increased prevalence of DM patients one of them occurred in Yogyakarta province which ranks 5th out of 33 provinces in Indonesia. Diabetics DM in DIY experienced a significant increase from 2.6% in 2007 to 3.0% in 2013.

According to research conducted by Chhaya Jatin et al (4) stated that of 576 teachers in Ahmedabad city institutions of India who suffer from non-infectious diseases namely DM as much as 5.35 %. Hyperglycemia risk factors are unhealthy lifestyles such as physical inactivity, unhealthy diet and not balanced and obesity (5). As physical activity continues to increase as a result of a transition or lifestyle change, all activities require physical energy but are now all made easier by technology (6).

Physical activity plays a role in controlling or control blood sugar by converting it into energy glucose (7). So the most important thing of controlling hyperglycemia is to control the risk factor.

The behavior of physical activity that less at age ≥ 10 years in Indonesia until 2013 reach 26,1%, while in Yogyakarta province until 2013 reach 72,5% (3). Research conducted by Andre a D. Smith et al (8) with the title of physical activity and incident type 2 diabetes mellitus obtained the result that there is a relationship between physical activity with the incidence of diabetes mellitus means the lower the physical activity then the greater the risk factor for the incidence of DM type 2.

An intervention program that can be done to reduce the coin receipt factor of hyperglycemia and obesity that is by way of improving lifestyle such as increased frequency of physical activity, healthy diet pattern (low consumption of carbohydrate and fat and high of vegetable and fruit), and reduce work stress (9).

N based upon the description, the incidence of hyperglycemia and diabetes mellitus teacher pretty much ser ta lack of research done on the Islamic boarding school hyperglycemia, so researchers are interested to know the relationship of physical activity by hyperglycemia on clerics and teachers in boarding DIY.

MATERIALS AND METHODS

This study was part of a joint study of the factors that influence the incidence of hyperglycemia in kyai and teachers in boarding school DIY. The type of research in this research was analytic observational with a cross-sectional design. This study was conducted in a boarding school located in 4 districts and 1 city in the Province of Yogyakarta Special Region from March to August 2017.

Population in this research was all kyai and teacher at boarding school in DIY. The number of population in this research was 579 people from 35 boarding school. The sample in this research is kyai and teacher in the Islamic boarding school of DIY that fit with inclusion and exclusion criteria. The inclusion criteria were kyai and the teacher who were willing to be the research respondent and the kyai and the teacher who are willing to do blood glucose examination, while for the exclusion criteria were kyai and fasting teachers, pregnant women and teachers, and kyai and teachers in the boarding school which does not provide confirmation after the follow up as much as 3x and has exceeded the time limit specified. The number of samples required in this study was as many as 184 respondents. The sampling technique used in this research was probability proportional to size (PPS).

The study consisted of three variables: independent variable (physical activity), the dependent variable (hyperglycemia), and disturbing variables (age, sex, last job, and occupation). Instruments used in the form research Easy Touch (check tool blood glucose levels), blood glucose strip, lancet, alcohol 70% and questionnaire data themselves and questionnaire physical activity is used in this study is the International Physical Activity Questionnaire (IPAQ) which has been simplified by Afifah&Isti (10). Data collection was conducted by team assisted by enumerator with education background of Nutrition Science as much as 2 people who have been given training and equation of perception and standardization of data retrieval process. How to collect data of blood glucose level is by checking blood glucose Easy Touch , while for the way of collecting data of physical activity that is by interview , covering kinds of activity done during last 1 week, frequency in doing every activity in last 1 week, which is needed in one time doing the activity. Physical activity scores are calculated according to the IPAQ protocol schema ie the METs value of each activity x the frequency x the length of time used and expressed in units of METs/day (if data obtained per 1 week means the final result is divided by 7). The data obtained were analyzed using chi-square test and T-test using SPSS version 20.0 software.

RESULTS AND DISUSUSSION

Based on **Table 1** can be partially n d iketahui that respondents aged <40 know that is 92.9%, female as much as 54.3%, educated past high

Table 1. Frequency Distribution of Respondent Characteristics and Research Variables

Characteristics	n	%
Age (years)		
<40	171	92.9
≥ 40	13	7.1
Gender		
Man	84	45.7
Women	100	54.3
Last Education		
Elementary school	1	0.5
Junior high school	10	5.4
Senior high school	120	65.2
University	53	28.8
Occupation		
Kyai / Nyai	13	7.1
Badal Kyai	27	14.7
Ustadz / Ustadza h	144	78.3
Hyperglycemia		
Yes (> 140 mg / dl)	13	7.1
No (≤ 140 mg / dl)	171	92.9
Physical Activity		
Less (<1500 MET s)	155	84.2
Enough (≥1500METs)	29	15.8

Source: Primary Data 2017

school/vocational school that is 65.2% and the profession as a religious scholar/cleric as many as 78.3%. Of the 184 respondents only 13 respondents (7.1%) were clicking hyperglycemia (high blood glucose levels). Physical activity on kyai and teachers in boarding school of DIY mostly included in the category of less that is 155 respondents (84.2 %).

Based on **Table 2** it can be seen that there is a difference in average blood glucose levels between physical activity is less with adequate physical activity of 3.127, but the difference of blood glucose is not between respondents whose physical activity is enough with the respondents whose physical activity is less with the value of T = 0.446 and the value of p- *value* = 0.656.

Based on **Table 3** it can be seen that from some variables in the analysis of age, last education, and work have a significant relationship with the incidence of hyperglycemia with p- *value* <0.05. For other variables, namely gender and physical activity does not have a significant relationship with the occurrence of hyperglycemia because the value *p-value*> 0,05.

DISCUSSION

Age

Table 1 shows that most respondents aged <40 years as many as 171 (92.9%). Age is one risk factor for the occurrence of hip erglikemia, along with the increase in age, the risk factor of hyperglycemia also increases, especially at the age of more than 40 years. This is because in ages and aging there will be increased glucose intolerance or insulin resistance so that will decrease the ability of β-pancreatic cells to produce insulin (11) .

Gender

Based on **Table 1** it can be seen that most of the respondents are female as much as 100 people (54.3 %) . Sex is one of the factors of the occurrence of hyperglycemia. Women have a higher risk of having blood glucose than men. High fat composition will cause women to have more body fat accumulation than men so that women will more easily experience obesity. Someone who is overweight will more easily experience hyperglycemia until DM (12).

Last education

In **Table 1** shows that most of the last educated respondents graduated from senior high school/vocational school were as many as 120

Table 2. Mean Blood Glucose Level (KGD) based on physical activity

Physical Activity	Frequency (N)	Percentage (%)	Average Blood Glucose	Mean Diff.	T	p- *value*
Less	155	84.2	101.17	3.127	0.446	0.656
Enough	29	15.8	98.05			
Total	184	100				

Source: Primary Data 2017

Table 3. Relationship Characteristics of Respondents and Variables with Hyperglycemia

Characteristics	Hyperglycemia				Total (n)	p- *value*
	Yes		No			
	n	%	n	%		
Age (years)						
<40	6	3.9	146	96.1	152	0,000 *
≥ 40	7	21.9	25	78.1	32	
Gender						
Man	9	10.7	75	89.3	84	0.077
Women	4	4	96	96	100	
Last education						
Elementary school	0	0	1	100	1	
Junior high school	0	0	10	100	10	
Senior high school	4	3.3	116	96.7	120	
University	9	17	44	83	53	0.010 *
Work						
Kyai / Nyai	6	46.2	7	53.8	13	
Badal Kyai	2	7.4	25	92.6	27	
Ustadz / Ustadzah	5	3.5	139	96.5	144	0,000 *
Physical Activity						
Enough	2	6.9	27	93.1	29	
Less	11	7.1	144	92.2	155	0.969

Source: Primary Data 2017

people (65.2 %) . A person's level of education can influence the onset of hyperglycaemia. Someone who memil iki education levels grama h height usually tend to have knowledge and have gained more information anyway so that will make a person has a better awareness to be r like such a thing in terms of her health that will have an impact on behavior and lifestyle daily (11) .

Work

Based on **Table 1** dpat know that the work is divided into 3 groups namely Kyai / Nyai, Badal Kyai, and Ustadz / Ustadzah. The result of analysis shows that most of the respondents work as ustadz / ustadzah as many as 144 people (78.3%), respondents who work as Badal Kyai there are 27 people (14.7%) and who work as Kyai/Nyai there are 13 people (7.1%). The work is closely related to the incidence of hyperglycemia, because the work will affect the physical activity of a person. In this study the respondents studied were Kyai / Nyai, Badal Kyai, Ustadz / Ustadzah or teachers who have physical activity tend to be less because in one day part of the time was done to teach (13) .

Hyperglycemia

Table 1 showed that most respondents had hyperglycemia of 102 people (55.4 %), and respondents who had normal glucose level of 82 people (44.5%). This is in line with research conducted by Fuad (14) of 20 respondents who studied showed 18 people (90%) had blood glucose levels exceeded normal. Hyperglycemia is a medical condition in the form of elevated blood glucose levels that exceed the normal limit (1) .

Hyperglycemia is a sign of diabetes mellitus. According to *Internatinal Diabetes Federation* (15) the prevalence of diabetes mellitus in the world will continue to increase. This increase in prevalence can occur because at the present time most people in the world want all the practical things, not to mention also the intake and physical activity. They want without physical activity, everything is available by itself (4).

Physical Activity

Table 1 showed that most respondents do less physical activity as many as 155 people (84, 2%), and respondents were long enough for 1 week as many as 29 people (25.8%). This is in parallel

with Paramitha (16) study shows that most of the respondents have less physical activity level that is 89.8 % and only 5.1% of respondents have enough physical activity.

According to Danim (17) a person's profession also determines physical activity that is done everyday. In this case the respondents who studied the kyai and teachers who require daily physical activity to sit for hours and standing, then the physical activity that does tend to be only a little that can be classified into less.

Average Blood Glucose Levels by Physical Activity

Based on **Table 2** it can be seen that there is a difference in average blood glucose levels between physical activity is less with adequate physical activity of 3.127. There was no insignificant difference with p- *value* = 0.656 between blood glucose group group on physical activity with group of blood glucose level in less physical activity. This result is in line with the research laid out by Fathoni A, et al. (18) that there is no significant difference between groups in fasting blood glucose levels of physical activity and a group of short-term fasting blood glucose levels on a long-term activity.

Age relationship with hyperglycemia

Based on **Tabel 3** showed that respondents who menglami hyperglycemia aged ≥ 40 years as many as 7 people (21.9 %). Based on the statistical test by using *chi square* test between the variables of age with hyperglycemia variable significance value *p-value* = 0.000 (<0.05) which is a significant relationship between age and hyperglycemia, which means the bertambahnnya age it will be increasing the risk to experience hyperglycemia. This is in line with research conducted by Dianah (19) which shows that age is associated with diabetes mellitus in elderly in West Kalimantan Province with significance *value* p- *value* = 0.026. In the Dianah study (19) stated that the increased risk of diabetes mellitus is more noticeable at the age between 39 -49 years, this means in line with the results of this study that at age ≥ 40 years also experienced hyperglycemia.

Relationship Gender with Hyperglycemia

Based **on Table 3,** most of respondents who experienced male genital hyperglycemia were as many as 9 people (10.7 %). Based on the statistical test by using *chi square* test between the variables of sex with hyperglycemia variable significance value *p-value* = 0.077 (> 0.05) means that there is no relationship anatara sex with hyperglycemia. This is in line with research conducted by Dianah (19) which shows that there is no relationship between sex with diabetes mellitus in elderly in West Kalimantan Province with value of p- *value* = 1,000.

According to Arisandi (12) male sex has a risk of diabetes increases faster than women. In men there is concentration of fat concentrated around the abdomen that triggers central obesity. Central obesity is an example of dangerous body fat accumulation because adepocytes in this area are very efficient and more resistant to the effects of insulin than adepocytes in other regions. The increase in adipose tissue is usually followed by a state of insulin resistance. Insulin resistance is an early phase of insulin abnormality to clinically manifested diabetes mellitus.

Last Educational Relationship with Hyperglycemia

Based on **Table 3** respondents in this study who experienced hyperglycemia most of the last educated graduate of PT (Higher Education) as many as 9 people (17%). Based on the statistical test by using *chi square* test between the last educational variables with variable hyperglycemia significance value *p-value* = 0.010 (<0, 05) that there is a relationship between education last with hyperglycemia, which means that the lower the person's education, the higher the risk of experiencing hyperglycemia. This is in line with the results examined by Fikasari (20) which states that the higher a person's education the level of awareness of health will be higher too.

A person's education level also affects the profession or his job, the higher the education level of a person then the work he does requires only a little energy so that will make the activities he did also more light, conversely with someone who low level of education will tend to have jobs that

require large energy making a person doing enough physical activity to the weight (20).

Occupational Relations with Hyperglycemia

Based on **Table 3** most respondents in this study who experienced hyperglycemia profession as kyai / nyai that is as much as 6 people (46.2 %). Based on the statistical test by using *chi square* test between variables work with hyperglycemia variable significance value *p-value* = 0.000 (<0.05) that there is a relationship between job by hyperglycemia, which means that the higher the level of someone's job or position of the lower activities that do so that the higher the risk of experiencing hyperglycemia. This result is not in line with research conducted by Chandra *et al* (21) stated that work (PNS) is not related to blood glucose levels with p- *value* = 0.385.

Based on this research data obtained that if according to the type of work that is more at risk of hyperglycemia is kyai / nyai because the result is higher when compared with badal kyai, ustadz and ustadzah that is equal to 46.2 %. In this study physical activity performed by kyai / nyai included in the category less, because the value of physical activity 11 people from 13 people kyai / nyai under 1500 METs/day. Activities performed by kyai / nyai in boarding school every day that is teaching santri recite and only occasionally do homework, because from interview result most of kyai / nyai there are others who help in doing its job, this must make kyai / nyai not doing activities outside of teaching. Almost all respondents in this study always do nap. Not infrequently kyai/nyai who claimed never to exercise. This is in accordance with the research conducted by Purba (13) states that some of the activities undertaken by teachers other than teaching is doing household chores while for leisure time spent relaxing like watching tv and sleeping, and most respondents rarely exercise, so the activity physically most of them are low as much as 88.6%.

Relationship of Physical Activity to Hyperglycemia

Table 3 shows that respondents who have less physical activity and hyperglycemia as many as 11 people (7.1%), while respondents who have less physical activity and not hyperglycemia as many as 144 people (92.2%), respondents who have enough activity and hyperglycemia there are as many as 2 people (6.9%), and respondents who have enough physical activity and no hyperglycemia there are 29 people (93.1%). Based on the results of the *chi-square* statistical test between the variables of physical activity by hyperglycemia variable significance value *p-value* = 0.969 (> 0.05), which means there is no relationship between physical activity by hyperglycemia on clerics and teachers in boarding DIY.

These results may be influenced by other factors that may be risk factors for hyperglycemia such as heredity, more than normal nutritional status, and therefore more at risk for hyperglycemia than those with normal nutritional status (22), as well as dietary factors or dietary intake are also highly influential to the increase in a person's blood glucose levels (23).

The results of this study are in line with a study conducted by Fuad (14) with the title "The Relation of Physical Activity with Fasting Blood Sugar Levels in Type 2 Diabetes Mellitus Patients at Cilegon Municipal Hospital in 2013" which indicates that there is no significant relationship between physical activity and levels fasting blood sugar, or it can be concluded that there is no difference between respondents who have less physical activity experiencing hyperglycemia with respondents who have adequate physical activity but also have hyperglycemia.

This result contradicts the theory put forward by Hasdianah (11) that a person should have sufficient physical activity to help control weight. Blood glucose will be burned into energy, the body's cells will become more sensitive to insulin. Blood circulation will get better and the risk of type 2 diabetes mellitus will decrease by 50%. Physical activity plays an important role in regulating blood glucose levels. Patients with type 2 diabetes mellitus, impaired insulin production in the body, but there was still a lack of response to insulin receptors on cells (insulin resistance) so that insulin can not help transfer glucose into cells (24). When performing physical activity, the membrane permeability of glucose increases in the contracting muscle so that

insulin resistance decreases and insulin sensitivity increases. This will cause the need for insulin will be reduced, so that glucose levels in the body can be controlled.

CONCLUSIONS AND RECOMMENDATION

Most of the respondents were <40 years old (17.9%), more female respondents were 100 people (54.3%), most of the last educated respondents graduated from SMA / SMK namely 120 people (65.2%), and respondents mostly have job as Ustadz/Ustadzah that is 144 people (78.3%). Most of the respondents did not experience hyperglycemia as many as 171 people (92 , 9 %). Most respondents have less physical activity that is 155 people (84. 2 %). There was a proportion of blood glucose levels between the respondents who had less activity with the respondents who had enough activity, but the difference was not significant with the value of t = 0.446 and p- *value* = 0.656. There is a relationship between age , last education, and work with hyperglycemia in kyai and teachers in boarding school of DIY, but there is no relationship between sex with hyperglycemia in kyai and teacher at boarding school of DIY. There is no relationship between physical activity with hyperglycemia in kyai and teachers in boarding school DIY with p- *value* = 0.969.

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