Original Article

Abdominal Circumference and Blood Glucose Levels Among Farmers: A Cohort Retrospective Study of Non-Communicable Disease Program in Public Health Center of Jember Regency, Indonesia

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Abstract
Introduction & Purpose: Diabetic Mellitus (DM) is signed high level blood glucose that related abdominal obesity. Non communicable disease (NCDs) program have designed by Indonesian government to solve NCDs, including DM through screening and detection in public health centers (PHCs). The purpose of this study was to analyze the correlation between abdominal circumference and blood glucose levels among farmer PHCs of Jember, Indonesia.
Methods: A cohort retrospective study design was used to analyze secondary data of NCDs program on January to March 2020. This study was approved by the Ethical Committee of University of Jember with ethical clearance No.978/UN25.8/KEPK/DL/2020. Data including age, gender, abdominal circumference, and randomly blood glucose levels were collected to Healthy NCDs register in PHCs. The abdominal circumference was categorized into obese (male ≥90 cm and female ≥80 cm) and non-obese (male <90 cm and female <80 cm). Blood sugar levels was classified three categories (hyperglycemia ≥200 mg/dl, moderate= 145-199 mg/dl, and normal <145 mg/dl). The data was analyzed using Chi Square test (p<0.05).
Results: Among 35 of farmers, there was differenced abdominal circumference among male and female farmers (p= 0.019). The obesity regarding abdominal circumference indicators among farmers of male and female were 11.4% and 77%, respectively. The random blood glucose levels among farmers were mostly normal (65.7%). There was no relationship between abdominal circumference and blood glucose levels (p=0.380). However, there was significance difference between gender and abdominal circumference among farmers (X^2= 6.68; p= 0.019).
Conclusion: The abdominal circumference of farmers is not related blood sugar level, although the abdominal circumference is differenced by gender among farmers. Therefore, the abdominal circumference should be monitored regarding gender to prevent increased blood glucose among farmers.

Keywords: blood glucose, farmers, abdominal circumference; gender; non communicable disease.

Introduction

Non-communicable disease con63% mortality of all demise cases in the world, it's give a reason of Indonesian goverment to establised non-communicable disease program (NCDs) in Public Health Centers . NCDs program performance needed to decrease amount of non-communicable disease, that proven of high cases non-communicable disease like a diabetes (Astuti *et al*., 2016). Diabetes is an effect of high blood glucose that can influenced from several factor such as abnormality pancreas performance that affecting of insulin production, age, genetic, life style, bad food pattern, smooking and abdominal obesity (Kurniawaty and Yanita, 2016).

The Basic Health Research conducted by the Ministry of Health in 2018 showed 30.8% of people with age ≥15 have high blood glucose and 10.9% have a diabetes. Farmer is a most job Indonesian people but occupying in first of hiperglikemia categories (32.4%) and third of diabetic categories (12.6%) in Indonesia. Based on this data was showed that profession can influence of diabetes and high blood glucose incident (Kementerian Kesehatan RI, 2018). According to phisiological theroy the blood glucose can regulated by insulin hormone that produced of β pancreas, and can disturbed when decreasing insulin production and insulin resistance happen. Insulin resistance associated with abdominal obesity, which one condition of fat accumulation in abdomen (Soelistijo *et al*., 2015). Abdominal fat measurement is important for doing to prevent abdominal obesity and prevent the effect as an insulin resistance.

Abdominal obesity indicator can measure from abdominal circumference, and decidable abdominal obesity when of man was showed abdominal circumference ≥90 cm and women showed ≥80 cm (Adwinda and Srimiati, 2019). Based on metabolic syndrom criteria according to *International Diabetes Federation* (IDF), when a man was showed abdominal circumference ≥90 cm and women was showed ≥80 cm there is can effecting blood glucose ≥100 mg/dl (Rini, 2015). Abdominal obesity of farmers can influenced of high sugar and high fat food consumtion, and based on previous research who farmers working less than 5 days per week can increasing overweight risk (Susanto *et al*., 2017; Prasetyaningtyas and Nindya, 2018). Blood glucose increase can continuous being diabetes if not handled immediately.

Screening about risk factor of chronic disease as diabetes is important to conducted. NCDs program has screening program of non-communicable disease such as measurenment of blood pressure, body mass index, abdominal circumference and checking of random blood glucose, uric acid and cholestrol which can usefull to monitoring health condition (Kementerian Kesehatan RI, 2019). NCDs program services hopefully can prevent and decrease chronic disease.

Based on pre-research study in public health center of Jember at January-March 2019 showed 18.61% people had hyperglicemia with blood glucose >200 mg/dl, the composition of data is 21.81% at January, 27.21% at February, and 11.88% at March. The data shows amount of blood glucose level which refers to diabetes incident is high enough. Considered of the problem the purpose of this study was to analyze the correlation between abdominal circumference and blood glucose levels among farmer PHCs of Jember, Indonesia.

Methods

Design and participants: Cohort retrospective study design was used to analyze correlation between abdominal cicumference and blood glucose levels among farmers based on secondary data of NCDs program of Public Health Center of Jember during Januari-March 2020.

Researcher collecting data of age, gender, abdominal circumference for 3 consecutive months (January-March) and blood glucose levels at third month (March). Data were

screened based on inclusion and exclusion criteria, and the results were 35 samples. The inclusion criteria for this study were farmer aged 15-59 years, having data of abdominal circumference and blood glucose levels in their NCDs registered card. The exclusion criteria were farmer haven't data related to age, age more than 59 years and below 15 years, haven't blood glucose levels data at March 2020, and haven't abdominal circumference data during January until March 2020 in their NCDs registered card.

Instruments:

NCDs registered card (KMS) was used to collect data of characteristics sample, abdominal circumference, and blood glucose level. NCDs registered card classified the abdominal circumference into 2 categories there is obese (male ≥90 cm and female ≥80 cm) and non-obese (male <90 cm and female <80 cm). Blood glucose levels was classified three categories (hyperglycemia ≥200 mg/dl, moderate= 145-199 mg/dl, and normal <145 mg/dl). This research merge the blood glucose level classification into 2 categories that is "normal" and "hyperglicemia", normal categories equal normal categories and hyperglicemia categories equal moderate and hyperglicemia categories.

Data collection: For collection the data, firstly researcher propose permit letter to the Faculty of Nursing University of Jember, Unity and Politic corporation of Jember goverment (Bakesbangpol), and Health corporation of Jember goverment. After get accepted to do a research, researcher visiting Public Health Centers to meet a chief of NCDs program.

Ethical consideration: The study was approved by the Ethical Committee Review Board of Indonesia of the Faculty of Dentistry, University of Jember No.978/UN25.8/KEPK/DL/2020.

Data analyses: Data analysis was performed using IBM SPSS Statistics 24 software. For univariat test was presented with frequenced and percentage for categorical data, then for numerical data was presented in mean and standard deviation. For bivariat test was used Chi square test to analyze the correlation between abdominal circumference and blood glucose levels with number significance is $p < 0.05$ and Independent T test was used to analyze between age and both of abdominal circumference and blood glucose level.

Research Flow: The research screening can be seen in the chart below :

Results

Based on Table 1, the mean of age in participant was 47 years old. Most of the gender of participant were female (88.6%).

The data shows that most of NCDs program visitor is female.

Table 2 describe that most of participant data was showed had a bad abdominal circumference (80%). The women has more bad abdominal circumference (77%) than good abdominal circumference (11.4%). Opposite of the women results, the man data was showed good abdominal circumference (8.6%) more than bad abdominal circumference (2.9%). The number of significance was showed correlation between abdominal circumference and gender (p=0.019), and no correlation between abdominal circumference and age (p=0.138). Based on Table 3. Most of NCDs program participant had a normal blood glucose levels (65.7%). The number of significance was showed no correlation between age and blood glucose levels (p=0.797), and no correlation between gender and blood glucose levels (p=1.00).

Table 4 shows that was not correlation of abdominal circumference and blood glucose levels among farmer in NCDs program in PHCs of Jember (p=0.380).
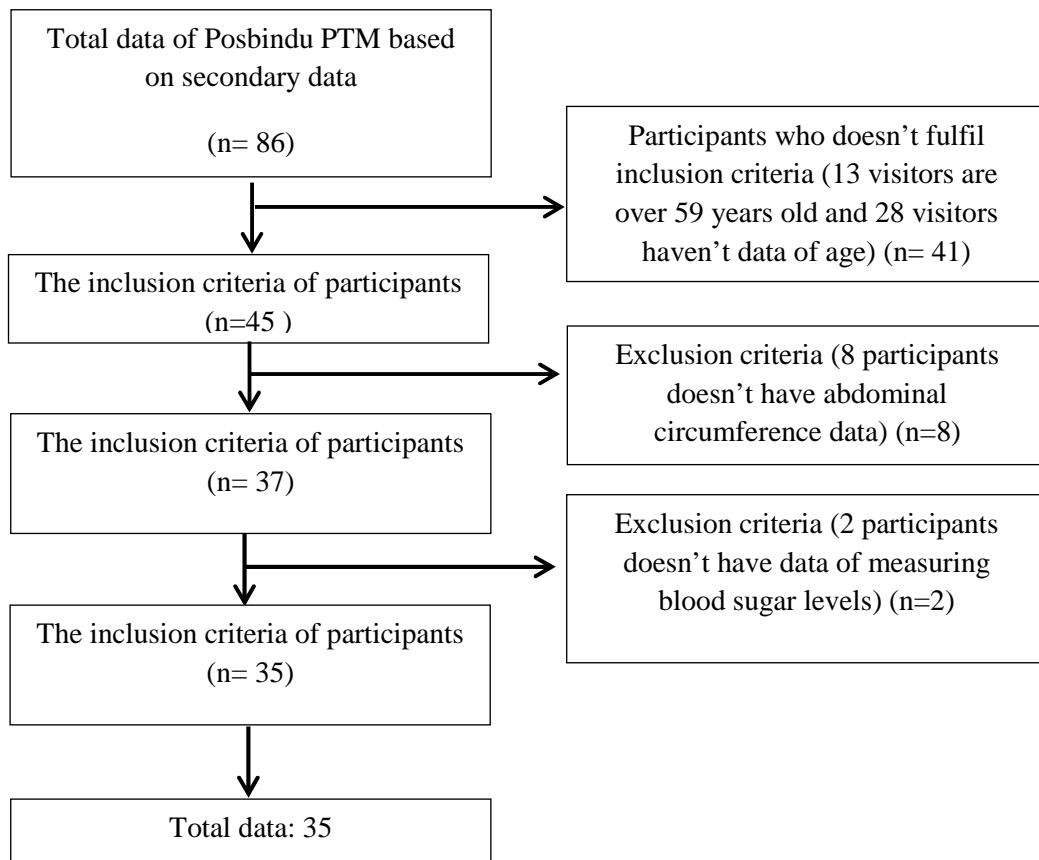
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┌───────────────────────────────┐
│ Total data of Posbindu PTM     │
│ based on secondary data        │
│                                │
│         (n= 86)                │
└───────────────────────────────┘
            │
            │          ┌────────────────────────────────┐
            │──────────▶│ Participants who doesn't fulfil │
            │          │ inclusion criteria (13 visitors │
            ▼          │ are over 59 years old and 28    │
┌───────────────────────────────┐│ visitors haven't data of age)  │
│ The inclusion criteria of      ││ (n= 41)                        │
│ participants                   │└────────────────────────────────┘
│         (n=45 )                │
└───────────────────────────────┘
            │          ┌────────────────────────────────┐
            │──────────▶│ Exclusion criteria (8           │
            │          │ participants doesn't have       │
            ▼          │ abdominal circumference data)   │
┌───────────────────────────────┐│ (n=8)                          │
│ The inclusion criteria of      │└────────────────────────────────┘
│ participants                   │
│         (n= 37)                │
└───────────────────────────────┘
            │          ┌────────────────────────────────┐
            │──────────▶│ Exclusion criteria (2           │
            │          │ participants doesn't have data  │
            ▼          │ of measuring blood sugar        │
┌───────────────────────────────┐│ levels) (n=2)                  │
│ The inclusion criteria of      │└────────────────────────────────┘
│ participants                   │
│         (n= 35)                │
└───────────────────────────────┘
            │
            ▼
┌───────────────────────────────┐
│ Total data: 35                 │
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Figure 1. Sample Screening

Table 1. Characteristics of Participants in NCDs Program of Sukorejo Public Health Centre, Jember Regency.

Farmer Characteristic		Farmer Data
Age		
	Mean ± *SD*	47.29±7.35
Gender		
	Female	31 (88.6%)
	Male	4 (11.4%)

Table 2. Data of Abdominal Circumference based on Age and Gender

		Abdominal Circumference		*p value*
		Male≥90 cm, Female≥80 cm	Male<90 cm, Female<80 cm	
Age	Mean ± *SD*			
	47.29±7.35	28 (80%)	7 (20%)	0.138
Gender	**n (%)**			
	Male	3 (8.6%)	1 (2.9%)	0.019
	Female	20 (57.1%)	11 (31.4%)	
Total		28 (80%)	7 (20%)	

Table 3. Data of Blood Glucose Levels based on Age and Gender

		Blood Glucose Levels		*p value*
		Normal	Hyperglicemia	
Age	Mean ± *SD*			
	47.29±7.355	23 (65.7%)	12 (34.3%)	0.797
Gender	**n (%)**			
	Male	3 (8.6%)	1 (2.9%)	1.00
	Female	20 (57.1%)	11 (31.4%)	
Total		23 (65.7%)	12 (34.3%)	

Table 4. Correlation Between Abdominal Circumference and Blood Glucose Levels

	Blood Glucose Levels		p value
	Hyperglicemia	Normal	
Abdominal circumference			
Male≥90 cm, Female≥80 cm	11 (31.4%)	17 (48.6%)	0.380
Male<90 cm, Female<80 cm	1 (2.9%)	6 (17.1%)	

Discussion

A lot of diabetes and high blood glucose levels incident of farmer in Indonesia occupying in first high blood glucose levels categories and third diabetes categories (Kementerian Kesehatan RI, 2018). Special attention for farmer needed to decereasing amount of diabetes incident which could have an impact of farmers productivity.

The blood glucose levels data of this research showed that participant mostly had a normal random blood glucose measurenment (65.71%). The result probability affected by physical activity participant which has profession as farmer, this is related to previous research was showed correlation of physical activity and blood glucose level (Nababan *et al*., 2020). Good activitiy can increasing frequence of muscle contraction to triggering insertion of *Glucose Transporter* - 4 (GLUT-4) in the active muscle plasma membrane, although haven't insulin. Most GLUT-4 exist in the muscles and fat tissues as most glucose absorber tissue (Lisiswanti and Cordita, 2016).

All of hyperglicemia incident from this research is small according to statistics measurement, but according to clinical considerantion this is much enough, there is 12 from 35 participant had hyperglicemia that is equal 1 from 3 participant had hyperglicemia. The meaningful of clinical number supported by effect of hyperglicemia when develop into diabetes. People with diabetes have a risk of cardiovascular disease 2-4 times more than their haven't. A risk to have an hypertension and dislipidemia of people with diabetes is more than to normal people. The effect of diabetes need a dynamic modality therapy and certainly requires a cost (Decroli, 2019).

The factor can affecting blood glucose level which one is central obesity that can measured by abdominal circumference. The data of abdominal circumference in this research showed that mostly of farmer has a bad abdominal circumference (M≥90 cm, F≥80 cm) that is 80%. Most of the incident number maybe affected from domination of female participant (88.6%). The result of this research also shows significance correlation between abdominal circumference with gender (p=0.019). A lot of the number of abdominal circumference in female farmers can be affected by workload or their activity.

Previous research shows correlation between physical activity and central obesity incident (Gusnilawati and Septiyanti, 2018). Diverification of female farmer activity and male farmer activity supported by previous research in Majene regency, and showed based on time work the male farmer work (60%) longer than female farmer (20%), and the rest showed equal time to work (20%) (Ratmayani *et al*., 2018). Female participant also affected by menopause period when the women have 45 years or more, that can effecting of changes in hormone and caused

increasing body fat distribution (Nugroho *et al.*, 2019).

Correlation between abdominal circumference and blood sugar level among farmers participating in NCDs Program of this research is not significance. The results of this study are in line with previous studies among college student that abdominal circumference and blood sugar level haven't significance correlation (Wijaya *et al.*, 2019), but opposite with the research among aldolescent that abdominal circumference and blood sugar level have significance correlation (Perwitasari *et al.*, 2017). The different result maybe affected with various characteristic of population, so many factor can be affecting. Population characteristic such as diet pattern, physical activity, and life style haven't contain in this research was needed to considered (Wijaya *et al.*, 2019).

This study has limitations because the participant of NCDs program was not consecutive to visiting NCDs program, there is give an effect of most participant data that should be eliminated by inclusion and exclusion criteria. Small sample decreasing variation of data. Uncompleted the data also can give effect of small variabel to researched and give limited interpretation. Based on this assumption, suggested to the next researcher was used primery data that participant can follow up by researcher and get more sample with completed data.

Source of the data in this research was used NCDs registered card which the characteristics of the participant was noted in general, that is make researcher cannot knowing the specific characteristics participant as farmer. The next researcher suggested to used specific quisionere to assessment the another factors that can related with farmer, maybe can affecting the abdominal circumference and blood sugar level among farmer.

Conclusion: There is no correlation of abdominal circumference and blood sugar levels among farmers. The result indicated that central obesity is not the main factor of diabetic and other factors of diabetic can influence each other. However, there is significance differenced between gender and abdominal circumference among farmers. Therefore, regarding the gender make important to monitored the abdominal circumference to prevent central obesity.

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Appendix 1. KMS Questionnaire