KORESPONDENSI ARTIKEL

Judul   :Screening of Diabetes Mellitus and Physical Activity Analysis: A Stepwise WHO Approach
Penulis : Zata Ismah, et al

Jurnal   : Unnes Journal Of Public Health

Indeks   : Scopus

Link   :https://journal.unnes.ac.id/sju/ujph/issue/view/2164
         Or

         https://www.scopus.com/record/display.uri?eid=2-s2.0-
         85159602184&origin=inward&txGid=38eec18d9df4c180ba94b518784107d4

Scopus Preview   Q   ≡

Document details - Screening of Diabetes Mellitus and Physical Activity Analysis: A Stepwise WHO Approach

1 of 1
Export   Download   More... >

Unnes Journal of Public Health
Volume 11, Issue 2, 25 July 2022, Pages 116-124

Cited by 0 documents

Screening of Diabetes Mellitus and Physical Activity Analysis: A Stepwise WHO Approach(Article)(Open Access)

Ismah, Z.,   Nst, C.C.,   Wahidah,   Novita, E.,   Susanti, N.

aPublic Health Faculty of State Islamic, University of North Sumatra, Indonesia
bMedical Faculty of Sriwijaya University, Indonesia

Inform me when this document is cited in Scopus:

Set citation alert >   Set citation feed >

Related documents

Find more related documents in Scopus based on:

Daftar Isi :

M Gmail

Zata Ismah <zataismah@gmail.com>

[UJPH] Submission Acknowledgement
1 pesan

Arum Siwiendrayanti <journal@mail.unnes.ac.id>
Kepada: zata ismah <zataismah@gmail.com>

7 Januari 2021 pukul 04.21

zata ismah:

Thank you for submitting the manuscript, "The" to Unnes Journal of Public Health. With the online journal management system that we are using, you will be able to track its progress through the editorial process by logging in to the journal web site:

Manuscript URL: https://journal.unnes.ac.id/sju/index.php/ujph/authorDashboard/submission/43809
Username: zata

If you have any questions, please contact me. Thank you for considering this journal as a venue for your work.

Arum Siwiendrayanti

---

journal.unnes.ac.id/sju/ujph/authorDashboard/submission/43809

| Unnes Journal of Public Health ▾ | Tasks **0** | | English | View Site | zata |

UNNES Journal of Public Health

Submissions

Submission Library   View Metadata

Screening of Diabetes Mellitus and Physical Activity Analysis: A Stepwise WHO Approach
Zata Ismah, Citra Cahyati Nst, Wahidah Wahidah

| **Submission** | **Review** | **Copyediting** | **Production** |

Submission Files
🔍 Search

▸ 📄 115252-1   zata, Sub English_Rev.1_Artikel Lanjutan Japan.rtf   Article Text

Download All Files

Pre-Review Discussions
Add discussion

Name	From	Last Reply	Replies	Closed
		No Items		

2

Screening of Diabetes Mellitus and Physical Activity Analysis : a Stepwise WHO Approach

Article Info

Abstract

Abstract : By 2030 it is predicted that there will be 52 million deaths per year due to NCD, an increase of 9 million from 38 million people today. The purpose of this research was to describe the risk factors for NCD in Medan using the stepwise WHO. This research method is a quantitative method with a cross-sectional design. Univariate and Bivariate analysis using the *Chi Square* test were carried out in this research. 799 participants were recruited using accidental sampling technique. The place of this research was conducted in Medan City, North Sumatra Province. The results of this research indicate that age 55-59 years, last elementary school education, work as an entrepreneur and not eating vegetables are risk factors for diabetes mellitus in this research. It is suggested that local health workers provide health education through outreach to the community, especially the people of Medan City, on how to reduce the risk of increased blood sugar or diabetes mellitus incidence. In addition, participants or the community are expected to be able to maintain a good diet, namely by implementing balanced nutrition, especially paying attention to adequate vegetable consumption.

Keywords : NCD, Stepwise WHO, Diabetes Melitus.

□ Copartisipance Address:
Medan, Indonesia
E-mail: zataismah@uinsu.ac.id

INTRODUCTION

The total number in 2030 is estimated that there are 52 million deaths each year due to Non-Communicable Diseases. A rise of 9 million from 38 million today. In middle and poor countries Non-Communicable Diseases will be responsible for three times and five times the death of infectious, maternal, perinatal diseases as well as nutrition problems (WHO, 2011). WHO estimates that, globally 422 million adults aged over 18 years lived with diabetes in 2014. The largest number of people with diabetes is estimated to come from Southeast Asia and the Western Pacific, accounting for about half the cases of diabetes in the world. Worldwide, the number of diabetics has increased substantially between 1980 and 2014, increasing from 108 million to 422 million or about four times as much (WHO, 2014).

WHO estimates that in 2030 the number of sufferers of Diabetes Mellitus in Japan will increase from 2000, which is ranked 5th with 6.8 million sufferers, while in 2030 it is ranked 8th out of 10 countries with the largest Diabetes Mellitus with 8.9 million patients, (WHO, 2018). Diabetes in Southeast Asia in 2014 there were 96 million adults with Diabetes in 11 member countries in the Southeast Asia region. The prevalence of diabetes among adults in the Southeast Asian region increased from 4.1% in the 1980s to 8.6% in 2014 (WHO, 2014). Diabetes caused 1.5 million deaths in 2012. Blood sugar higher than the maximum limit resulted in an additional 2.2 million deaths, by increasing the risk of cardiovascular and other diseases. Forty-three percent (43%) of these 3.7 million deaths occurred before the age of 70 years. The percentage of deaths due to diabetes that occurs before the age of 70 is higher in low and middle income countries than in high income countries (WHO, 2016).

The incidence of diabetes in the world in 2015, there were 415 million adults from countries: North America, the Caribbean, South and Middle America, Africa, the Middle East, North Africa, the Western Pacific, Europe diabetes increased 4-fold from 108 million in 1980s. By 2040 it is estimated that the number will be 642 million (IDF Atlas 2015). Nearly 80% of people with diabetes are in low and middle income countries. In 2015, the percentage of adults with diabetes was 8.5% (1 out of 11 adults with Diabetes) (WHO, 2015). The Stepwise data functions among others, as information, the new NCD risk factor finder and a reference for the government for future state-level NCD countermeasures. In addition, the benefits of using Stepwise each country can have robust data on NCD risk factors and can be used as a government program in overcoming priority NCD in the last 15 years, for example Togo, Benin, Mauritania and Cabo Verde (Riley, 2016).

In 2015, Indonesia ranked seventh in the world for the highest prevalence of Diabetes along with China, India, the United States, Brazil, Russia and Mexico with an estimated number of people with diabetes of 10 million people (IDF Atlas 2015). WHO estimates that in 2030 the number of sufferers of Diabetes Mellitus in Indonesia will be ranked 4th same like in 2000 but with the number of sufferers increasing from 8.4 million in 2000 to 21.3 million in 2030 among the 10 largest countries with diabetes mellitus (WHO, 2016). Diabetes with complicated deaths (6.7%) is the third highest cause of death in Indonesia (SRS, 2014). The percentage of deaths due to Diabetes in Indonesia is the second highest after Sri Lanka, the prevalence of Diabetics in Indonesia shows an increase from 5.7% in 2007 to 6.9% in 2016 (Riskesdas, 2016). The prevalence of diabetes mellitus in North Sumatera has increased from 2013 (1.3%) to (1.5%) in 2018 (Ministry of Health, 2018).

Looking at the data above, it is clear that Diabetes Mellitus has an impact on the quality of resources as well as a large increase in health costs, because of it, it is necessary to control Diabetes Mellitus, one of which is to reduce the risk factors for diabetes (Ministry of Health, 2015). Therefore, this research aims to determine the risk factors for diabetes mellitus in one of the cities in North Sumatra Province, namely Medan City.

METHOD

The method in this research is a quantitative method with cross-sectional design. The analysis in this research is descriptive analysis with frequency distribution and central distribution. A total of 799 people were selected and invited to participate in this research. The sampling technique in the research used accidental sampling. The research site was conducted in Medan, North Sumatra. When the research is in 2019. The method of data collection is carried out in this research, namely using primary data collected and processed by the researcher directly from the subject and the object of research. Research instruments using the Stepwise WHO questionnaire. Measurement of research instruments using the WHO stepwise questionnaire and direct measurements namely: measurement of height using the Stature Meter (stadiometer), weight measurement using scales, measuring cholesterol levels using cholesterol check tool, measurement of blood sugar levels with blood sugar check tool, blood pressure measurements with a

Spigmomanometer with a cuff type on the upper arm. Univariate analysis was carried out in this research to describe the distribution and frequency of each variable. Furthermore, bivariate analysis was also carried out in this research to see the risk factors for diabetes mellitus using the *Chi Square* test.

RESULT

Table 1. Risk Factors for Diabetes Mellitus Incidence Based on the Demographic Characteristics

Variable	n	Glucose		Sig	PR	95% CI of OR	
		High	Normal			lower	Upper
Gender							
Man	358 (44.8%)	77 (21.5%)	281 (78.5%)	0.286	0.870	0.673	1.124
Woman	441 (55.2%)	109 (24.7%)	332 (75.3%)				
Age (years)							
60-64	53 (6.6%)	17 (32.1%)	36 (67.9%)	0.001	6.768	2.339	10.342
55-59	76 (9.5%)	27 (35.5%)	49 (64.5%)	0.001	7.897	2.704	10.975
50-54	160 (20%)	49 (30.6%)	111 (69.4%)	0.001	6.327	2.395	9.207
45-49	100 (12.5%)	24 (24.0%)	76 (76%)	0.001	4.526	1.788	7.572
40-44	119 (14.9%)	30 (25.2%)	89 (74.8%)	0.001	4.831	1.913	7.811
35-39	79 (9.9%)	15 (19.0%)	64 (81.0%)	0.005	3.359	1.336	6.343
30-34	74 (9.3%)	15 (20.3%)	59 (79.7%)	0.003	3.644	1.430	6.758
25-29	138 (17.3%)	9 (6.5%)	129 (93.5%)	reference	reference	reference	reference
Last Education							
No education	2 (0.3%)	0 (0%)	2 (100%)	0.481	0	1.177	1.325
Primary School	63 (7.9%)	26 (41.27%)	37 (58.73%)	0.001	3.727	1.578	5.053
Junior High School	79 (9.9%)	19 (24.05%)	60 (75.95%)	0.426	8,270	0.764	1.907
Senior High School	379 (47.4%)	86 (22.69%)	293 (77.31%)	0.395	8,923	0.843	1.538
College	276 (34.5%)	55 (19.93%)	21 (80.07%)	reference	reference	reference	reference
Occupation							
Housewife	236 (29.5%)	58 (24.6%)	178 (75.4%)	0.093	0.944	0.387	1.043
Self-employment	261 (32.7%)	62 (23.8%)	199 (76.2%)	0.070	0.987	0.375	1.005
Government Officials	170 (21.3%)	40 (23.5%)	130 (76.5%)	reference	reference	reference	reference
Non Government Officials	71 (8.9%)	8 (11.3%)	63 (88.7%)	0.076	2.423	0.362	1.022
Private employees	30 (3.8%)	6 (20%)	24 (80%)	0.001	1.231	0.547	2.529

Variable	n	Glucose		Sig	PR	95% CI of OR	
		High	Normal			lower	Upper
Unemployment	31 (3.9%)	12 (38.7%)	19 (61.3%)	0.109	0.487	0.223	1.199

Based on table 1, it is known that the sex distribution of all participants shows that the majority of the participants' gender are women as many as 441 (55.2%) with a significance value of 0.286; PR: 0.870 and CI: 0.673-1.124. Age distribution shows the majority of participants aged are 50-54 years, as many as 160 participants (20%) with a significance value of 0.001; PR: 6,327 and CI: 2,395-10,975. The 55-59 age category was the age category that had the highest PR value, namely 7,897 with a significance value of 0.001 and CI: 2,704-10,975. Furthermore, the distribution of the latest education shows that the majority of participants have the latest education at the high school level, namely 379 participants (47.4%) with a significance value of 0.395; PR: 8,923 and CI: 0.843-1,538. Participants who had the latest education at the elementary level had a relationship with the risk of diabetes mellitus with a significance value of 0.001, PR: 3.727 and CI: 1.578-5.053. The majority of the participants worked as entrepreneurs, namely 261 participants (32.7%) with a significance value of 0.070; PR: 0.987 and CI: 0.375-1.005. Participants who work as private employees have a relationship with the risk of diabetes mellitus with a significance value of 0.001, PR: 1.230 and CI: 0.132-0.641.

Table 2. Risk Factors for Diabetes Mellitus Based on the physical activity of the participants

Variable	n	Glucose		Sig	PR	95% CI of PR	
		High	Normal			lower	Upper
High Intensity Physical Activity in The Workplace							
Ya	40 (5%)	0 (0.0%)	40 (100%)				
Tidak	759 (95%)	112 (14.7%)	647 (85.3%)	0.355	1.173	1.079	1.275
Moderate intensity physical activity in The Workplace							
Ya	224 (28%)	16 (2%)	248 (31%)	0.108	0.338	0.180	1.425
Tidak	575 (72%)	96 (12%)	439 (55%)				
High intensity exercise							
Ya	40 (5%)	0 (0.0%)	40 (100%)				
Tidak	759 (95%)	112 (14.7%)	647 (85.3%)	0.355	0.853	0.777	0.918
Moderate exercise intensity							
Ya	28	16 (88.9%)	2 (11.1%)	0.663	0.947	0.136	3.237
Tidak	72	69 (84.1%)	13 (15.9%)				
Cycling							
Ya	343 (43%)	32 (9.3%)	311 (90.7%)				
Tidak	456 (57%)	80 (17.5%)	376 (82.5%)	0.240	1.886	0.640	8.069

6

Based on table 2, it is known that the distribution of participants who did not do High Intensity Physical activity in the workplace was 759 participants (95%) with a significance value of 0.355; PR: 1,173 and CI: 1,079-1,275. The distribution of participants who did not do moderate intensity physical activity at work was 575 participants (72%) with a significance value of 0.3338; PR: 1.108 and CI: 0.180-1.425. The distribution of participants who did not do high intensity sports was as many as 759 participants (95%) with a significance value of 0.355; PR: 0.853 and CI: 1.777-1918. Then, the distribution of participants who did not do moderate intensity exercise was 456 participants (57%) with a significance value of 0.663; PR: 0.947 and CI: 0.136-3.237. The distribution of participants who did not exercise cycling was 456 participants (72%) with a significance value of 0.355; PR: 1.886 and CI: 0.640-8.069.

Tabel 3. Risk Factors for Diabetes Mellitus Based on the physical Behavioral of the participants

Variable	N	Glucosa		Sig	PR	95% CI of PR	
		High	Normal			Lower	Upper
Smoking							
Yes	237 (29.7%)	57 (24.1%)	180 (75.9%)	0.738	1.048	0.798	1376
No	562 (70.3%)	129(22,9%)	433(77,04%)				
Fruit consumption a day (portion)							
Do not consume	30 (3,75%)	5 (16.7%)	25 (83.3%)	0,331	0.611	0.296	1.547
1	153 (19,14%)	30(19,60%)	123 (80,39%)	0,236	0.746	0.543	1.167
2	187 (23,4%)	44 (23,52%)	143 (76,47%)	0.786	3.130	0.686	1.331
3	157 (19.64%)	40 (25,47%)	117(74,52%)	0.845	1.229	0.737	1.451
≥4	272 (34,04%)	67 (24,63%)	205 (75,36%)	Reference	Reference	Reference	Reference
Consumption of vegetables a day (portion)							
Do not consume	61 (7,63%)	37(60,65%)	24(39,34%)	0,000	6.294	2.383	3.989
1	31 (3,87%)	10(33,5%)	21(67,74%)	0.089	1.944	0.961	2.798
2	38(4,75%)	8(21,05%)	30 (78,94%)	0.836	1.088	0.566	2.021
3	54(6,75%)	10 (18,51%)	44(81,48%)	0.837	0.927	0.526	1.684
≥4	615(76,97%)	121 (19,67%)	494 (80,32%)	Reference	Reference	Reference	Reference

Based on table 3, it is known that 29.7% of all participants were active smokers with a significance value of 0.738; PR 1.048 and CI: 0.798-1.376. The distribution of alcohol consumption showed that only 4.5% of all participants consumed alcohol with a significance value of 0.001; PR 0.466 and CI: 0.183-1.184. A total of 30 participants did not eat fruit, 5 of which experienced high blood sugar with a significance value; 0.331 PR 0.611 and CI: 0.296-1.547. 61 participants who did not consume vegetables, including 37 people experiencing high blood sugar with a significance value of 0.000; PR = 6,294 and CI: 2,383-3,989.

Tabel 3. Diabetes Mellitus Risk Factors Based on Biochemical Measurements

Variable	N	Glucose		Sig	PR	95% CI of PR	
		High	Normal			Lower	Upper
IMT							

Variable	N	Glucose		Sig	PR	95% CI of PR	
		High	Normal			Lower	Upper
Normal	272 (34,04%)	46 (16,91)	226 (83.08%)	Refrence	Reference	Reference	Reference
Under weight	31 (3.87%)	6 (19,35%)	25 (80,64%)	0,732	1.179	0,532	2,460
Over Weight	85 (10.63%)	17 (20%)	68 (80%)	0,514	2.197	0,717	1,950
Obesity	411 (51.43%)	117 (28,46)	294(71,53%)	0,001	1.955	1,241	2,283

8

Based on table 3. It is known that 51.4% were obese, where as many as 117 participants (62.9%) of them had high blood sugar levels with a significance value of 0.001; PR 1.955 and CI: 1.241-2,283. This measurement of high blood sugar levels refers to the theory of the Indonesian Ministry of Health which states that high blood sugar levels are> 140 mg/dl.

DISCUSION

Risk Factors for Diabetes Mellitus Based on Demographic Characteristics

a. Age

The results of this research indicate that the age of 55-59 years has a significant relationship with the incidence of diabetes mellitus with a significance value of 0.00, where 27 (35.5%) participants who are in this age category have high blood sugar levels. At the age of 55-59 years, a person will be 7,897 times more likely to suffer from diabetes mellitus. This is in line with Isnaini's research (2018) which showed that age ≥ 45 years has a significant relationship with the incidence of type 2 diabetes mellitus (p value = 0.010; OR: 0.312 and CI: 0.126-0.770). Age causes a decrease in all body systems, including endocrine, where this causes insulin to be in a state of resistance so that blood sugar becomes unstable (Isnaini, 2018). In addition, the older a person is, there will be a decrease in mitochondrial activity in muscle cells by 35%, where this decrease will cause an increase in fat levels in muscle by 30% and lead to insulin resistance (Sari, 2019). 40 years generally do not realize that he has diabetes mellitus (Susanti, 2018).

b. Gender

The majority of the population who suffer from diabetes is female (Nabyl, 2012). This is usually related to an increase in waist circumference in women as they age where in the Willer's research (2016) which used a combined analysis of a prospective population-based cohort research it was reported that 31% of women in Germany who experienced a 1 cm increase in waist circumference were at risk of developing diabetes mellitus type 2. Whereas the risk of type 2 diabetes mellitus in men increased by 34% each year due to an increase of 1 kg body weight. However, in this research, it was found that gender had no relationship with the incidence of diabetes mellitus with a significance value of 0.286; pr: 0.870; CI: 0.673-1.124 This is inversely proportional to research conducted by Isnaini (2018) which shows that the gender variable has a significant relationship to the incidence of type 2 diabetes mellitus (p value = 0.063; OR: 2.184 and CI: 0.952-5.011).

c. Education

The results of this research indicate that participants who have the latest education at the SD level have a relationship with the risk of diabetes mellitus with a significance value of 0.001, PR: 3.727 and CI: 1.578-5.053. This means that people who have last elementary education will be 3,727 times more likely to suffer from diabetes mellitus. In this research it can be seen in Table 1 that as many as 26 (41.27%) participants in the last elementary education category had diabetes mellitus. This research is in line with Isnaini's research (2018) that low education has a significant relationship to the incidence of type 2 diabetes mellitus (p value = 0.007; OR: 0.272 and CI: 0.103-0.721). Education is related to health knowledge that a person has (Notoadmojo, 2010). With health knowledge, people will have awareness in maintaining their health (Sari, 2019).

Research conducted by Yosmar (2018) also showed the same thing as the results of this research, namely that there is a relationship (p value = 0.000) of the level of education to the risk of the incidence of type 2 diabetes mellitus, but in this research it was reported that level of high school education or the equivalent have the greatest risk for the incidence of type 2 diabetes mellitus. When a person has low education, their knowledge of health will be low so that it increases the risk of diabetes mellitus (Notoadmojo, 2010).

d. Occupation

Type of occupation is also closely related to the incidence of Diabetes mellitus, where a person's occupation affects a person's level of physical activity (Sari, 2019). This research shows the results that work as an entrepreneur has a relationship with the incidence of diabetes mellitus with a significance value of 0.001,

PR: 1.230 and CI: 0.132-0.641. This means that people who work as entrepreneurs have a risk of 1,230 times higher than people who do not work as entrepreneurs. In the occupation category as entrepreneurs, as many as 6 participants (20%) who suffer from diabetes mellitus. This may occur because of being busy at work causing a person's eating frequency to be irregular and eating out of control (Sukmaningsih, 2016).

Risk Factors for Diabetes Mellitus Based on Physical Activity

Physical activity is the movement of limbs that produces simple energy which is very important for the body, spirit and the quality of a healthy lifestyle (Sherly, 2015), besides that physical activity is also a major determinant of energy expenditure so it is important for energy balance and weight control. Based on Riskesdas 2018 data, non-communicable diseases were caused by the proportion of less physical activity of 35.5%. Inadequate physical activity is one of the ten main risk factors for global death (The Indonesian Ministry of Health, 2018).

Physical activity can control blood sugar in the body. Glucose will be converted into energy during physical activities. In people who rarely do physical activity such as exercising, all the food substances that enter the body will not be burned, but stored in the body as fat and sugar. If the insulin in the body is not enough to convert glucose into energy, it can cause diabetes mellitus (Agusti, 2017). Isnaini's research (2018) states that diabetes mellitus occurs due to several risk factors, namely lack of physical activity, genetic factors, unhealthy lifestyles, and smoking behavior. This was also reported in Riskesdas 2018 that people who do not do physical activity (20-30%) are more at risk of contracting non-communicable diseases and even causing death (The Indonesian Ministry of Health, 2018).

The physical activity variables in this research were categorized into 5, namely physical activity in the workplace with high, moderate intensity, cycling physical activity, high intensity sports and moderate intensity sports. This research shows that there is no significant relationship between the participants' physical activity and the incidence of diabetes mellitus. That is, physical activity is not a risk factor for diabetes mellitus. This is in line with Yosmar's research (2018) which reported that age has a close relationship with an increase in blood sugar, meaning that the older you get, the risk of experiencing type 2 diabetes is higher. However, this is not in line with the research. This is inversely proportional to the results of Adriani's research (2017) which showed that there was a relationship between physical activity and fasting blood sugar levels of participants with type 2 Diabetes Mellitus with p value = 0.000.

Risk Factors for Diabetes Mellitus Based on the physical Behavioral of the participants

a. **Smoking**

Research in Medan shows that the percentage of smokers is 29.7% of the total participants. This research obtained a PR value of 1,048, meaning that participants who actively smoke will experience a greater risk of 1,048 suffering from diabetes than those who did not smoke. Based on SURKERNAS data in 2016, the national smoking prevalence was 28.5%, the smoking prevalence according to male sex was 59%, and female smoking was 1.6%. Based on the age group, at the age of 40-49 the highest prevalence was 39.5%, while for novice smokers <18 years, it was 8.8% (The Indonesian Ministry of Health, 2017).

Furthermore, the results of Septyarani's research (2015) entitled Risk Factor Survey for Non-Communicable Diseases in Rembang Regency showed that male smokers were 72.40% (Septyarani, 2015). Smoking is one of the risk factors for non-communicable diseases and acts as the biggest contributor compared to other risk factors. Someone who consumes cigarettes a day has a 2 to 4 times risk of developing coronary heart disease, the risk of lung cancer and other PTM (The Indonesian Ministry of Health, 2017).

Cigarettes are also very closely related to the risk factors for Diabetes Mellitus because based on information in the field there are 6 participants who have high blood sugar with blood sugar levels of > 130 mg / dl who are active smokers. Thus it can be said that 6 participants werw at risk of developing Diabetes Mellitus. This is in line with other researchs which showed that smoking is also a risk factor for high blood sugar levels which can lead to Diabetes Mellitus. When smoking, the blood vessels will constrict due to the substances contained in cigarettes. In addition, it can also increase insulin resistance which causes the body to not produce

insulin properly (Wati, 2010). To prevent the risk of non-communicable diseases, smokers can do several things by reducing their daily cigarette consumption, or by forcing themselves to quit smoking (Gultom, 2017).

b. Consumption of Fruits and Vegetables

Research in Medan City shows that 3.75% of all participants do not eat fruit every week, meaning that most participants generally eat fruit. This research also shows that only 7.63% of all participants do not eat vegetables every week. Participants who experience high blood sugar are found in participants who consume fruits and vegetables > 4 portions / week (36.02%) and (65%), this means that the participants consume fruit and vegetables 0.57 portions per day. This standard is said to be not good enough when viewed from the standards given by WHO, namely WHO recommends consuming 250 grams of vegetables (equivalent to two portions and 150 grams of fruit (equivalent to three Ambon bananas, one slice of papaya or three medium-sized oranges). Everyone consumes vegetables and fruit in a balanced way, namely 400 grams per day (WHO, 2003).

This research resulted in a Risk Prevalence calculation of 6,294 for not consuming vegetables / week, meaning that there will be a risk of experiencing Diabetes Mellitus by 6 times compared to people who consume vegetables / week. The PR of not consuming fruit / week is 0.611 which means that people who do not consume fruit / week will have 0.611 times the risk of suffering from Diabetess Mellitus than those who consume fruit / week. This research also showed that not consuming vegetables with a p-value of 0.000 and fruit of 0.331 increased blood sugar levels. This shows that people do not consume fruits and vegetables to maintain blood sugar levels.

Previous research has been conducted and showed that the consumption of vegetables and fruits has a relationship with an increase in blood sugar levels, it is obtained p = 0.037 less than 0.05 (Susi, 2017). This is because consumption of fruits and vegetables can reduce the risk of developing diabetes mellitus. Consumption of fiber found in vegetables can reduce insulin resistance in the body. When someone has consumed foods that contain fiber, it can make a person feel full and can delay hunger and slow down the intake of glucose in the blood. The increase in glucose occurs because foods containing fiber can reduce total cholesterol levels in the body because there is a hypocholesterolemic effect which can reduce cholesterol absorption (Susi, 2017).

Risk Factors for Diabetes Mellitus Based on Biochemical Measurements

Participants were categorized as obese with BMI's status > 25. In this research, the calculation of PR 1.955 means that obese people will be at risk of 1.955 to suffer from diabetes. Obesity is a risk factor that plays an important role in diabetes mellitus. People who are obese have excessive calorie intake. Pancreatic beta cells are depleted and unable to produce enough insulin to compensate for excess calorie intake. As a result, blood glucose levels become high which eventually becomes DM (Kaban, 2009). A research was conducted by Sanjaya (2009) at Kabanan Hospital, Bali showed that subjects who were overweight or obese had a 2.7 times greater risk of suffering from type 2 diabetes than subjects who were not obese. Participants need to have a diet low in calories and fat, exercise regularly, and reduce their intake of high carbohydrate processed foods.

The results showed that the participants who were obese were 51.4%. This is caused by risk factors for lack of physical activity such as sports. It is known that participants only did their usual activities such as cooking and traveling. The prevalence of obesity in adults in Indonesia has increased to 21.8%. This prevalence increased from the results of the 2013 Riskesdas which stated that the obesity rate in Indonesia had only reached 14.8%. This is caused by an unhealthy lifestyle such as a lack of physical activity in the community (The Indonesian Ministry of Health, 2018). For this reason, researchers suggest to the participants for always do physical activities such as sports and eat healthy and nutritious foods.

In this research, participants who had high blood sugar levels were 186 (23.27%). This happens because it was found that participants who had high blood sugar levels did not do physical activity and maintain their diet. In this research it is in line with (Dewi, 2014). The factors that affect controlling blood sugar levels are diet, physical activity, adherence to taking medication and knowledge. Diabetes Mellitus sufferers are expected to be able to control their blood sugar levels properly by adjusting the diet of each patient according to the 3J principle, namely jumlah makanan (the amount of food), jenis makanan (type of food), and jadwal makan yang teratur (a regular eating schedule). One of the benefits obtained in Diabetes mellitus sufferers is that they can contain food by increasing the sensitivity of insulin receptors so that in the end it can reduce blood glucose levels.

11

CONCLUSION

Risk factors for the incidence of diabetes mellitus in this researchs included age with the most risk age category in the 55-59 years age category (significance: 0.001; PR: 7.897; CI: 2.704-10.975), last elementary education (significance: 0.001; : 3,727; CI: 1,578-5,053), work as an entrepreneur (significance: 0.001; PR: 1,230; CI: 0.132-0.641) and not consuming vegetables (significance: 0,000; PR: 0.158; CI: 2,383-3,989). The advice given by researchers to reduce high blood sugar levels is that local health workers should provide health education through outreach to the community, especially the people of Medan City about how to reduce the risk of increased blood sugar or diabetes mellitus. In addition, participants or the community are expected to be able to maintain a good diet, namely by implementing balanced nutrition, especially paying attention to adequate vegetable consumption.

AKNOWLEDGEMENT

REFERENCES

Abil, Rudi. 2017. Factors that influence fasting blood sugar levels in laboratory service users. *Wawasan Kesehatan*, 3(2), 33-39.

Agusti, Nur. et al.2017. Survey of risk factors for non-communicable diseases in 2017 Halu Oleo University students. *Jimkesmas*. 2(6).

Ahmad Alghadir, et al. 2012. *Lifestyle and modern diseases*. Yogyakarta: Kanisu.

Dewi, Sofia & digi familia. 2014.. Risk Factor Overview of Type II Diabetes Mellitus Patients in Endocrine Polytechnic / SMFFK-UNSRAT RSU. Prof. Dr. R.D Kandou Manado Period May 2014-October 2014. *Journal of e-Biomedics,* 1(1), 45-49.

Gultom, S. 2017. Stop smoking habits with behavior therapy. 75-81.

Hariyanto F. 2013. Relationship between Physical Activity and Fasting Blood Sugar Levels in Type 2 Diabetes Mellitus patients in Cilegon City Hospital. Jakarta: FK.

IDF. 2015. Diabetes Atlas Seventh Edition: International Diabetes Federation 2015.

Isnaini, Nur, Ratnasari. 2018. Risk Factors Was Affects of Diabetes Mellitus Type. *Journal of Nursing and Midwifery Aisyiyah.* 14 (1).

Kaban, Simplified. 2009. Type 2 Diabetes in Sibolga City in 2007. *Nusantara Medical Magazine.* 4(2).

The Indonesian Ministry of Health. 2015. Disease, Control; Environment, Health. Technical guidelines for Measuring Risk Factors for Diabetes Mellitus.

The Indonesian Ministry of Health. 2016. Basic Health Research (RISKESDAS) 2016. Jakarta: Health research and development agency.

The Indonesian Ministry of Health. 2017. Non-communicable disease control program.

The Indonesian Ministry of Health. 2018. Basic Health Research (RISKESDAS) 2018. Jakarta: Health research and development agency

Nabyl. 2012. Preventing and Treating Diabetes Mellitus. Jogjakarta

Notoadmojo, S. 2009. Public Health Sciences: Principles of Dasra. Rineka Cipta

Notoadmodjo, S. 2010. Behavioral Health Sciences. Jakarta: Rineka Cipta.

Rahmi, A and Kwireth, H.N. 2018. Risk Factors Affecting Fasting Blood Sugar Levels in Laboratory Service Users. *Health insight.* 3(2), 33-39.

Sanjaya, I Nyoman. 2009. Pattern of Consumption of Traditional Balinese Food as a Risk Factor for Type II Diabetes Mellitus in Tabanan.

Sari, Nonita & Agus Purnama. 2019. Physical Activity and Its Relationship with Diabetes Mellitus. *Jurnal Kesehatan,* 2(4): 368-381

Septyarini, Princess. 2015. Survey of several risk factors for Non-Communicable Diseases in Rembang District. 3(1).

Serly, V. Sofian, A ,. & ernalia, Y. 2015. Relationship of Body Image, Energy Intake and Physical Activity with Nutrition Status for Students of the Faculty of Medicine, University of Riau. 2014. *Online Journal of Students of the Faculty of Medicine,* University of Riau, 2 (2).

Sudaryanto. 2014. The Relationship between Diet, Genetics and Sports Habits on the Occurrence of Type II Diabetes Mellitus in the Working Area of the Nusukan Health Center, Banjarsari, ISBN 978-602-99334-3-7.

Sukmaningsih, Wahyu Ratri. 2016. Risk Factors for Type II Diabetes Mellitus in the Work Area of Puskesmas Purwodiningratan Surakarta. Muhammaddiyah University Surakarta. *Muhammadiyah Surakarta University*

Susi, N. 2017. Differences in consumption of vegetables and fruit in normal subjects and people with type 2 diabetes mellitus. 1(2).

Riley, Leanne. Et al. 2016. The Wold Health Organization STEPwise Approach To Noncommunicable Disease Risk-Factors Surveillance: Methods, Challenges, and Opportunities.

Trisnawati S. Widarsa T. Suastica K. Risk Factors of type 2 diabetes mellitus of out patients in the community.

Wati, Siska. 2010. Different blood glucose levels in male smokers and non-smokers of tobacco aged 20-60 years in Salemba.

WHO. 2003. Fruit and Vegetable Promotion Initiative.

WHO. Global Report On Diabetes. France: World Health Organization; 2014.

WHO. Global Report On Diabetes. France: World Health Organization; 2015.

WHO. Global Report On Diabetes. France: World Health Organization; 2016

WHO. Global Report On Diabetes. France: World Health Organization; 2016

WHO. Global Status Report on Non-Communicable Disease 2010, Geneva, World Health Organization 2011.

Willer, et al. 2017. Editorial Type 2 Diabetes and Cardiovascular Risk in Women 2016. *International Journal of Endocrinology,* https://doi.org/10.1155/2017/6905697.

Yosmar, et al. Survei Risiko Penyakit Diabetes Melitus Terhadap Masyarakat Kota Padang. *Jurnal Sains Farmasi & Klinis, 5(2):* 134–141.

13

2. First Riview: Accepted with revision (23-04-2021)

Notifications

[UJPH] Editor Decision

2021-04-23 03:56 PM

zata ismah, Citra Cahyati Nst, Wahidah Wahidah:

We have reached a decision regarding your submission to Unnes Journal of Public Health, "Screening of Diabetes Mellitus and Physical Activity Analysis : a Stepwise WHO Approach".

Our decision is to: REVISE

Fitri Indrawati
Universitas Negeri Semarang
fitriindrawati@mail.unnes.ac.id

---

journal.unnes.ac.id/sju/ujph/authorDashboard/submission/43809

Unnes Journal of Public Health ▾   Tasks 0   ❂ English   ◉ View Site

UNNES Journal of Public Health   **Submission Library**   **View Metadata**

Submissions

Screening of Diabetes Mellitus and Physical Activity Analysis: A Stepwise WHO Approach
Zata Ismah, Citra Cahyati Nst, Wahidah Wahidah

Submission   **Review**   **Copyediting**   **Production**

Round 1

Round 1 Status
Submission accepted.

Notifications

[UJPH] Editor Decision   2021-04-23 03:56 PM

Reviewer's Attachments   Q Search

https://journal.unnes.ac.id/sju/ujph/$$$call$$$/tab/author-dashboard/author-dashboard-tab/fetch-tab?submissionId=43809&stageId=3

14

PUBLIC HEALTH

Screening of Diabetes Mellitus and Physical Activity Analysis : a Stepwise WHO Approach

Article Info

Abstract

Abstract : By 2030 it is predicted that there will be 52 million deaths per year due to NCD, an increase of 9 million from 38 million people today. The purpose of this research was to describe the risk factors for NCD in Medan using the stepwise WHO. This research method is a quantitative method with a cross-sectional design. Univariate and Bivariate analysis using the *Chi Square* test were carried out in this research. 799 participants were recruited using accidental sampling technique. The place of this research was conducted in Medan City, North Sumatra Province. The results of this research indicate that age 55-59 years, last elementary school education, work as an entrepreneur and not eating vegetables are risk factors for diabetes mellitus in this research. It is suggested that local health workers provide health education through outreach to the community, especially the people of Medan City, on how to reduce the risk of increased blood sugar or diabetes mellitus incidence. In addition, participants or the community are expected to be able to maintain a good diet, namely by implementing balanced nutrition, especially paying attention to adequate vegetable consumption.

Keywords : NCD, Stepwise WHO, Diabetes Melitus.

© 20xx Universitas Negeri Semarang

Commented [FI1]: Lebih baik langsung data DM

Commented [FI2]: NCD atau DM?

Copartisipance Address:
Medan, Indonesia
E-mail: zataismah@uinsu.ac.id

INTRODUCTION

The total number in 2030 is estimated that there are 52 million deaths each year due to Non-Communicable Diseases. A rise of 9 million from 38 million today. In middle and poor countries Non-Communicable Diseases will be responsible for three times and five times the death of infectious, maternal, perinatal diseases as well as nutrition problems (WHO, 2011). WHO estimates that, globally 422 million adults aged over 18 years lived with diabetes in 2014. The largest number of people with diabetes is estimated to come from Southeast Asia and the Western Pacific, accounting for about half the cases of diabetes in the world. Worldwide, the number of diabetics has increased substantially between 1980 and 2014, increasing from 108 million to 422 million or about four times as much (WHO, 2014).

WHO estimates that in 2030 the number of sufferers of Diabetes Mellitus in Japan will increase from 2000, which is ranked 5th with 6.8 million sufferers, while in 2030 it is ranked 8th out of 10 countries with the largest Diabetes Mellitus with 8.9 million patients, (WHO, 2018). Diabetes in Southeast Asia in 2014 there were 96 million adults with Diabetes in 11 member countries in the Southeast Asia region. The prevalence of diabetes among adults in the Southeast Asian region increased from 4.1% in the 1980s to 8.6% in 2014 (WHO, 2014). Diabetes caused 1.5 million deaths in 2012. Blood sugar higher than the maximum limit resulted in an additional 2.2 million deaths, by increasing the risk of cardiovascular and other diseases. Forty-three percent (43%) of these 3.7 million deaths occurred before the age of 70 years. The percentage of deaths due to diabetes that occurs before the age of 70 is higher in low and middle income countries than in high income countries (WHO, 2016).

The incidence of diabetes in the world in 2015, there were 415 million adults from countries: North America, the Caribbean, South and Middle America, Africa, the Middle East, North Africa, the Western Pacific, Europe diabetes increased 4-fold from 108 million in 1980s. By 2040 it is estimated that the number will be 642 million (IDF Atlas 2015). Nearly 80% of people with diabetes are in low and middle income countries. In 2015, the percentage of adults with diabetes was 8.5% (1 out of 11 adults with Diabetes) (WHO, 2015). The Stepwise data functions among others, as information, the new NCD risk factor finder and a reference for the government for future state-level NCD countermeasures. In addition, the benefits of using Stepwise each country can have robust data on NCD risk factors and can be used as a government program in overcoming priority NCD in the last 15 years, for example Togo, Benin, Mauritania and Cabo Verde (Riley, 2016).

In 2015, Indonesia ranked seventh in the world for the highest prevalence of Diabetes along with China, India, the United States, Brazil, Russia and Mexico with an estimated number of people with diabetes of 10 million people (IDF Atlas 2015). WHO estimates that in 2030 the number of sufferers of Diabetes Mellitus in Indonesia will be ranked 4th same like in 2000 but with the number of sufferers increasing from 8.4 million in 2000 to 21.3 million in 2030 among the 10 largest countries with diabetes mellitus (WHO, 2016). Diabetes with complicated deaths (6.7%) is the third highest cause of death in Indonesia (SRS, 2014). The percentage of deaths due to Diabetes in Indonesia is the second highest after Sri Lanka, the prevalence of Diabetics in Indonesia shows an increase from 5.7% in 2007 to 6.9% in 2016 (Riskesdas, 2016). The prevalence of diabetes mellitus in North Sumatera has increased from 2013 (1.3%) to (1.5%) in 2018 (Ministry of Health, 2018).

Looking at the data above, it is clear that Diabetes Mellitus has an impact on the quality of resources as well as a large increase in health costs, because of it, it is necessary to control Diabetes Mellitus, one of which is to reduce the risk factors for diabetes (Ministry of Health, 2015). Therefore, this research aims to determine the risk factors for diabetes mellitus in one of the cities in North Sumatra Province, namely Medan City.

METHOD

The method in this research is a quantitative method with cross-sectional design. The analysis in this research is descriptive analysis with frequency distribution and central distribution. A total of 799 people were selected and invited to participate in this research. The sampling technique in the research used accidental sampling. The research site was conducted in Medan, North Sumatra. When the research is in 2019. The method of data collection is carried out in this research, namely using primary data collected and processed by the researcher directly from the subject and the object of research. Research instruments using the Stepwise WHO questionnaire. Measurement of research instruments using the WHO stepwise questionnaire and direct measurements namely: measurement of height using the Stature Meter (stadiometer), weight measurement using scales, measuring cholesterol levels using cholesterol check tool, measurement of blood sugar levels with blood sugar check tool, blood pressure measurements with a

Commented [FI3]: (NCD)

Commented [FI4]: Dijelaskan lebih terperfinci

Commented [FI5]: Adakah ethical clearance nya

Commented [FI6]: Apakah ada kriteria tertentu?

Commented [FI7]: Kenapa dipilih accidental sampling

Commented [FI8]: Variable nya apa saja?

Commented [FI9]: Gula darah puasa atau gula darah sewaktu?

Spigmomanometer with a cuff type on the upper arm. Univariate analysis was carried out in this research to describe the distribution and frequency of each variable. Furthermore, bivariate analysis was also carried out in this research to see the risk factors for diabetes mellitus using the *Chi Square* test.

RESULT

Table 1. Risk Factors for Diabetes Mellitus Incidence Based on the Demographic Characteristics

Variable	n	Glucose		Sig	PR	95% CI of OR	
		High	Normal			lower	Upper
Gender							
Man	358 (44.8%)	77 (21.5%)	281 (78.5%)	0.286	0.870	0.673	1.124
Woman	441 (55.2%)	109 (24.7%)	332 (75.3%)				
Age (years)							
60-64	53 (6.6%)	17 (32.1%)	36 (67.9%)	0.001	6.768	2.339	10.342
55-59	76 (9.5%)	27 (35.5%)	49 (64.5%)	0.001	7.897	2.704	10.975
50-54	160 (20%)	49 (30.6%)	111 (69.4%)	0.001	6.327	2.395	9.207
45-49	100 (12.5%)	24 (24.0%)	76 (76%)	0.001	4.526	1.788	7.572
40-44	119 (14.9%)	30 (25.2%)	89 (74.8%)	0.001	4.831	1.913	7.811
35-39	79 (9.9%)	15 (19.0%)	64 (81.0%)	0.005	3.359	1.336	6.343
30-34	74 (9.3%)	15 (20.3%)	59 (79.7%)	0.003	3.644	1.430	6.758
25-29	138 (17.3%)	9 (6.5%)	129 (93.5%)	*reference*	*reference*	*reference*	*reference*
Last Education							
No education	2 (0.3%)	0 (0%)	2 (100%)	0.481	0	1.177	1.325
Primary School	63 (7.9%)	26 (41.27%)	37 (58.73%)	0.001	3.727	1.578	5.053
Junior High School	79 (9.9%)	19 (24.05%)	60 (75.95%)	0.426	8,270	0.764	1.907
Senior High School	379 (47.4%)	86 (22.69%)	293 (77.31%)	0.395	8,923	0.843	1.538
College	276 (34.5%)	55 (19.93%)	21 (80.07%)	*reference*	*reference*	*reference*	*reference*
Occupation							
Housewife	236 (29.5%)	58 (24.6%)	178 (75.4%)	0.093	0.944	0.387	1.043
Self-employment	261 (32.7%)	62 (23.8%)	199 (76.2%)	0.070	0.987	0.375	1.005
Government Officials	170 (21.3%)	40 (23.5%)	130 (76.5%)	*reference*	*reference*	*reference*	*reference*
Non Government Officials	71 (8.9%)	8 (11.3%)	63 (88.7%)	0.076	2.423	0.362	1.022
Private employees	30 (3.8%)	6 (20%)	24 (80%)	0.001	1.231	0.547	2.529

17

Variable	n	Glucose		Sig	PR	95% CI of OR	
		High	Normal			lower	Upper
Unemployment	31 (3.9%)	12 (38.7%)	19 (61.3%)	0.109	0.487	0.223	1.199

Based on table 1, it is known that the sex distribution of all participants shows that the majority of the participants' gender are women as many as 441 (55.2%) with a significance value of 0.286; PR: 0.870 and CI: 0.673-1.124. Age distribution shows the majority of participants aged are 50-54 years, as many as 160 participants (20%) with a significance value of 0.001; PR: 6,327 and CI: 2,395-10,975. The 55-59 age category was the age category that had the highest PR value, namely 7,897 with a significance value of 0.001 and CI: 2,704-10,975. Furthermore, the distribution of the latest education shows that the majority of participants have the latest education at the high school level, namely 379 participants (47.4%) with a significance value of 0.395; PR: 8,923 and CI: 0.843-1,538. Participants who had the latest education at the elementary level had a relationship with the risk of diabetes mellitus with a significance value of 0.001, PR: 3.727 and CI: 1.578-5.053. The majority of the participants worked as entrepreneurs, namely 261 participants (32.7%) with a significance value of 0.070; PR: 0.987 and CI: 0.375-1.005. Participants who work as private employees have a relationship with the risk of diabetes mellitus with a significance value of 0.001, PR: 1.230 and CI: 0.132-0.641.

Table 2. Risk Factors for Diabetes Mellitus Based on the physical activity of the participants

Variable	n	Glucose		Sig	PR	95% CI of PR	
		High	Normal			lower	Upper
High Intensity Physical Activity in The Workplace							
Ya	40 (5%)	0 (0.0%)	40 (100%)				
Tidak	759 (95%)	112 (14.7%)	647 (85.3%)	0.355	1.173	1.079	1.275
Moderate intensity physical activity in The Workplace							
Ya	224 (28%)	16 (2%)	248 (31%)	0.108	0.338	0.180	1.425
Tidak	575 (72%)	96 (12%)	439 (55%)				
High intensity exercise							
Ya	40 (5%)	0 (0.0%)	40 (100%)				
Tidak	759 (95%)	112 (14.7%)	647 (85.3%)	0.355	0.853	0.777	0.918
Moderate exercise intensity							
Ya	28	16 (88.9%)	2 (11.1%)	0.663	0.947	0.136	3.237
Tidak	72	69 (84.1%)	13 (15.9%)				
Cycling							
Ya	343 (43%)	32 (9.3%)	311 (90.7%)	0.240	1.886	0.640	8.069
Tidak	456 (57%)	80 (17.5%)	376 (82.5%)				

Commented [FI10]: Memakai Bahasa inggris

18

Based on table 2, it is known that the distribution of participants who did not do High Intensity Physical activity in the workplace was 759 participants (95%) with a significance value of 0.355; PR: 1,173 and CI: 1,079-1,275. The distribution of participants who did not do moderate intensity physical activity at work was 575 participants (72%) with a significance value of 0.3338; PR: 1.108 and CI: 0.180-1.425. The distribution of participants who did not do high intensity sports was as many as 759 participants (95%) with a significance value of 0.355; PR: 0.853 and CI: 1.777-1918. Then, the distribution of participants who did not do moderate intensity exercise was 456 participants (57%) with a significance value of 0.663; PR: 0.947 and CI: 0.136-3.237. The distribution of participants who did not exercise cycling was 456 participants (72%) with a significance value of 0.355; PR: 1.886 and CI: 0.640-8.069.

> **Commented [FI11]:** Dituliskan interpretasinya

Tabel 3. Risk Factors for Diabetes Mellitus Based on the physical Behavioral of the participants

| Variable | N | Glucosa | | Sig | PR | 95% CI of PR | |
		High	Normal			Lower	Upper
Smoking							
Yes	237 (29.7%)	57 (24.1%)	180 (75.9%)	0.738	1.048	0.798	1376
No	562 (70.3%)	129 (22,9%)	433(77,04%)				
Fruit consumption a day (portion)							
Do not consume	30 (3,75%)	5 (16.7%)	25 (83.3%)	0,331	0.611	0.296	1.547
1	153 (19,14%)	30(19,60%)	123 (80,39%)	0,236	0.746	0.543	1.167
2	187 (23,4%)	44 (23,52%)	143 (76,47%)	0.786	3.130	0.686	1.331
3	157 (19.64%)	40 (25,47%)	117(74,52%)	0.845	1.229	0.737	1.451
≥4	272 (34,04%)	67 (24,63%)	205 (75,36%)	Reference	Reference	Reference	Reference
Consumption of vegetables a day (portion)							
Do not consume	61 (7,63%)	37(60,65%)	24(39,34%)	0,000	6.294	2.383	3.989
1	31 (3,87%)	10(33,5%)	21(67,74%)	0.089	1.944	0.961	2.798
2	38(4,75%)	8(21,05%)	30 (78,94%)	0.836	1.088	0.566	2.021
3	54(6,75%)	10 (18,51%)	44(81,48%)	0.837	0.927	0.526	1.684
≥4	615(76,97%)	121 (19,67%)	494 (80,32%)	Reference	Reference	Reference	Reference

> **Commented [FI12]:** Mohon penulisan diperbaiki

Based on table 3, it is known that 29.7% of all participants were active smokers with a significance value of 0.738; PR 1.048 and CI: 0.798-1.376. The distribution of alcohol consumption showed that only 4.5% of all participants consumed alcohol with a significance value of 0.001; PR 0.466 and CI: 0.183-1.184. A total of 30 participants did not eat fruit, 5 of which experienced high blood sugar with a significance value; 0.331 PR 0.611 and CI: 0.296-1.547. 61 participants who did not consume vegetables, including 37 people experiencing high blood sugar with a significance value of 0.000; PR = 6,294 and CI: 2,383-3,989.

> **Commented [FI13]:** Interpretasinya apa

Tabel 3. Diabetes Mellitus Risk Factors Based on Biochemical Measurements

| Variable | N | Glucose | | Sig | PR | 95% CI of PR | |
		High	Normal			Lower	Upper
IMT							

19

Variable	N	Glucose		Sig	PR	95% CI of PR	
		High	Normal			Lower	Upper
Normal	272 (34,04%)	46 (16,91)	226 (83.08%)	*Refrence*	*Reference*	*Reference*	*Reference*
Under weight	31 (3.87%)	6 (19,35%)	25 (80,64%)	0,732	1.179	0,532	2,460
Over Weight	85 (10.63%)	17 (20%)	68 (80%)	0,514	2.197	0,717	1,950
Obesity	411 (51.43%)	117 (28,46)	294(71,53%)	0,001	1.955	1,241	2,283

Based on table 3. It is known that 51.4% were obese, where as many as 117 participants (62.9%) of them had high blood sugar levels with a significance value of 0.001; PR 1.955 and CI: 1.241-2,283. This measurement of high blood sugar levels refers to the theory of the Indonesian Ministry of Health which states that high blood sugar levels are> 140 mg/dl.

DISCUSION

> Commented [FI14]: Mohon interpretasi analisis data diperiksa kembali

Risk Factors for Diabetes Mellitus Based on Demographic Characteristics

e. Age

The results of this research indicate that the age of 55-59 years has a significant relationship with the incidence of diabetes mellitus with a significance value of 0.00, where 27 (35.5%) participants who are in this age category have high blood sugar levels. At the age of 55-59 years, a person will be 7,897 times more likely to suffer from diabetes mellitus. This is in line with Isnaini's research (2018) which showed that age ≥ 45 years has a significant relationship with the incidence of type 2 diabetes mellitus (p value = 0.010; OR: 0.312 and CI: 0.126-0.770). Age causes a decrease in all body systems, including endocrine, where this causes insulin to be in a state of resistance so that blood sugar becomes unstable (Isnaini, 2018). In addition, the older a person is, there will be a decrease in mitochondrial activity in muscle cells by 35%, where this decrease will cause an increase in fat levels in muscle by 30% and lead to insulin resistance (Sari, 2019). 40 years generally do not realize that he has diabetes mellitus (Susanti, 2018).

f. Gender

The majority of the population who suffer from diabetes is female (Nabyl, 2012). This is usually related to an increase in waist circumference in women as they age where in the Willer's research (2016) which used a combined analysis of a prospective population-based cohort research it was reported that 31% of women in Germany who experienced a 1 cm increase in waist circumference were at risk of developing diabetes mellitus type 2. Whereas the risk of type 2 diabetes mellitus in men increased by 34% each year due to an increase of 1 kg body weight. However, in this research, it was found that gender had no relationship with the incidence of diabetes mellitus with a significance value of 0.286; pr: 0.870; CI: 0.673-1.124 This is inversely proportional to research conducted by Isnaini (2018) which shows that the gender variable has a significant relationship to the incidence of type 2 diabetes mellitus (p value = 0.063; OR: 2.184 and CI: 0.952-5.011).

g. Education

The results of this research indicate that participants who have the latest education at the SD level have a relationship with the risk of diabetes mellitus with a significance value of 0.001, PR: 3.727 and CI: 1.578-5.053. This means that people who have last elementary education will be 3,727 times more likely to suffer from diabetes mellitus. In this research it can be seen in Table 1 that as many as 26 (41.27%) participants in the last elementary education category had diabetes mellitus. This research is in line with Isnaini's research (2018) that low education has a significant relationship to the incidence of type 2 diabetes mellitus (p value = 0.007; OR: 0.272 and CI: 0.103-0.721). Education is related to health knowledge that a person has (Notoadmojo, 2010). With health knowledge, people will have awareness in maintaining their health (Sari, 2019).

Research conducted by Yosmar (2018) also showed the same thing as the results of this research, namely that there is a relationship (p value = 0.000) of the level of education to the risk of the incidence of type 2 diabetes mellitus, but in this research it was reported that level of high school education or the equivalent have the greatest risk for the incidence of type 2 diabetes mellitus. When a person has low education, their knowledge of health will be low so that it increases the risk of diabetes mellitus (Notoadmojo, 2010).

h. Occupation

Type of occupation is also closely related to the incidence of Diabetes mellitus, where a person's occupation affects a person's level of physical activity (Sari, 2019). This research shows the results that work as an entrepreneur has a relationship with the incidence of diabetes mellitus with a significance value of 0.001,

21

PR: 1.230 and CI: 0.132-0.641. This means that people who work as entrepreneurs have a risk of 1,230 times higher than people who do not work as entrepreneurs. In the occupation category as entrepreneurs, as many as 6 participants (20%) who suffer from diabetes mellitus. This may occur because of being busy at work causing a person's eating frequency to be irregular and eating out of control (Sukmaningsih, 2016).

Risk Factors for Diabetes Mellitus Based on Physical Activity

Physical activity is the movement of limbs that produces simple energy which is very important for the body, spirit and the quality of a healthy lifestyle (Sherly, 2015), besides that physical activity is also a major determinant of energy expenditure so it is important for energy balance and weight control. Based on Riskesdas 2018 data, non-communicable diseases were caused by the proportion of less physical activity of 35.5%. Inadequate physical activity is one of the ten main risk factors for global death (The Indonesian Ministry of Health, 2018).

Physical activity can control blood sugar in the body. Glucose will be converted into energy during physical activities. In people who rarely do physical activity such as exercising, all the food substances that enter the body will not be burned, but stored in the body as fat and sugar. If the insulin in the body is not enough to convert glucose into energy, it can cause diabetes mellitus (Agusti, 2017). Isnaini's research (2018) states that diabetes mellitus occurs due to several risk factors, namely lack of physical activity, genetic factors, unhealthy lifestyles, and smoking behavior. This was also reported in Riskesdas 2018 that people who do not do physical activity (20-30%) are more at risk of contracting non-communicable diseases and even causing death (The Indonesian Ministry of Health, 2018).

The physical activity variables in this research were categorized into 5, namely physical activity in the workplace with high, moderate intensity, cycling physical activity, high intensity sports and moderate intensity sports. This research shows that there is no significant relationship between the participants' physical activity and the incidence of diabetes mellitus. That is, physical activity is not a risk factor for diabetes mellitus. This is in line with Yosmar's research (2018) which reported that age has a close relationship with an increase in blood sugar, meaning that the older you get, the risk of experiencing type 2 diabetes is higher. However, this is not in line with the research. This is inversely proportional to the results of Adriani's research (2017) which showed that there was a relationship between physical activity and fasting blood sugar levels of participants with type 2 Diabetes Mellitus with p value = 0.000.

> **Commented [FI15]:** Apakah kesimpulannya seperti ini

Risk Factors for Diabetes Mellitus Based on the physical Behavioral of the participants

c. Smoking

Research in Medan shows that the percentage of smokers is 29.7% of the total participants. This research obtained a PR value of 1,048, meaning that participants who actively smoke will experience a greater risk of 1,048 suffering from diabetes than those who did not smoke. Based on SURKERNAS data in 2016, the national smoking prevalence was 28.5%, the smoking prevalence according to male sex was 59%, and female smoking was 1.6%. Based on the age group, at the age of 40-49 the highest prevalence was 39.5%, while for novice smokers <18 years, it was 8.8% (The Indonesian Ministry of Health, 2017).

> **Commented [FI16]:** Pada variable ini sig lebih dari 0,05 dan CI melewati angka satu..apakah masih dapat disimpulkan bahwa merokok meningkatkan resiko diabetes?

Furthermore, the results of Septyarani's research (2015) entitled Risk Factor Survey for Non-Communicable Diseases in Rembang Regency showed that male smokers were 72.40% (Septyarani, 2015). Smoking is one of the risk factors for non-communicable diseases and acts as the biggest contributor compared to other risk factors. Someone who consumes cigarettes a day has a 2 to 4 times risk of developing coronary heart disease, the risk of lung cancer and other PTM (The Indonesian Ministry of Health, 2017).

Cigarettes are also very closely related to the risk factors for Diabetes Mellitus because based on information in the field there are 6 participants who have high blood sugar with blood sugar levels of > 130 mg / dl who are active smokers. Thus it can be said that 6 participants werw at risk of developing Diabetes Mellitus. This is in line with other researchs which showed that smoking is also a risk factor for high blood sugar levels which can lead to Diabetes Mellitus. When smoking, the blood vessels will constrict due to the substances contained in cigarettes. In addition, it can also increase insulin resistance which causes the body to not produce

insulin properly (Wati, 2010). To prevent the risk of non-communicable diseases, smokers can do several things by reducing their daily cigarette consumption, or by forcing themselves to quit smoking (Gultom, 2017).

d. Consumption of Fruits and Vegetables

Research in Medan City shows that 3.75% of all participants do not eat fruit every week, meaning that most participants generally eat fruit. This research also shows that only 7.63% of all participants do not eat vegetables every week. Participants who experience high blood sugar are found in participants who consume fruits and vegetables > 4 portions / week (36.02%) and (65%), this means that the participants consume fruit and vegetables 0.57 portions per day. This standard is said to be not good enough when viewed from the standards given by WHO, namely WHO recommends consuming 250 grams of vegetables (equivalent to two portions and 150 grams of fruit (equivalent to three Ambon bananas, one slice of papaya or three medium-sized oranges). Everyone consumes vegetables and fruit in a balanced way, namely 400 grams per day (WHO, 2003).

This research resulted in a Risk Prevalence calculation of 6,294 for not consuming vegetables / week, meaning that there will be a risk of experiencing Diabetes Mellitus by 6 times compared to people who consume vegetables / week. The PR of not consuming fruit / week is 0.611 which means that people who do not consume fruit / week will have 0.611 times the risk of suffering from Diabetess Mellitus than those who consume fruit / week. This research also showed that not consuming vegetables with a p-value of 0.000 and fruit of 0.331 increased blood sugar levels. This shows that people do not consume fruits and vegetables to maintain blood sugar levels.

Previous research has been conducted and showed that the consumption of vegetables and fruits has a relationship with an increase in blood sugar levels, it is obtained p = 0.037 less than 0.05 (Susi, 2017). This is because consumption of fruits and vegetables can reduce the risk of developing diabetes mellitus. Consumption of fiber found in vegetables can reduce insulin resistance in the body. When someone has consumed foods that contain fiber, it can make a person feel full and can delay hunger and slow down the intake of glucose in the blood. The increase in glucose occurs because foods containing fiber can reduce total cholesterol levels in the body because there is a hypocholesterolemic effect which can reduce cholesterol absorption (Susi, 2017).

> **Commented [FI17]:** Untuk variable in ikan sig nya lebih dari 0,05 apakah ini masih dianggap berhubungan?

Risk Factors for Diabetes Mellitus Based on Biochemical Measurements

Participants were categorized as obese with BMI's status > 25. In this research, the calculation of PR 1.955 means that obese people will be at risk of 1.955 to suffer from diabetes. Obesity is a risk factor that plays an important role in diabetes mellitus. People who are obese have excessive calorie intake. Pancreatic beta cells are depleted and unable to produce enough insulin to compensate for excess calorie intake. As a result, blood glucose levels become high which eventually becomes DM (Kaban, 2009). A research was conducted by Sanjaya (2009) at Kabanan Hospital, Bali showed that subjects who were overweight or obese had a 2.7 times greater risk of suffering from type 2 diabetes than subjects who were not obese. Participants need to have a diet low in calories and fat, exercise regularly, and reduce their intake of high carbohydrate processed foods.

The results showed that the participants who were obese were 51.4%. This is caused by risk factors for lack of physical activity such as sports. It is known that participants only did their usual activities such as cooking and traveling. The prevalence of obesity in adults in Indonesia has increased to 21.8%. This prevalence increased from the results of the 2013 Riskesdas which stated that the obesity rate in Indonesia had only reached 14.8%. This is caused by an unhealthy lifestyle such as a lack of physical activity in the community (The Indonesian Ministry of Health, 2018). For this reason, researchers suggest to the participants for always do physical activities such as sports and eat healthy and nutritious foods.

In this research, participants who had high blood sugar levels were 186 (23.27%). This happens because it was found that participants who had high blood sugar levels did not do physical activity and maintain their diet. In this research it is in line with (Dewi, 2014). The factors that affect controlling blood sugar levels are diet, physical activity, adherence to taking medication and knowledge. Diabetes Mellitus sufferers are expected to be able to control their blood sugar levels properly by adjusting the diet of each patient according to the 3J principle, namely jumlah makanan (the amount of food), jenis makanan (type of food), and jadwal makan yang teratur (a regular eating schedule). One of the benefits obtained in Diabetes mellitus sufferers is that they can contain food by increasing the sensitivity of insulin receptors so that in the end it can reduce blood glucose levels.

CONCLUSION

Risk factors for the incidence of diabetes mellitus in this researchs included age with the most risk age category in the 55-59 years age category (significance: 0.001; PR: 7.897; CI: 2.704-10.975), last elementary education (significance: 0.001; : 3,727; CI: 1,578-5,053), work as an entrepreneur (significance: 0.001; PR: 1,230; CI: 0.132-0.641) and not consuming vegetables (significance: 0,000; PR: 0.158; CI: 2,383-3,989). The advice given by researchers to reduce high blood sugar levels is that local health workers should provide health education through outreach to the community, especially the people of Medan City about how to reduce the risk of increased blood sugar or diabetes mellitus. In addition, participants or the community are expected to be able to maintain a good diet, namely by implementing balanced nutrition, especially paying attention to adequate vegetable consumption.

AKNOWLEDGEMENT

Thanks to colleagues who have worked together to complete this journal well and on time.

REFERENCES

Abil, Rudi. 2017. Factors that influence fasting blood sugar levels in laboratory service users. *Wawasan Kesehatan* , 3(2), 33-39.

Agusti, Nur. et al.2017. Survey of risk factors for non-communicable diseases in 2017 Halu Oleo University students. *Jimkesmas*. 2(6).

Ahmad Alghadir, et al. 2012. *Lifestyle and modern diseases*. Yogyakarta: Kanisu.

Dewi, Sofia & digi familia. 2014.. Risk Factor Overview of Type II Diabetes Mellitus Patients in Endocrine Polytechnic / SMFFK-UNSRAT RSU. Prof. Dr. R.D Kandou Manado Period May 2014-October 2014. *Journal of e-Biomedics*, 1(1), 45-49.

Gultom, S. 2017. Stop smoking habits with behavior therapy. 75-81.

Hariyanto F. 2013. Relationship between Physical Activity and Fasting Blood Sugar Levels in Type 2 Diabetes Mellitus patients in Cilegon City Hospital. Jakarta: FK.

IDF. 2015. Diabetes Atlas Seventh Edition: International Diabetes Federation 2015.

Isnaini, Nur, Ratnasari. 2018. Risk Factors Was Affects of Diabetes Mellitus Type. *Journal of Nursing and Midwifery Aisyiyah*. 14 (1).

Kaban, Simplified. 2009. Type 2 Diabetes in Sibolga City in 2007. *Nusantara Medical Magazine*. 4(2).

The Indonesian Ministry of Health. 2015. Disease, Control; Environment, Health. Technical guidelines for Measuring Risk Factors for Diabetes Mellitus.

The Indonesian Ministry of Health. 2016. Basic Health Research (RISKESDAS) 2016. Jakarta: Health research and development agency.

The Indonesian Ministry of Health. 2017. Non-communicable disease control program.

The Indonesian Ministry of Health. 2018. Basic Health Research (RISKESDAS) 2018. Jakarta: Health research and development agency

Nabyl. 2012. Preventing and Treating Diabetes Mellitus. Jogjakarta

Notoadmojo, S. 2009. Public Health Sciences: Principles of Dasra. Rineka Cipta

Notoadmodjo, S. 2010. Behavioral Health Sciences. Jakarta: Rineka Cipta.

Rahmi, A and Kwireth, H.N. 2018. Risk Factors Affecting Fasting Blood Sugar Levels in Laboratory Service Users. *Health insight*. 3(2), 33-39.

Sanjaya, I Nyoman. 2009. Pattern of Consumption of Traditional Balinese Food as a Risk Factor for Type II Diabetes Mellitus in Tabanan.

Sari, Nonita & Agus Purnama. 2019. Physical Activity and Its Relationship with Diabetes Mellitus. *Jurnal Kesehatan*, 2(4): 368-381

Septyarini, Princess. 2015. Survey of several risk factors for Non-Communicable Diseases in Rembang District. 3(1).

Commented [FI18]: Sesuaikan dengan pedoman UJPH, minimal daftar Pustaka 20 buah, >80 % adalah referensi primer kurang dari 9 tahun dan disertakan DOI dan atau URL

Serly, V. Sofian, A ,. & ernalia, Y. 2015. Relationship of Body Image, Energy Intake and Physical Activity with Nutrition Status for Students of the Faculty of Medicine, University of Riau. 2014. *Online Journal of Students of the Faculty of Medicine,* University of Riau, 2 (2).

Sudaryanto. 2014. The Relationship between Diet, Genetics and Sports Habits on the Occurrence of Type II Diabetes Mellitus in the Working Area of the Nusukan Health Center, Banjarsari, ISBN 978-602-99334-3-7.

Sukmaningsih, Wahyu Ratri. 2016. Risk Factors for Type II Diabetes Mellitus in the Work Area of Puskesmas Purwodiningratan Surakarta. Muhammaddiyah University Surakarta. *Muhammadiyah Surakarta University*

Susi, N. 2017. Differences in consumption of vegetables and fruit in normal subjects and people with type 2 diabetes mellitus. 1(2).

Riley, Leanne. Et al. 2016. The Wold Health Organization STEPwise Approach To Noncommunicable Disease Risk-Factors Surveillance: Methods, Challenges, and Opportunities.

Trisnawati S. Widarsa T. Suastica K. Risk Factors of type 2 diabetes mellitus of out patients in the community.

Wati, Siska. 2010. Different blood glucose levels in male smokers and non-smokers of tobacco aged 20-60 years in Salemba.

WHO. 2003. Fruit and Vegetable Promotion Initiative.

WHO. Global Report On Diabetes. France: World Health Organization; 2014.

WHO. Global Report On Diabetes. France: World Health Organization; 2015.

WHO. Global Report On Diabetes. France: World Health Organization; 2016

WHO. Global Report On Diabetes. France: World Health Organization; 2016

WHO. Global Status Report on Non-Communicable Disease 2010, Geneva, World Health Organization 2011.

Willer, et al. 2017. Editorial Type 2 Diabetes and Cardiovascular Risk in Women 2016. *International Journal of Endocrinology,* https://doi.org/10.1155/2017/6905697.

Yosmar, et al. Survei Risiko Penyakit Diabetes Melitus Terhadap Masyarakat Kota Padang. *Jurnal Sains Farmasi & Klinis, 5(2):* 134–141.

25

3. Second Riview, (28 -02- 2021)

Zata Ismah <zataismah@gmail.com>

[UJPH] New notification from Unnes Journal of Public Health
1 pesan

Arum Siwiendrayanti <journal@mail.unnes.ac.id>   28 Februari 2021 pukul 19.56
Balas Ke: Arum Siwiendrayanti <ujph@mail.unnes.ac.id>
Kepada: zata ismah <zataismah@gmail.com>

You have a new notification from Unnes Journal of Public Health:

You have been added to a discussion titled "Your manuscript is in review process" regarding the submission "Screening of Diabetes Mellitus and Physical Activity Analysis : a Stepwise WHO Approach".

Link: https://journal.unnes.ac.id/sju/index.php/ujph/authorDashboard/submission/43809

Arum Siwiendrayanti

journal.unnes.ac.id/sju/ujph/authorDashboard/submission/43809

Unnes Journal of Public Health ▾   Tasks 0   🌐 English   👁 View Site

Reviewer's Attachments   🔍 Search

📄   125797-1   , zata ismah-arum kd.rtf

📝   137676-1   , BA_zat.doc

Revisions   🔍 Search   **Upload File**

▸   📝   127075-2   Article Text, BA_zat_Revision.doc (2)   Article Text

Review Discussions   **Add discussion**

Name	From	Last Reply	Replies	Closed
Your manuscript is in review process	a_siwie Feb/28	zata May/05	1	☐

26

Unnes Journal of Public Health

PUBLIC HEALTH

Screening of Diabetes Mellitus and Physical Activity Analysis : a Stepwise WHO Approach

Article Info

Abstract

Abstract : The largest number of diabetics is estimated to come from Southeast Asia and the West Pacific, accounting for about half of diabetes cases in the world. The purpose of this reseacrh was to determine the general risk factors and specific activities of Diabetes Mellitus in Medan City, North Sumatra Province. This research method is a quantitative method with a cross-sectional design. Univariate and Bivariate analysis using the *Chi Square* test were carried out in this research. 799 participants were recruited using accidental sampling technique. The place of this research was conducted in Medan City, North Sumatra Province. The results of this research indicate that age 55-59 years, last elementary school education, work as an entrepreneur and not eating vegetables are risk factors for diabetes mellitus in this research. It is suggested that local health workers provide health education through outreach to the community, especially the people of Medan City, on how to reduce the risk of increased blood sugar or diabetes mellitus incidence. In addition, participants or the community are expected to be able to maintain a good diet, namely by implementing balanced nutrition, especially paying attention to adequate vegetable consumption.

Keywords : NCD, Stepwise WHO, Diabetes Melitus.

Copartisipance Address:
Medan, Indonesia
E-mail: zataismah@uinsu.ac.id

INTRODUCTION

World Health Organization (WHO) estimates that, globally 422 million adults aged over 18 years lived with diabetes in 2014. The largest number of people with diabetes is estimated to come from Southeast Asia and the Western Pacific, accounting for about half the cases of diabetes in the world. Worldwide, the number of diabetics has increased substantially between 1980 and 2014, increasing from 108 million to 422 million or about four times as much (WHO, 2014). Furthermore, the number of people with Diabetes Mellitus in 2015 was 415 million and it is estimated that in 2040 it will increase to 642 million people globally (International Diabetes Federation, 2015).

Diabetes in Southeast Asia in 2014 there were 96 million adults with Diabetes in 11 member countries in the Southeast Asia region. The prevalence of diabetes among adults in the Southeast Asian region increased from 4.1% in the 1980s to 8.6% in 2014 (WHO, 2014). Diabetes caused 1.5 million deaths in 2012. Blood sugar higher than the maximum limit resulted in an additional 2.2 million deaths, by increasing the risk of cardiovascular and other diseases. Forty-three percent (43%) of these 3.7 million deaths occurred before the age of 70 years. The percentage of deaths due to diabetes that occurs before the age of 70 is higher in low and middle income countries than in high income countries (WHO, 2016).

The incidence of diabetes in the world in 2015, there were 415 million adults from countries: North America, the Caribbean, South and Middle America, Africa, the Middle East, North Africa, the Western Pacific, Europe diabetes increased 4-fold from 108 million in 1980s. By 2040 it is estimated that the number will be 642 million (IDF Atlas 2015). Nearly 80% of people with diabetes are in low and middle income countries. In 2015, the percentage of adults with diabetes was 8.5% (1 out of 11 adults with Diabetes) (WHO, 2015). The Stepwise data functions among others, as information, the new NCD risk factor finder and a reference for the government for future state-level NCD countermeasures. In addition, the benefits of using Stepwise each country can have robust data on NCD risk factors and can be used as a government program in overcoming priority NCD in the last 15 years, for example Togo, Benin, Mauritania and Cabo Verde (Riley, 2016).

In 2015, Indonesia ranked seventh in the world for the highest prevalence of Diabetes along with China, India, the United States, Brazil, Russia and Mexico with an estimated number of people with diabetes of 10 million people (IDF Atlas 2015). WHO estimates that in 2030 the number of sufferers of Diabetes Mellitus in Indonesia will be ranked 4th same like in 2000 but with the number of sufferers increasing from 8.4 million in 2000 to 21.3 million in 2030 among the 10 largest countries with diabetes mellitus (WHO, 2016). Diabetes with complicated deaths (6.7%) is the third highest cause of death in Indonesia (SRS, 2014). The percentage of deaths due to Diabetes in Indonesia is the second highest after Sri Lanka, the prevalence of Diabetics in Indonesia shows an increase from 5.7% in 2007 to 6.9% in 2016 (Riskesdas, 2016). The prevalence of diabetes mellitus in North Sumatera has increased from 2013 (1.3%) to (1.5%) in 2018 (Ministry of Health, 2018).

Looking at the data above, it is clear that Diabetes Mellitus has an impact on the quality of resources as well as a considerable increase in health costs, therefore it is necessary to control Diabetes Mellitus, one of which is to reduce diabetes risk factors (Ministry of Health, 2015). Risk factors are an important measure in overcoming non-communicable diseases, including Diabetes Mellitus. Without knowing the risk factors, disease control cannot be done optimally. Therefore, researchers are interested in conducting a research entitled "Screening of Diabetes Mellitus and Physical Activity Analysis : a Stepwise WHO Approach". The purpose of this research is to determine the general risk factors and specific activities of Diabetes Mellitus in Medan City, North Sumatra Province.

> **Commented [MOU19]:** Why this issue is important to be explore in this study? It should be clear enough by raising the evidence gap and magnitude of the problem in this section

METHOD

The method in this research is a quantitative method with cross-sectional design. The analysis in this research is descriptive analysis with frequency distribution and central distribution. The research site was conducted in Medan, North Sumatra. When the research is in 2019. A total of 799 people were selected and invited to participate in this research. The inclusion criteria were people aged 25 to 64 years. The exclusion criteria were pregnant women and people who were experiencing infection.

> **Commented [MOU20]:** If the inclusive criteria only by age, how to determine someone could be included or not. I doesn't clear. Authors should justify for sampling strategy

This research works in conjunction with several licensed screening checkpoints in Medan city parks so that the samples taken are people who volunteer to come for inspection. Thus the sampling technique used in this research was accidental sampling. Before being examined, the community filled out the approval form. Data collection related to blood biochemistry was collected by health workers at the screening post.

The method of data collection is carried out in this research, namely using primary data collected and processed by the researcher directly from the subject and the object of research. Research

instruments using the Stepwise WHO questionnaire. The WHO stepwise questionnaire contains 3 examinations.

The first examination is about demographic data (gender, age, latest education, occupation) which is measured by the questions in the WHO stepwise questionnaire. The second examination is regarding physical activity data (High Intensity Physical Activity at Workplace, Moderate Intensity Physical Activity at Workplace, High Intensity Exercise, Medium Intensity Exercise and Cycling) which is measured by the questions in the WHO stepwise questionnaire. The third examination is direct measurements namely: measurement of height using the Stature Meter (stadiometer), weight measurement using scales, measuring cholesterol levels using cholesterol check tool, measurement of current level of glucose with blood sugar check tool, blood pressure measurements with a Spigmomanometer with a cuff type on the upper arm. Univariate analysis was carried out in this research to describe the distribution and frequency of each variable. Furthermore, bivariate analysis was also carried out in this research to see the risk factors for diabetes mellitus using the *Chi Square* test.

RESULT

Table 1. Risk Factors for Diabetes Mellitus Incidence Based on the Demographic Characteristics

Variable	n	Glucose		Sig	PR	95% CI of OR	
		High	Normal			lower	Upper
Gender							
Man	358 (44.8%)	77 (21.5%)	281 (78.5%)	0.286	0.870	0.673	1.124
Woman	441 (55.2%)	109 (24.7%)	332 (75.3%)				
Age (years)							
60-64	53 (6.6%)	17 (32.1%)	36 (67.9%)	0.001*	6.768	2.339	10.342
55-59	76 (9.5%)	27 (35.5%)	49 (64.5%)	0.001*	7.897	2.704	10.975
50-54	160 (20%)	49 (30.6%)	111 (69.4%)	0.001*	6.327	2.395	9.207
45-49	100 (12.5%)	24 (24.0%)	76 (76%)	0.001*	4.526	1.788	7.572
40-44	119 (14.9%)	30 (25.2%)	89 (74.8%)	0.001*	4.831	1.913	7.811
35-39	79 (9.9%)	15 (19.0%)	64 (81.0%)	0.005*	3.359	1.336	6.343
30-34	74 (9.3%)	15 (20.3%)	59 (79.7%)	0.003*	3.644	1.430	6.758
25-29	138 (17.3%)	9 (6.5%)	129 (93.5%)	reference	reference	reference	reference
Last Education							
No education	2 (0.3%)	0 (0%)	2 (100%)	0.481	0	1.177	1.325
Primary School	63 (7.9%)	26 (41.27%)	37 (58.73%)	0.001*	3.727	1.578	5.053
Junior High School	79 (9.9%)	19 (24.05%)	60 (75.95%)	0.426	8,270	0.764	1.907
Senior High School	379 (47.4%)	86 (22.69%)	293 (77.31%)	0.395	8,923	0.843	1.538
College	276 (34.5%)	55 (19.93%)	21 (80.07%)	reference	reference	reference	reference
Occupation							
Housewife	236 (29.5%)	58 (24.6%)	178 (75.4%)	0.093	0.944	0.387	1.043

Variable	n	Glucose		Sig	PR	95% CI of OR	
		High	Normal			lower	Upper
Self-employment	261 (32.7%)	62 (23.8%)	199 (76.2%)	0.070	0.987	0.375	1.005
Government Officials	170 (21.3%)	40 (23.5%)	130 (76.5%)	reference	reference	reference	reference
Non Government Officials	71 (8.9%)	8 (11.3%)	63 (88.7%)	0.076	2.423	0.362	1.022
Private employees	30 (3.8%)	6 (20%)	24 (80%)	0.001*	1.231	0.547	2.529
Unemployment	31 (3.9%)	12 (38.7%)	19 (61.3%)	0.109	0.487	0.223	1.199

* Information: The variable is significant at 5% alpha

Based on table 1, it is known that the sex distribution of all participants shows that the majority of the participants' gender are women as many as 441 (55.2%) with a significance value of 0.286; meaning that there is no relationship between Gender with people having high blood sugar.

Age distribution shows the majority of lparticipants aged are 50-54 years, as many as 160 participants (20%) with a significance value of 0.001; PR: 6,327 and CI: 2,395-10,975. The 55-59 age category was the age category that had the highest PR value, namely 7,897 with a significance value of 0.001 and CI: 2,704-10,975. Furthermore, the distribution of the latest education shows that the majority of participants have the latest education at the high school level, namely 379 participants (47.4%) with a significance value of 0.395; PR: 8,923 and CI: 0.843-1,538. Participants who had the latest education at the elementary level had a relationship with the risk of diabetes mellitus with a significance value of 0.001, PR: 3.727 and CI: 1.578-5.053. The majority of the participants worked as entrepreneurs, namely 261 participants (32.7%) with a significance (Pvalue of 0.070) meaning that there is no relationship between enterlreneurs with people having high blood sugar. Participants who work as private employees have a relationship with the risk of diabetes mellitus with a significance value of 0.001, PR: 1.230 and CI: 0.132-0.641.

Table 2. Risk Factors for Diabetes Mellitus Based on the physical activity of the participants

Variable	n	Glucose		Sig	PR	95% CI of PR	
		High	Normal			lower	Upper
High Intensity Physical Activity in The Workplace							
Yes	40 (5%)	0 (0.0%)	40 (100%)	0.355	1.173	1.079	1.275
No	759 (95%)	112 (14%)	647 (85.3%)				
Moderate intensity physical activity in The Workplace							
Yes	224 (28%)	16 (2%)	248 (31%)	0.108	0.338	0.180	1.425
No	575 (72%)	96 (12%)	439 (55%)				

Variable	n	Glucose		Sig	PR	95% CI of PR	
		High	Normal			lower	Upper
High intensity exercise							
Yes	40 (5%)	0 (0.0%)	40 (100%)				
No	759 (95%)	112 (14%)	647 (85.3%)	0.355	0.853	0.777	0.918
Moderate exercise intensity							
Yes	224 (28%)	199 (88.8%)	25 (11.2%)	0.663	0.947	0.136	3.237
No	575 (72%)	484 (84.2%)	91 (15.8%)				
Cycling							
Yes	343 (43%)	32 (9.3%)	311 (90.7%)				
No	456 (57%)	80 (17.5%)	376 (82.5%)	0.240	1.886	0.640	8.069

Based on table 2, it is known that the distribution of participants who did High Intensity Physical Activity in the Workplace were 40 participants (5%) and did not do High Intensity Physical activity in the Workplace was 759 participants (95%) with a significance value of 0.355 meaning that there is no relationship between High Intensity Physical activity at Workplace with people having high blood sugar.

The distribution of participants who did the moderate intensity physical activity at Workplace were 224 participants (28%) and did not do moderate intensity physical activity at Workplace were 575 participants (72%) with a significance value of 0.3338 that means there is no relationship between not doing moderate intensity physical activity at work with people having high blood sugar.

The distribution of participants who did high intensity exercise were 40 participants (5%) and did not do high intensity exercise were as many as 759 participants (95%) with a significance value of 0.355 that means there is no relationship between not doing high intensity exercise with people having high blood sugar.

Then, the distribution of participants who did moderate intensity exercise were 224 participants (28%) and did not do moderate intensity exercise were 575 participants (72%) with a significance value of 0.663 that means there is no relationship between not doing moderate intensity exercise with people having high blood sugar.

The distribution of participants who did exercise cycling were 343 participants (43%) and did not exercise cycling were 456 participants (72%) with a significance value of 0.355 that means there is no relationship between cycling with people having high blood sugar.

Tabel 3. Risk Factors for Diabetes Mellitus Based on the physical Behavioral of the participants

Variable	N	Glucosa		Sig	PR	95% CI of PR	
		High	Normal			Lower	Upper
Smoking							
Yes	237 (29.7%)	57 (24.1%)	180 (75.9%)	0.738	1.048	0.798	1.376
No	562 (70.3%)	129 (22,9%)	433 (77,04%)				
Fruit consumption a day (portion)							
Do not consume	30 (3,75%)	5 (16.7%)	25 (83.3%)	0,331	0.611	0.296	1.547

31

Variable	N	Glucosa		Sig	PR	95% CI of PR	
		High	Normal			Lower	Upper
1	153 (19,14%)	30(19,60%)	123 (80,39%)	0,236	0.746	0.543	1.167
2	187 (23,4%)	44 (23,52%)	143 (76,47%)	0.786	3.130	0.686	1.331
3	157 (19.64%)	40 (25,47%)	117(74,52%)	0.845	1.229	0.737	1.451
≥4	272 (34,04%)	67 (24,63%)	205 (75,36%)	Reference	Reference	Reference	Reference
Consumption of vegetables a day (portion)							
Do not consume	61 (7,63%)	37(60,65%)	24(39,34%)	0,000*	6.294	2.383	3.989
1	31 (3,87%)	10(33,5%)	21(67,74%)	0.089	1.944	0.961	2.798
2	38(4,75%)	8(21,05%)	30 (78,94%)	0.836	1.088	0.566	2.021
3	54(6,75%)	10 (18,51%)	44(81,48%)	0.837	0.927	0.526	1.684
≥4	615(76,97%)	121 (19,67%)	494 (80,32%)	Reference	Reference	Reference	Reference

* Information: The variable is significant at 5% alpha

Based on table 3, it is known that distribution of participants who smoking as many as 57 participants (24.1%) with a significance value of 0,738 that means there is no relationship between smoking and the risk of people having high blood sugar.

The distribution of participants who rarely ate fruit was 5 participants (16.7%) with a significance value of 0.331 that means there is no relationship between rarely ate fruit and the risk of people having high blood sugar.

Then the distribution of participants who rarely consumed vegetables was 37 participants (60.65%) with a significance value of 0.000; PR: 6,294 and CI: 2,383-3,989. Then the distribution of participants who rarely consume vegetables is 37 participants (60.65%) with a significance value of 0.000; PR: 6,294 and CI: 2,383-3,989. It means that there is a relationship between rarely eating vegetables and the risk of people having high blood sugar.

Tabel 4. Diabetes Mellitus Risk Factors Based on Biochemical Measurements

Variable	N	Glucose		Sig	PR	95% CI of PR	
		High	Normal			Lower	Upper
IMT							
Normal	272 (34,04%)	46 (16,91)	226 (83.08%)	Reffence	Reference	Reference	Reference
Under weight	31 (3.87%)	6 (19,35%)	25 (80,64%)	0,732	1.179	0,532	2,460
Over Weight	85 (10.63%)	17 (20%)	68 (80%)	0,514	2.197	0,717	1,950
Obesity	411 (51.43%)	117 (28,46)	294(71,53%)	0,001	1.955	1,241	2,283

This measurement of high blood sugar levels refers to the theory of the Indonesian Ministry of Health which states that high blood sugar levels are> 140 mg/dl. Based on table 4. It is known that 51.4% were obese, where as many as 117 participants (62.9%) of them had high blood sugar levels with a significance value of 0.001; PR 1.955 and CI: 1.241-2,283. It means that there is a relationship between obese with the risk of people having high blood sugar.

DISCUSION

Risk Factors for Diabetes Mellitus Based on Demographic Characteristics

i. Age

The results of this research indicate that the age of 55-59 years has a significant relationship with the incidence of diabetes mellitus with a significance value of 0.001, where 27 participants (35.5%) who are in this age category have high blood sugar levels. This is in line with Yosmar's research (2018) which reported that age has a close relationship with an increase in blood sugar, meaning that the older you get, the risk of experiencing type 2 diabetes is higher.

At the age of 55-59 years, a person will be 7,897 times more likely to suffer from diabetes mellitus. This is in line with Isnaini's research (2018) which showed that age $\geq$ 45 years has a significant relationship with the incidence of type 2 diabetes mellitus (p value = 0.010; OR: 0.312 and CI: 0.126-0.770). Age causes a decrease in all body systems, including endocrine, where this causes insulin to be in a state of resistance so that blood sugar becomes unstable (Isnaini, 2018). In addition, the older a person is, there will be a decrease in mitochondrial activity in muscle cells by 35%, where this decrease will cause an increase in fat levels in muscle by 30% and lead to insulin resistance (Sari, 2019). 40 years generally do not realize that he has diabetes mellitus (Susanti, 2018).

j. Gender

The majority of the population who suffer from diabetes mellitus is female, that is as many as 109 participants (24.7%). It's line with Hamzah's research that showed the majority who suffer diabetes mellitus is female as many as 52 participants (52%). This is usually related to an increase in waist circumference in women as they age where in the Willer's research (2016) which used a combined analysis of a prospective population-based cohort research it was reported that 31% of women who experienced a 1 cm increase in waist circumference were at risk of developing diabetes mellitus type 2. Whereas the risk of type 2 diabetes mellitus in men increased by 34% each year due to an increase of 1 kg body weight. However, in this research, it was found that gender had no relationship with the incidence of diabetes mellitus with a significance value of 0.286; pr: 0.870; CI: 0.673-1.124 This is inversely proportional to research conducted by Isnaini (2018) which shows that the gender variable has a significant relationship to the incidence of type 2 diabetes mellitus (p value = 0.063; OR: 2.184 and CI: 0.952-5.011).

k. Education

The results of this research indicate that participants who have the latest education at the SD level have a relationship with the risk of diabetes mellitus with a significance value of 0.001, PR: 3.727 and CI: 1.578-5.053. This means that people who have last primary school education will be 3,727 times more likely to suffer from diabetes mellitus. In this research it can be seen in Table 1 that as many as 26 participants (41.27%) in the last elementary education category had diabetes mellitus. This research is in line with Isnaini's research (2018) that low education has a significant relationship to the incidence of type 2 diabetes mellitus (p value = 0.007; OR: 0.272 and CI: 0.103-0.721). Education is related to health knowledge that a person has (Sriyono, 2015). With health knowledge, people will have awareness in maintaining their health (Notoadmojo, 2010).

Research conducted by Yosmar (2018) also showed the same thing as the results of this research, namely that there is a relationship (p value = 0.000) of the level of education to the risk of the incidence of type 2 diabetes mellitus, but in this research it was reported that level of high school education or the equivalent

33

have the greatest risk for the incidence of type 2 diabetes mellitus. When a person has low education, their knowledge of health will be low so that it increases the risk of diabetes mellitus (Notoadmojo, 2010).

l. Occupation
    Type of occupation is also closely related to the incidence of Diabetes mellitus, where a person's occupation affects a person's level of physical activity (Sari, 2019). This research shows the results that work as an private employees has a relationship with the incidence of diabetes mellitus with a significance value of 0.001, PR: 1.231 and CI: 0.132-0.641. This means that people who work as private employees have a risk of 1,231 times higher than people who do not work as private employees. In the occupation category as private employees, as many as 6 participants (20%) who suffer from diabetes mellitus. This may occur because of being busy at work causing a person's eating frequency to be irregular and eating out of control (Sukmaningsih, 2016).

Risk Factors for Diabetes Mellitus Based on Physical Activity
    Physical activity is the movement of limbs that produces simple energy which is very important for the body, spirit and the quality of a healthy lifestyle (Sherly, 2015), besides that physical activity is also a major determinant of energy expenditure so it is important for energy balance and weight control. Based on Riskesdas 2018 data, non-communicable diseases were caused by the proportion of less physical activity of 35.5%. Inadequate physical activity is one of the ten main risk factors for global death (The Indonesian Ministry of Health, 2018).
    Physical activity can control blood sugar in the body. Glucose will be converted into energy during physical activities. In people who rarely do physical activity such as exercising, all the food substances that enter the body will not be burned, but stored in the body as fat and sugar. If the insulin in the body is not enough to convert glucose into energy, it can cause diabetes mellitus (Agusti, 2017). Isnaini's research (2018) states that diabetes mellitus occurs due to several risk factors, namely lack of physical activity, genetic factors, unhealthy lifestyles, and smoking behavior. This was also reported in Riskesdas 2018 that people who do not do physical activity (20-30%) are more at risk of contracting non-communicable diseases and even causing death (The Indonesian Ministry of Health, 2018).
    The physical activity variables in this research were categorized into 5, namely high intensity physical activity in the Workplace, moderate intensity physical activity in the Workplace, cycling, high intensity exercise and moderate intensity exercise. This research shows that there is no significant relationship between the participants' physical activity and the incidence of diabetes mellitus. That is, physical activity is not a risk factor for diabetes mellitus. This is inversely proportional to the results of Adriani's research (2017) which showed that there was a relationship between physical activity and fasting blood sugar levels of participants with type 2 Diabetes Mellitus with p value = 0.000.
    It's also inversely proportional to the results of Sari's research (2019) which showed that there was a relationship between physical activity and fasting blood sugar levels of participants Diabetes Mellitus with p value = 0.009. Where in Sari's (2019) study most of the participants were in the non-working group and were also female. This group is housewives. Therefore, based on the results of this study, the researchers assessed that physical activity was not a risk factor for diabetes mellitus because the majority of participants in this study were a group of workers, whose occupations included self employment (32.7%), Government Officials 170 (21.3%), Non Government Officials (8.9%) and Private employees (3.8%) compared to participants who were only a housewife (29.5%).

Risk Factors for Diabetes Mellitus Based on the physical Behavioral of the participants

e. Smoking
    Research in Medan shows that the percentage of smokers at high glucose levels is only 24.1% of the total participants. This research obtain a p value of 0.738, meaning that smoking is not a risk factor in the incidence of diabetes mellitus. This research is inversely proportional to Septyarani's (2015) research entitled Risk Factor Survey for Non-Communicable Diseases in Rembang Regency which shows that male smokers are 72.40% (Septyarani, 2015). Smoking is a risk factor for non-communicable diseases and is the biggest contributor compared to other risk factors. A person who consumes cigarettes a day has a 2 to 4 times risk of developing

coronary heart disease, the risk of lung cancer, and other PTM (Ministry of Health of the Republic of Indonesia, 2017).

In theory, smoking is also very closely related to the risk factors for Diabetes Mellitus because based on information in the field there are 6 participants who have high blood sugar with blood sugar levels > 130 mg / dl who are active smokers. This is in line with other studies which show that smoking is also a risk factor for high blood sugar levels that can lead to Diabetes Mellitus (Fatimah, 2015). According to Slagter et al (2013), smoking habits are associated with an increase in the prevalence of metabolic syndrome and an increase in Body Mass Index (BMI). This increase is associated with an increased risk of decreased HDL (High Desity Lipoprotein) cholesterol, and higher triglycerides and an increase in waist circumference. According to Hilawe et al (2015), the concentration of adiponectin appears to partially mediate the effect of smoking on diabetes. To prevent the risk of non-communicable diseases, smokers must reduce or even stop their daily cigarette consumption.

f. Consumption of Fruits and Vegetables

Research in Medan City shows that participants who rarely consumed fruit and had high glucose levels were 16.7% with a significance value of 0.331; PR: 0.611 and CI: 0.296-1.547. These findings suggest that fruit is not a risk factor for diabetes mellitus. However, people who rarely eat vegetables in the research were a risk factor with a significance value of 0.000.

This research resulted in a Risk Prevalence calculation of 6,294 if they did not eat vegetables / week, meaning that there would be a risk of experiencing Diabetes Mellitus by 6 times compared to people who ate vegetables / week. The prevalence rate of not consuming fruit / week is 0.611, which means that people who do not consume fruit / week have 0.611 times the risk of suffering from Diabetess Mellitus compared to people who consume fruit / week. This research also showed that not consuming vegetables with a p value of 0.000 can increase blood sugar levels.

Previous research has been conducted and shows that the consumption of vegetables and fruit has a relationship with increasing blood sugar levels obtained by p = 0.037 less than 0.05 (Susi, 2017). This is because consumption of fruits and vegetables can reduce the risk of developing diabetes mellitus. Consumption of fiber found in vegetables can reduce insulin resistance in the body. When someone has eaten foods that contain fiber, it can make a person feel full and can delay hunger and slow down the intake of glucose in the blood. The increase in glucose occurs because foods containing fiber can reduce total cholesterol levels in the body because there is a hypocholesterolemic effect which can reduce cholesterol absorption (Susi, 2017).

Risk Factors for Diabetes Mellitus Based on Biochemical Measurements

Participants were categorized as obese with BMI's status > 25. In this research, the calculation of PR 1.955 means that obese people will be at risk of 1.955 to suffer from diabetes. Obesity is a risk factor that plays an important role in diabetes mellitus. A person who is obese in his body accumulates excess fat. Fat tissue is an active endocrine tissue that can release adipose cytokines. These adipose cytokines have a proinflammatory effect and can interfere with insulin signaling pathways which can lead to insulin resistance. This situation causes an increase in blood glucose levels in a person (Fadilah, 2015). A research was conducted by Kabosu (2019) at Bhayangkara Hospital, Kupang City showed that subjects who were obese had 3,826 times greater risk of suffering from type 2 diabetes than subjects who were not obese. It's also in line with Trisnawati's research (2013) that showed obesity had a significant relationship with the incidence of diabetes mellitus where participants who were obese were 4.43 times greater than those who were not obese.

The results showed that the participants who were obese were 51.4%. Diabetes Mellitus sufferers are expected to be able to control their blood sugar levels properly by adjusting the diet of each patient according to the 3J principle, namely jumlah makanan (the amount of food), jenis makanan (type of food), and jadwal makan yang teratur (a regular eating schedule).

CONCLUSION

Risk factors for the incidence of diabetes mellitus in this researchs included age with the most risk age category in the 55-59 years age category (significance: 0.001; PR: 7.897; CI: 2.704-10.975), last primary school education (significance: 0.001; : 3,727; CI: 1,578-5,053), work as a private employees (significance: 0.001; PR:

35

1,231; CI: 0.132-0.641) and not consuming vegetables (significance: 0,000; PR: 0.158; CI: 2,383-3,989). The advice given by researchers to reduce high blood sugar levels is that local health workers should provide health education through outreach to the community, especially the people of Medan City about how to reduce the risk of increased blood sugar or diabetes mellitus. In addition, participants or the community are expected to be able to maintain a good diet, namely by implementing balanced nutrition, especially paying attention to adequate vegetable consumption.

AKNOWLEDGEMENT

REFERENCES

Abil, Rudi. (2017). Factors that influence fasting blood sugar levels in laboratory service users. *Wawasan Kesehatan*, 3(2), pp. 33-39. DOI : 10.31227/osf.io/d3kes. Available at : https://osf.io/preprints/inarxiv/d3kes/

Agusti, Nur. et al. (2017). Survey of risk factors for non-communicable diseases in 2017 Halu Oleo University students. *Jimkesmas*. 2(6). DOI: http://dx.doi.org/10.37887/jimkesmas.v2i6.2878. Available at : http://ojs.uho.ac.id/index.php/JIMKESMAS/article/view/2878.

Fatimah, Restyana Noor. (2015). Diabetes Mellitus Type 2. *Medical Journal Of Majority*, 4(5), pp. 93-101. Available at : http://juke.kedokteran.unila.ac.id/index.php/majority/article/viewFile/615/619

Gultom, S. (2017). Stop smoking habits with behavior therapy. Pp. 75-81. Available at : https://jurnal.unimed.ac.id/2012/index.php/gk/article/view/7090/6072.

Hamzah, Diza Fathamira. (2018). Analysis Of The Use Of Herbal Medicines For Type II Diabetes Mellitus Patients In Langsa City. Jurnal JUMANTIK, 4(2), pp. 168-177. DOI: http://dx.doi.org/10.30829/jumantik.v4i2.5057. Available at : http://jurnal.uinsu.ac.id/index.php/kesmas/article/view/5057

Hilawe, E. H., *et al.* (2015). Smoking and Diabetes: Is the Association Mediated by Adiponectin, Leptin, or C-reactive Protein. *Journal of Epidemiology,* 25(2), pp. 99-109. http://doi.org/10.2188/jea.JE20140055.

International Diabetes Federation (IDF). (2015). IDF Diabetes Atlas Seventh Edition 2015. Brussels: International Diabetes Federation

Isnaini, Nur, Ratnasari. (2018). Risk Factors Was Affects of Diabetes Mellitus Type. Journal of Nursing and Midwifery Aisyiyah. 14 (1). DOI: https://doi.org/10.31101/jkk.550. Available at : https://ejournal.unisayogya.ac.id/ejournal/index.php/jkk/article/view/550.

Kabosu, Renata Aryndra Sukma., et al. (2019). Risk Factors for Type Two Diabetes Mellitus at Bhayangkara Hospital, Kupang City. Timorese Journal of Public Health, 1(1), pp. 11-23. DOI: https://doi.org/10.35508/tjph.v1i1.2122. Available at : https://ejurnal.undana.ac.id/TJPH/article/view/2122study

Notoadmodjo, S. (2010). Behavioral Health Sciences. Jakarta: Rineka Cipta.

Putri, Andi Fadilah Yusran., *et al.* (2015). The Relationship between Obesity Degree and Fasting Blood Sugar Levels in Communities in Batung Taba Village and Korong Gadang Village, Padang City. *Jurnal Kesehatan Andalas,* 4(3), pp. 707-711. DOI: https://doi.org/10.25077/jka.v4i3.351.

Purnama, Agus & Nonita Sari. (2019). Physical Activity and Its Relationship with Diabetes Mellitus. Jurnal Kesehatan, 2(4), pp. 368-381. DOI : https://doi.org/10.33368/woh.v0i0.213. Available at : https://jurnal.fkmumi.ac.id/index.php/woh/article/view/213

Riley, Leanne. Et al. (2016). The Wold Health Organization STEPwise Approach To Noncommunicable Disease Risk-Factors Surveillance: Methods, Challenges, and Opportunities. *American Journal of Public Health, 106(1), pp. 74–78.* DOI : 10.2105/AJPH.2015.302962

Sari, Nonita & Agus Purnama. (2019). Physical Activity and Its Relationship with the Incidence of Diabetes Mellitus. Window of Health : Jurnal Kesehatan, 2(4), pp. 368-381. Availabe at : http://jurnal.fkmumi.ac.id/index.php/woh/article/view/woh2408.

Commented [MOU23]: I think the conclusion doesn't need numeric values of the statistical analysis.

Slagter, S. N., *et al.* (2013). Associations Between Smoking, Components of Metabolic Syndrome and Lipoprotein Particle Size. *Journal BMC Medicine*, 11(195), pp. 1-15. http://doi.org/10.1186/1741-7015-11-195

Septyarini, Putri. (2015). Survey of several risk factors for Non-Communicable Diseases in Rembang District. Jurnal Kesehatan Masyarakat (Undip), 3(1), pp. 181-190. Available at : https://ejournal3.undip.ac.id/index.php/jkm/article/view/11341

Serly, V. Sofian, A., & ernalia, Y. (2015). Relationship of Body Image, Energy Intake and Physical Activity with Nutrition Status for Students of the Faculty of Medicine, University of Riau. 2014. *Online Journal of Students of the Faculty of Medicine*, University of Riau, 2(2), pp. 1-14. Available at : https://jom.unri.ac.id/index.php/JOMFDOK/article/view/4860.

Sudaryanto. (2014). The Relationship between Diet, Genetics and Sports Habits on the Occurrence of Type II Diabetes Mellitus in the Working Area of the Nusukan Health Center, Proceedings of 5th SNST, pp. 19-24. DOI:10.13140/2.1.3702.9448.

Sukmaningsih, Wahyu Ratri. (2016). Risk Factors for Type II Diabetes Mellitus in the Work Area of Puskesmas Purwodiningratan Surakarta. Muhammaddiyah University Surakarta. *Muhammadiyah Surakarta University*. Available at : http://eprints.ums.ac.id/42800/.

Susi, N. (2017). Differences in consumption of vegetables and fruit in normal subjects and people with type 2 diabetes mellitus. *Darussalam Nutrition Journal*, 1(2), pp. 37-44. DOI: http://dx.doi.org/10.21111/dnj.v1i2.1344.

The Indonesian Ministry of Health. (2015). Disease, Control; Environment, Health. Technical guidelines for Measuring Risk Factors for Diabetes Mellitus.

The Indonesian Ministry of Health. (2016). Basic Health Research (RISKESDAS) 2016. Jakarta: Health research and development agency.

The Indonesian Ministry of Health. (2017). Non-communicable disease control program.

The Indonesian Ministry of Health. (2018). Basic Health Research (RISKESDAS) 2018. Jakarta: Health research and development agency

Trisnawati, S. K. & Setyorogo, S. (2013). Risk Factors for Type 2 Diabetes Mellitus at the Cengkareng District Health Center, West Jakarta, 2012. *Jurnal Ilmiah Kesehatan*, 5(1), pp. 6-11. Available at : https://docplayer.info/29559379-Faktor-risiko-kejadian-diabetes-melitus-tipe-ii-di-puskesmas-kecamatan-cengkareng-jakarta-barat-tahun-2012.html

WHO. (2014). Global Report On Diabetes. France: World Health Organization.

WHO. (2015). Global Report On Diabetes. France: World Health Organization.

WHO. (2016). Global Report On Diabetes. France: World Health Organization.

Willer, et al. (2017). Editorial Type 2 Diabetes and Cardiovascular Risk in Women 2016. *International Journal of Endocrinology*, pp. 1-2. https://doi.org/10.1155/2017/6905697.

Yosmar, et al. Survey of Diabetes Mellitus Risk to the Community of Padang City. *Jurnal Sains Farmasi & Klinis*, 5(2), pp. 134–141. DOI : 10.25077/jsfk.5.2.134-141.2018. Available at :http://jsfk.ffarmasi.unand.ac.id/index.php/jsfk/article/view/261.

<mark>4. **Revised version received (05-05-2021)**</mark>

Review Discussions				Add discussion
Name	From	Last Reply	Replies	Closed
Your manuscript is in review process	a_siwie Feb/28	zata May/05	1	☐

Your manuscript is in review process   ✖

Participants

Arum Siwiendrayanti (a_siwie)

Fitri Indrawati (fitriindrawati)

zata ismah (zata)

Messages

Note	From
Dear Author, Your manuscript is in review process. Thank you PS: Accepted manuscript will be charged IDR 1,000,000.	a_siwie Feb 28
▼ Terimakasih atas riviewnya. Kami sudah meng-upload perbaikan jurnal kami. Mohon diterima. Atas perhatiannya kami ucapkan terimakasih.	zata May 05

Delete

Screening of Diabetes Mellitus and Physical Activity Analysis : a Stepwise WHO Approach

Zata Ismah[1] , Citra Cahyati Nst[1,] Wahidah[1] ,Emma Novita[2], Nofi Susanti[1]

[1]Public Health Faculty of State Islamic University of North Sumatra
[2]Medical Faculty of Sriwijaya University

Article Info

Abstract

Abstract : The largest number of diabetics is estimated to come from Southeast Asia and the West Pacific, accounting for about half of diabetes cases in the world. The purpose of this reseacrh was to determine the general risk factors and specific activities of Diabetes Mellitus in Medan City, North Sumatra Province. This research method is a quantitative method with a cross-sectional design. Univariate and Bivariate analysis using the *Chi Square* test were carried out in this research. 799 participants were recruited using accidental sampling technique. The place of this research was conducted in Medan City, North Sumatra Province. The results of this research indicate that age 55-59 years, last elementary school education, work as an entrepreneur and not eating vegetables are risk factors for diabetes mellitus in this research. It is suggested that local health workers provide health education through outreach to the community, especially the people of Medan City, on how to reduce the risk of increased blood sugar or diabetes mellitus incidence. In addition, participants or the community are expected to be able to maintain a good diet, namely by implementing balanced nutrition, especially paying attention to adequate vegetable consumption.
Keywords : NCD, Stepwise WHO, Diabetes Melitus.

INTRODUCTION

World Health Organization (WHO) estimates that, globally 422 million adults aged over 18 years lived with diabetes in 2014. The largest number of people with diabetes is estimated to come from Southeast Asia and the Western Pacific, accounting for about half the cases of diabetes in the world. Worldwide, the number of diabetics has increased substantially between 1980 and 2014, increasing from 108 million to 422 million or about four times as much (WHO, 2014). Furthermore, the number of people with Diabetes Mellitus in 2015 was 415 million and it is estimated that in 2040 it will increase to 642 million people globally (International Diabetes Federation, 2015).

Diabetes in Southeast Asia in 2014 there were 96 million adults with Diabetes in 11 member countries in the Southeast Asia region. The prevalence of diabetes among adults in the Southeast Asian region increased from 4.1% in the 1980s to 8.6% in 2014 (WHO, 2014). Diabetes caused 1.5 million deaths in 2012. Blood sugar higher than the maximum limit resulted in an additional 2.2 million deaths, by increasing the risk of cardiovascular and other diseases. Forty-three percent (43%) of these 3.7 million deaths occurred before the age of 70 years. The percentage of deaths due to diabetes that occurs before the age of 70 is higher in low and middle income countries than in high income countries (WHO, 2016).

The incidence of diabetes in the world in 2015, there were 415 million adults from countries: North America, the Caribbean, South and Middle America, Africa, the Middle East, North Africa, the Western Pacific, Europe diabetes increased 4-fold from 108 million in 1980s. By 2040 it is estimated that the number will be 642 million (IDF Atlas 2015). Nearly 80% of people with diabetes are in low and middle income countries. In 2015, the percentage of adults with diabetes was 8.5% (1 out of 11 adults with Diabetes) (WHO, 2015). The Stepwise data functions among others, as information, the new NCD risk factor finder and a reference for the government for future state-level NCD countermeasures. In addition, the benefits of using Stepwise each country can have robust data on NCD risk factors and can be used as a government program in overcoming priority NCD in the last 15 years, for example Togo, Benin, Mauritania and Cabo Verde (Riley, 2016).

In 2015, Indonesia ranked seventh in the world for the highest prevalence of Diabetes along with China, India, the United States, Brazil, Russia and Mexico with an estimated number of people with diabetes of 10 million people (IDF Atlas 2015). WHO estimates that in 2030 the number of sufferers of Diabetes Mellitus in Indonesia will be ranked 4th same like in 2000 but with the number of sufferers increasing from 8.4 million in 2000 to 21.3 million in 2030 among the 10 largest countries with diabetes mellitus (WHO, 2016). Diabetes with complicated deaths (6.7%) is the third highest cause of death in Indonesia (SRS, 2014). The percentage of deaths due to Diabetes in Indonesia is the second highest after Sri Lanka, the prevalence of Diabetics in Indonesia shows an increase from 5.7% in 2007 to 6.9% in 2016 (Riskesdas, 2016). The prevalence of diabetes mellitus in North Sumatera has increased from 2013 (1.3%) to (1.5%) in 2018 (Ministry of Health, 2018). Looking at this data, it is clear that Diabetes Mellitus has an impact on the quality of resources as well as a considerable increase in health costs, therefore it is necessary to control Diabetes Mellitus, one of which is to reduce diabetes risk factors (Ministry of Health, 2015).

The prevalence of Diabetes Mellitus based on a doctor's diagnosis increased from 6.9% in 2013 to 8.5% in 2018. In fact, only 25% of the Indonesian population knows that their condition is suffering from Diabetes Mellitus (The Indonesian Ministry of Health, 2020). From this data, it can be seen that the health screening carried out in Indonesia has not been maximized. Therefore, health screening is very important to be carried out effectively and efficiently so that people can know their actual condition. In addition, it is necessary to know the risk factors that may occur after screening is carried out. Risk factors are an important measure in overcoming non-communicable diseases, including Diabetes Mellitus. Without knowing the risk factors, disease control cannot be carried out optimally. Then, physical activity also contributes to preventing and managing noncommunicable diseases such as Diabetes Mellitus (WHO, 2020). Thus, researchers are interested in conducting a study entitled "Screening of Diabetes Mellitus and Physical Activity Analysis : a Stepwise WHO Approach. The purpose of this study was to determine the general risk factors and specific activities of Diabetes Mellitus in Medan City, North Sumatra Province.

METHOD

The method in this research is a quantitative method with cross-sectional design. The analysis in this research is descriptive analysis with frequency distribution and central distribution. The research site was conducted in Medan, North Sumatra. When the research is in 2019. A total of 799 people were selected and invited to participate in this research. The inclusion criteria were people aged 25 to 64 years. The exclusion criteria were pregnant

women and people who were experiencing infection.

This research works in conjunction with several licensed screening checkpoints in Medan city parks so that the samples taken are people who volunteer to come for inspection. Thus the sampling technique used in this research was accidental sampling. Before being examined, the community filled out the approval form. To find out the participants were in the age range of 25 to 64 years, it was seen from the participant's identity card (KTP). Data collection related to blood biochemistry was collected by health workers at the screening post.

The method of data collection is carried out in this research, namely using primary data collected and processed by the researcher directly from the subject and the object of research. Research instruments using the Stepwise WHO questionnaire (WHO, 2004). The WHO stepwise questionnaire contains 3 examinations.

The first examination is about demographic data (gender, age, latest education, occupation) which is measured by the questions in the WHO stepwise questionnaire. The second examination is regarding physical activity data (High Intensity Physical Activity at Workplace, Moderate Intensity Physical Activity at Workplace, High Intensity Exercise, Medium Intensity Exercise and Cycling) which is measured by the questions in the WHO stepwise questionnaire. The third examination is direct measurements namely: measurement of height using the Stature Meter (stadiometer), weight measurement using scales, measuring cholesterol levels using cholesterol check tool, measurement of current level of glucose with blood sugar check tool, blood pressure measurements with a Spigmomanometer with a cuff type on the upper arm. Univariate analysis was carried out in this research to describe the distribution and frequency of each variable. Furthermore, bivariate analysis was also carried out in this research to see the risk factors for diabetes mellitus using the *Chi Square* test.

RESULT

Table 1. Risk Factors for Diabetes Mellitus Incidence Based on the Demographic Characteristics

Variable	n	Glucose		Sig	PR	95% CI of OR	
		High	Normal			lower	Upper
Gender							
Man	358 (44.8%)	77 (21.5%)	281 (78.5%)	0.286	0.870	0.673	1.124
Woman	441 (55.2%)	109 (24.7%)	332 (75.3%)				
Age (years)							
60-64	53 (6.6%)	17 (32.1%)	36 (67.9%)	0.001*	6.768	2.339	10.342
55-59	76 (9.5%)	27 (35.5%)	49 (64.5%)	0.001*	7.897	2.704	10.975
50-54	160 (20%)	49 (30.6%)	111 (69.4%)	0.001*	6.327	2.395	9.207
45-49	100 (12.5%)	24 (24.0%)	76 (76%)	0.001*	4.526	1.788	7.572
40-44	119 (14.9%)	30 (25.2%)	89 (74.8%)	0.001*	4.831	1.913	7.811
35-39	79 (9.9%)	15 (19.0%)	64 (81.0%)	0.005*	3.359	1.336	6.343
30-34	74 (9.3%)	15 (20.3%)	59 (79.7%)	0.003*	3.644	1.430	6.758
25-29	138 (17.3%)	9 (6.5%)	129 (93.5%)	reference	reference	reference	reference
Last Education							
No education	2 (0.3%)	0 (0%)	2 (100%)	0.481	0	1.177	1.325
Primary School	63 (7.9%)	26 (41.27%)	37 (58.73%)	0.001*	3.727	1.578	5.053
Junior High School	79 (9.9%)	19 (24.05%)	60 (75.95%)	0.426	8.270	0.764	1.907
Senior High School	379 (47.4%)	86 (22.69%)	293 (77.31%)	0.395	8.923	0.843	1.538

Variable	n	Glucose		Sig	PR	95% CI of OR	
		High	Normal			lower	Upper
College	276 (34.5%)	55 (19.93%)	21 (80.07%)	reference	reference	reference	reference
Occupation							
Housewife	236 (29.5%)	58 (24.6%)	178 (75.4%)	0.093	0.944	0.387	1.043
Self-employment	261 (32.7%)	62 (23.8%)	199 (76.2%)	0.070	0.987	0.375	1.005
Government Officials	170 (21.3%)	40 (23.5%)	130 (76.5%)	reference	reference	reference	reference
Non Government Officials	71 (8.9%)	8 (11.3%)	63 (88.7%)	0.076	2.423	0.362	1.022
Private employees	30 (3.8%)	6 (20%)	24 (80%)	0.001*	1.231	0.547	2.529
Unemployment	31 (3.9%)	12 (38.7%)	19 (61.3%)	0.109	0.487	0.223	1.199

* Information: The variable is significant at 5% alpha

Based on table 1, it is known that the sex distribution of all participants shows that the majority of the participants' gender are women as many as 441 (55.2%) with a significance value of 0.286; meaning that there is no relationship between Gender with people having high blood sugar.

Age distribution shows the majority of lparticipants aged are 50-54 years, as many as 160 participants (20%) with a significance value of 0.001; PR: 6.327 and CI: 2.395-9.207. The 55-59 age category was the age category that had the highest PR value, namely 7.897 with a significance value of 0.001 and CI: 2.704-10.975. Furthermore, the distribution of the latest education shows that the majority of participants have the latest education at the high school level, namely 379 participants (47.4%) with a significance value of 0.395; PR: 8.923 and CI: 0.843-1.538. Participants who had the latest education at the elementary level had a relationship with the risk of diabetes mellitus with a significance value of 0.001, PR: 3.727 and CI: 1.578-5.053. The majority of the participants worked as entrepreneurs, namely 261 participants (32.7%) with a significance (Pvalue of 0.070) meaning that there is no relationship between enterlreneurs with people having high blood sugar. Participants who work as private employees have a relationship with the risk of diabetes mellitus with a significance value of 0.001, PR: 1.230 and CI: 0.132-0.641.

Table 2. Risk Factors for Diabetes Mellitus Based on the physical activity of the participants

Variable	n	Glucose		Sig	PR	95% CI of PR	
		High	Normal			lower	Upper
High Intensity Physical Activity in The Workplace							
Yes	40 (5%)	0 (0.0%)	40 (100%)				
No	759 (95%)	112 (14%)	647 (85.3%)	0.355	1.173	1.079	1.275
Moderate intensity physical activity							

Variable	n	Glucose		Sig	PR	95% CI of PR	
		High	Normal			lower	Upper
in The Workplace							
Yes	224 (28%)	16 (2%)	248 (31%)	0.108	0.338	0.180	1.425
No	575 (72%)	96 (12%)	439 (55%)				
High intensity exercise							
Yes	40 (5%)	0 (0.0%)	40 (100%)				
No	759 (95%)	112 (14%)	647 (85.3%)	0.355	0.853	0.777	0.918
Moderate exercise intensity							
Yes	224 (28%)	199 (88.8%)	25 (11.2%)	0.663	0.947	0.136	3.237
No	575 (72%)	484 (84.2%)	91 (15.8%)				
Cycling							
Yes	343 (43%)	32 (9.3%)	311 (90.7%)	0.240	1.886	0.640	8.069
No	456 (57%)	80 (17.5%)	376 (82.5%)				

Based on table 2, it is known that the distribution of participants who did High Intensity Physical Activity in the Workplace were 40 participants (5%) and did not do High Intensity Physical activity in the Workplace was 759 participants (95%) with a significance value of 0.355 meaning that there is no relationship between High Intensity Physical activity at Workplace with people having high blood sugar.

The distribution of participants who did the moderate intensity physical activity at Workplace were 224 participants (28%) and did not do moderate intensity physical activity at Workplace were 575 participants (72%) with a significance value of 0.3338 that means there is no relationship between not doing moderate intensity physical activity at work with people having high blood sugar.

The distribution of participants who did high intensity exercise were 40 participants (5%) and did not do high intensity exercise were as many as 759 participants (95%) with a significance value of 0.355 that means there is no relationship between not doing high intensity exercise with people having high blood sugar.

Then, the distribution of participants who did moderate intensity exercise were 224 participants (28%) and did not do moderate intensity exercise were 575 participants (72%) with a significance value of 0.663 that means there is no relationship between not doing moderate intensity exercise with people having high blood sugar.

The distribution of participants who did exercise cycling were 343 participants (43%) and did not exercise cycling were 456 participants (72%) with a significance value of 0.355 that means there is no relationship between cycling with people having high blood sugar.

Tabel 3. Risk Factors for Diabetes Mellitus Based on the physical Behavioral of the participants

Variable	N	Glucosa		Sig	PR	95% CI of PR	
		High	Normal			Lower	Upper
Smoking							
Yes	237 (29.7%)	57 (24.1%)	180 (75.9%)	0.738	1.048	0.798	1.376

Variable	N	Glucosa		Sig	PR	95% CI of PR	
		High	Normal			Lower	Upper
No	562 (70.3%)	129(22.9%)	433(77.04%)				
Fruit consumption a day (portion)							
Do not consume	30 (3.75%)	5 (16.7%)	25 (83.3%)	0.331	0.611	0.296	1.547
1	153 (19.14%)	30(19.60%)	123 (80.39%)	0.236	0.746	0.543	1.167
2	187 (23.4%)	44 (23.52%)	143 (76.47%)	0.786	3.130	0.686	1.331
3	157 (19.64%)	40 (25.47%)	117(74.52%)	0.845	1.229	0.737	1.451
≥4	272 (34.04%)	67 (24.63%)	205 (75.36%)	Reference	Reference	Reference	Reference
Consumption of vegetables a day (portion)							
Do not consume	61 (7.63%)	37(60.65%)	24(39.34%)	0.000*	6.294	2.383	3.989
1	31 (3.87%)	10(33.5%)	21(67.74%)	0.089	1.944	0.961	2.798
2	38(4.75%)	8(21.05%)	30 (78.94%)	0.836	1.088	0.566	2.021
3	54(6.75%)	10 (18.51%)	44(81.48%)	0.837	0.927	0.526	1.684
≥4	615(76.97%)	121 (19.67%)	494 (80.32%)	Reference	Reference	Reference	Reference

* Information: The variable is significant at 5% alpha

Based on table 3, it is known that distribution of participants who smoking as many as 57 participants (24.1%) with a significance value of 0.738 that means there is no relationship between smoking and the risk of people having high blood sugar.

The distribution of participants who rarely ate fruit was 5 participants (16.7%) with a significance value of 0.331 that means there is no relationship between rarely ate fruit and the risk of people having high blood sugar.

Then the distribution of participants who rarely consumed vegetables was 37 participants (60.65%) with a significance value of 0.000; PR: 6.294 and CI: 2.383-3.989. Then the distribution of participants who rarely consume vegetables is 37 participants (60.65%) with a significance value of 0.000; PR: 6.294 and CI: 2.383-3.989. It means that there is a relationship between rarely eating vegetables and the risk of people having high blood sugar.

Tabel 4. Diabetes Mellitus Risk Factors Based on Biochemical Measurements

Variable	N	Glucose		Sig	PR	95% CI of PR	
		High	Normal			Lower	Upper
IMT							
Normal	272 (34.04%)	46 (16.91)	226 (83.08%)	Refrence	Reference	Reference	Reference
Under weight	31 (3.87%)	6 (19.35%)	25 (80.64%)	0.732	1.179	0.532	2.460
Over Weight	85 (10.63%)	17 (20%)	68 (80%)	0.514	2.197	0.717	1.950
Obesity	411 (51.43%)	117 (28.46)	294(71.53%)	0.001	1.955	1.241	2.283

This measurement of high blood sugar levels refers to the theory of the Indonesian Ministry of Health which states that high blood sugar levels are> 140 mg/dl. Based on table 4. It is known that 51.4% were obese where as many as 117 participants (62.9%) of them had high blood sugar levels with a significance value of 0.001; PR 1.955 and CI: 1.241-2.283. It means that there is a relationship between obese with the risk of people having high blood sugar.

DISCUSION

Risk Factors for Diabetes Mellitus Based on Demographic Characteristics

m. Age
The results of this research indicate that the age of 55-59 years has a significant relationship with the incidence of diabetes mellitus with a significance value of 0.001, where 27 participants (35.5%) who are in this age category have high blood sugar levels. This is in line with Yosmar's research (2018) which reported that age has a close relationship with an increase in blood sugar, meaning that the older you get, the risk of experiencing type 2 diabetes is higher.

At the age of 55-59 years, a person will be 7.897 times more likely to suffer from diabetes mellitus. This is in line with Isnaini's research (2018) which showed that age $\geq$ 45 years has a significant relationship with the incidence of type 2 diabetes mellitus (p value = 0.010; OR: 0.312 and CI: 0.126-0.770). Age causes a decrease in all body systems, including endocrine, where this causes insulin to be in a state of resistance so that blood sugar becomes unstable (Isnaini, 2018). In addition, the older a person is, there will be a decrease in mitochondrial activity in muscle cells by 35%, where this decrease will cause an increase in fat levels in muscle by 30% and lead to insulin resistance (Sari, 2019). 40 years generally do not realize that he has diabetes mellitus (Susanti 2018).

n. Education
The results of this research indicate that participants who have the latest education at the Primary School level have a relationship with the risk of diabetes mellitus with a significance value of 0.001, PR: 3.727 and CI: 1.578-5.053. This means that people who have last primary school education will be 3,727 times more likely to suffer from diabetes mellitus. In this research it can be seen in Table 1 that as many as 26 participants (41.27%) in the last elementary education category had diabetes mellitus. This research is in line with Isnaini's research (2018) that low education has a significant relationship to the incidence of type 2 diabetes mellitus (p value = 0.007; OR: 0.272 and CI: 0.103-0.721). Education is related to health knowledge that a person has (Sriyono, 2015). With health knowledge, people will have awareness in maintaining their health (Notoadmojo, 2010).

Research conducted by Yosmar (2018) also showed the same thing as the results of this research, namely that there is a relationship (p value = 0.000) of the level of education to the risk of the incidence of type 2 diabetes mellitus. When a person has low education, their knowledge of health will be low so that it increases the risk of diabetes mellitus (Notoadmojo, 2010).

o. Occupation
Type of occupation is also closely related to the incidence of Diabetes mellitus, where a person's occupation affects a person's level of physical activity (Sari, 2019). This research shows the results that work as an private employees has a relationship with the incidence of diabetes mellitus with a significance value of 0.001, PR: 1.231 and CI: 0.132-0.641. This means that people who work as private employees have a risk of 1,231 times higher than people who do not work as private employees. In the occupation category as private employees, as many as 6 participants (20%) who suffer from diabetes mellitus. This may occur because of being busy at work causing a person's eating frequency to be irregular and eating out of control (Sukmaningsih, 2016).

Risk Factors for Diabetes Mellitus Based on Physical Activity

Physical activity is the movement of limbs that produces simple energy which is very important for the body, spirit and the quality of a healthy lifestyle (Sherly, 2015), besides that physical activity is also a major determinant of energy expenditure so it is important for energy balance and weight control. Based on Riskesdas 2018 data, non-communicable diseases were caused by the proportion of less physical activity of 35.5%. Inadequate physical activity is one of the ten main risk factors for global death (The Indonesian Ministry of Health, 2018).

Physical activity can control blood sugar in the body. Glucose will be converted into energy during physical activities. In people who rarely do physical activity such as exercising, all the food substances that enter the body will not be burned, but stored in the body as fat and sugar. If the insulin in the body is not enough to convert glucose into energy, it can cause diabetes mellitus (Agusti, 2017). Isnaini's research (2018) states that diabetes mellitus occurs due to several risk factors, namely lack of physical activity, genetic factors, unhealthy lifestyles, and smoking behavior. This was also reported in Riskesdas 2018 that people who do not do physical activity (20-30%) are more at risk of contracting non-communicable diseases and even causing death (The Indonesian Ministry of Health, 2018).

The physical activity variables in this research were categorized into 5, namely high intensity physical activity in the Workplace, moderate intensity physical activity in the Workplace, cycling, high intensity exercise and moderate intensity exercise. But this research shows that there is no significant relationship between the participants' physical activity and the incidence of diabetes mellitus. That is, physical activity is not a risk factor for diabetes mellitus. This is inversely proportional to the results of Adriani's research (2017) which showed that there was a relationship between physical activity and fasting blood sugar levels of participants with type 2 Diabetes Mellitus with p value = 0.000.

It's also inversely proportional to the results of Sari's research (2019) which showed that there was a relationship between physical activity and fasting blood sugar levels of participants Diabetes Mellitus with p value = 0.009. Where in Sari's (2019) study most of the participants were in the non-working group and were also female. This group is housewives. Therefore, based on the results of this study, the researchers assessed that physical activity was not a risk factor for diabetes mellitus because the majority of participants in this study were not housewives but they were a group of workers, whose occupations included self employment (32.7%), Government Officials 170 (21.3%), Non Government Officials (8.9%) and Private employees (3.8%) compared to participants who were only a housewife (29.5%).

Risk Factors for Diabetes Mellitus Based on Participants' Physical Behavior in Vegetable Consumption

This research in Medan City shows that participants who rarely consume are at risk of suffering from diabetes mellitus with a significance value of 0.000; PR = 6,294. These findings indicate that rarely eating vegetables makes individuals at risk of 6,294 times to suffer from Diabetes Mellitus.

Supported by previous research that consumption of vegetables and fruit has a relationship with increased blood sugar levels obtained p = 0.037 less than 0.05 (Susi, 2017). It is because the consumption of fruits and vegetables can reduce the risk of developing Diabetes Mellitus. Consumption of fiber found in vegetables can reduce insulin resistance in the body. When a person has eaten foods that contain fiber, it can make a person feel full and can delay hunger and slow down the intake of glucose in the blood. Increased glucose occurs because foods containing fiber can reduce total cholesterol levels in the body because there is a hypocholesterolemic effect that can reduce cholesterol absorption (Susi, 2017).

Risk Factors for Diabetes Mellitus Based on Biochemical Measurements

Participants were categorized as obese with BMI's status > 25. In this research, the calculation of PR 1.955 means that obese people will be at risk of 1.955 to suffer from diabetes. Obesity is a risk factor that plays an important role in diabetes mellitus. A person who is obese in his body accumulates excess fat. Fat tissue is an active endocrine tissue that can release adipose cytokines. These adipose cytokines have a proinflammatory effect and can interfere with insulin signaling pathways which can lead to insulin resistance. This situation causes an increase in blood glucose levels in a person (Putri, 2015). A research was conducted by Kabosu (2019) at Bhayangkara Hospital, Kupang City showed that subjects who were obese had 3,826 times greater risk of suffering from type 2 diabetes than subjects who were not obese. It's also in line with Trisnawati's research

(2013) that showed obesity had a significant relationship with the incidence of diabetes mellitus where participants who were obese were 4.43 times greater than those who were not obese.

The results showed that the participants who were obese were 51.4%. Diabetes Mellitus sufferers are expected to be able to control their blood sugar levels properly by adjusting the diet of each patient according to the 3J principle, namely jumlah makanan (the amount of food), jenis makanan (type of food), and jadwal makan yang teratur (a regular eating schedule).

CONCLUSION

Risk factors for the incidence of diabetes mellitus in this researchs included age with the most risk age category in the 55-59 years age category, last primary school education, work as a private employees and not consuming vegetables. The advice given by researchers to reduce high blood sugar levels is that local health workers should provide health education through outreach to the community, especially the people of Medan City about how to reduce the risk of increased blood sugar or diabetes mellitus. In addition, participants or the community are expected to be able to maintain a good diet, namely by implementing balanced nutrition, especially paying attention to adequate vegetable consumption.

AKNOWLEDGEMENT

REFERENCES

Agusti, Nur. et al. (2017). Survey of risk factors for non-communicable diseases in 2017 Halu Oleo University students. *Jimkesmas*. 2(6). DOI: http://dx.doi.org/10.37887/jimkesmas.v2i6.2878. Available at : http://ojs.uho.ac.id/index.php/JIMKESMAS/article/view/2878.

International Diabetes Federation (IDF). (2015). IDF Diabetes Atlas Seventh Edition 2015. Brussels: International Diabetes Federation

Isnaini, Nur, Ratnasari. (2018). Risk Factors Was Affects of Diabetes Mellitus Type. Journal of Nursing and Midwifery Aisyiyah. 14 (1). DOI: https://doi.org/10.31101/jkk.550. Available at : https://ejournal.unisayogya.ac.id/ejournal/index.php/jkk/article/view/550.

Kabosu, Renata Aryndra Sukma., et al. (2019). Risk Factors for Type Two Diabetes Mellitus at Bhayangkara Hospital, Kupang City. Timorese Journal of Public Health, 1(1), pp. 11-23. DOI: https://doi.org/10.35508/tjph.v1i1.2122. Available at : https://ejurnal.undana.ac.id/TJPH/article/view/2122study

Notoadmodjo, S. (2010). Behavioral Health Sciences. Jakarta: Rineka Cipta.

Putri, Andi Fadilah Yusran., *et al.* (2015). The Relationship between Obesity Degree and Fasting Blood Sugar Levels in Communities in Batung Taba Village and Korong Gadang Village, Padang City. *Jurnal Kesehatan Andalas,* 4(3), pp. 707-711. DOI: https://doi.org/10.25077/jka.v4i3.351.

Riley, Leanne. Et al. (2016). The Wold Health Organization STEPwise Approach To Noncommunicable Disease Risk-Factors Surveillance: Methods, Challenges, and Opportunities. *American Journal of Public Health, 106(1), pp. 74–78.* DOI : 10.2105/AJPH.2015.302962

Sari, Nonita & Agus Purnama. (2019). Physical Activity and Its Relationship with the Incidence of Diabetes Mellitus. Window of Health : Jurnal Kesehatan, 2(4), pp. 368-381. Availabe at : http://jurnal.fkmumi.ac.id/index.php/woh/article/view/woh2408.

Sukmaningsih, Wahyu Ratri. (2016). Risk Factors for Type II Diabetes Mellitus in the Work Area of Puskesmas Purwodiningratan Surakarta. Muhammaddiyah University Surakarta. *Muhammadiyah Surakarta University.* Available at : http://eprints.ums.ac.id/42800/.

Susi, N. (2017). Differences in consumption of vegetables and fruit in normal subjects and people with type 2 diabetes mellitus. *Darussalam Nutrition Journal,* 1(2), pp. 37-44. DOI: http://dx.doi.org/10.21111/dnj.v1i2.1344.

The Indonesian Ministry of Health. (2015). Disease, Control; Environment, Health. Technical guidelines for Measuring Risk Factors for Diabetes Mellitus.

The Indonesian Ministry of Health. (2016). Basic Health Research (RISKESDAS) 2016. Jakarta: Health research and development agency.

The Indonesian Ministry of Health. (2017). Non-communicable disease control program.

The Indonesian Ministry of Health. (2018). Basic Health Research (RISKESDAS) 2018. Jakarta: Health research and development agency

The Indonesian Ministry of Health. (2020). Stay Productive, Prevent and Overcome Diabetes Mellitus. Data and Information Center of The Indonesian Ministry of Health (INFODATIN).

Trisnawati, S. K. & Setyorogo, S. (2013). Risk Factors for Type 2 Diabetes Mellitus at the Cengkareng District Health Center, West Jakarta, 2012. *Jurnal Ilmiah Kesehatan*, 5(1), pp. 6-11. Available at : https://docplayer.info/29559379-Faktor-risiko-kejadian-diabetes-melitus-tipe-ji-di-puskesmas-kecamatan-cengkareng-jakarta-barat-tahun-2012.html

WHO. (2004). WHO STEPS Instrument (Core and Expanded). Available at : https://www.who.int/ncds/surveillance/steps/STEPS_Instrument_v2.1.pdf

WHO. (2014). Global Report On Diabetes. France: World Health Organization.

WHO. (2015). Global Report On Diabetes. France: World Health Organization.

WHO. (2016). Global Report On Diabetes. France: World Health Organization.

WHO. (2020). Physical activity. Available at : https://www.who.int/news-room/fact-sheets/detail/physical-activity

Yosmar, et al. Survey of Diabetes Mellitus Risk to the Community of Padang City. *Jurnal Sains Farmasi & Klinis*, 5(2), pp. 134–141. DOI : 10.25077/jsfk.5.2.134-141.2018. Available at :http://jsfk.ffarmasi.unand.ac.id/index.php/jsfk/article/view/261.

M Gmail

Zata Ismah <zataismah@gmail.com>

Editing and layout process
2 pesan

Unnes Journal Of Public Health <ujph@mail.unnes.ac.id>   24 Juli 2022 pukul 20.46
Kepada: Zata Ismah <zataismah@gmail.com>

Dear Author,

We are in the editing and layout process. We need you to check the attached file. Please confirm if there is any problem. We wait for your response until 27 July 2022; 11:00 PM (Jakarta Time).
Thank you.

Best regards,
Fitri Indrawati

--
===
Unnes Journal of Public Health
Jurusan Ilmu Kesehatan Masyarakat, Universitas Negeri Semarang
Gedung F5 Lantai 2, Kampus UNNES Sekaran, Gunungpati, Semarang 50229
Indonesia
https://journal.unnes.ac.id/sju/index.php/ujph

📄 **SL Zata.pdf**
256K

Zata Ismah <zataismah@gmail.com>   25 Juli 2022 pukul 11.11
Kepada: Unnes Journal Of Public Health <ujph@mail.unnes.ac.id>

Dear editor,
Dari saya sudah bagus, utk sementara ini tidak ada perbaikan 🙏

Terimakasih.

| Unnes Journal of Public Health ▾ | Tasks 0 | | | English | View Site | zata |

| | | | | Submission Library | View Metadata |

Screening of Diabetes Mellitus and Physical Activity Analysis: A Stepwise WHO Approach
Zata Ismah, Citra Cahyati Nst, Wahidah Wahidah

Submission   **Review**   **Copyediting**   **Production**

Copyediting Discussions   **Add discussion**

Name	From	Last Reply	Replies	Closed
Mohon diperiksa ulang sebelum kami publish	fitriindrawati Jul/24	-	0	☐

Mohon diperiksa ulang sebelum kami publish   ✕

Participants

Fitri Indrawati (fitriindrawati)

zata ismah (zata)

Messages

Note	From
Yth Author, Mohon diperiksa ulang sebelum kami publish 📄 fitriindrawati, SL Zata.pdf	fitriindrawati Jul 24

M Gmail

Zata Ismah <zataismah@gmail.com>

[UJPH] New notification from Unnes Journal of Public Health
2 pesan

Fitri Indrawati <fitriindrawati@mail.unnes.ac.id>   24 Agustus 2022 pukul 10.48
Balas Ke: Fitri Indrawati <ujph@mail.unnes.ac.id>
Kepada: zata ismah <zataismah@gmail.com>

You have a new notification from Unnes Journal of Public Health:

You have been added to a discussion titled "Similarity check-13%" regarding the submission "Screening of Diabetes Mellitus and Physical Activity Analysis: A Stepwise WHO Approach".

Link: https://journal.unnes.ac.id/sju/index.php/ujph/authorDashboard/submission/43809

Fitri Indrawati

| Unnes Journal of Public Health ▾ | Tasks 0 | | @ English | 👁 View Site | 👤 za |

| | Submission Library | View Metadata |

UNNES Journal of Public Health

Submissions

Screening of Diabetes Mellitus and Physical Activity Analysis: A Stepwise WHO Approach
Zata Ismah, Citra Cahyati Nst, Wahidah Wahidah

Submission **Review** **Copyediting** **Production**

Production Discussions				**Add discussion**
Name	From	Last Reply	Replies	Closed
Similarity check-13%	fitriindrawati Aug/24	-	0	☐
Copyright form	fitriindrawati Aug/24	-	0	☐

Similarity check-13%   ✕

Participants

Fitri Indrawati (fitriindrawati)

zata ismah (zata)

Messages

Note	From
Similarity check-13%	fitriindrawati Aug 24
📄 fitriindrawati, Screening of Diabetes Mellitus and Physical Activity Analysis a Stepwise WHO Approach.pdf	

Add Message

Screening of Diabetes Mellitus and Physical Activity Analysis a Stepwise WHO Approach

by Zata Ismah

Screening of Diabetes Mellitus and Physical Activity Analysis : a Stepwise WHO Approach

Zata Ismah[1] , Citra Cahyati Nst[1,] Wahidah[1] ,Emma Novita[2], Nofi Susanti[1]

[1]Public Health Faculty of State Islamic University of North Sumatra
[2]Medical Faculty of Sriwijaya University

Article Info	Abstract
	Abstract : The largest number of diabetics is estimated to come from Southeast Asia and the West Pacific, accounting for about half of diabetes cases in the world. The purpose of this research was to determine the general risk factors and specific activities of Diabetes Mellitus in Medan City, North Sumatra Province. This research method is a quantitative method with a cross-sectional design. Univariate and Bivariate analysis using the *Chi Square* test were carried out in this research. 799 participants were recruited using accidental sampling technique. The place of this research was conducted in Medan City, North Sumatra Province. The results of this research indicate that age 55-59 years, last elementary school education, work as an entrepreneur and not eating vegetables are risk factors for diabetes mellitus in this research. It is suggested that local health workers provide health education through outreach to the community, especially the people of Medan City, on how to reduce the risk of increased blood sugar or diabetes mellitus incidence. In addition, participants or the community are expected to be able to maintain a good diet, namely by implementing balanced nutrition, especially paying attention to adequate vegetable consumption. Keywords : NCD, Stepwise WHO, Diabetes Melitus.

Copartisipance Address:
Medan, Indonesia
E-mail: zataismah@uinsu.ac.id

I

52

INTRODUCTION

World Health Organization (WHO) estimates that, globally 422 million adults aged over 18 years lived with diabetes in 2014. The largest number of people with diabetes is estimated to come from Southeast Asia and the Western Pacific, accounting for about half the cases of diabetes in the world. Worldwide, the number of diabetics has increased substantially between 1980 and 2014, increasing from 108 million to 422 million or about four times as much (WHO, 2014). Furthermore, the number of people with Diabetes Mellitus in 2015 was 415 million and it is estimated that in 2040 it will increase to 642 million people globally (International Diabetes Federation, 2015).

Diabetes in Southeast Asia in 2014 there were 96 million adults with Diabetes in 11 member countries in the Southeast Asia region. The prevalence of diabetes among adults in the Southeast Asian region increased from 4.1% in the 1980s to 8.6% in 2014 (WHO, 2014). Diabetes caused 1.5 million deaths in 2012. Blood sugar higher than the maximum limit resulted in an additional 2.2 million deaths, by increasing the risk of cardiovascular and other diseases. Forty-three percent (43%) of these 3.7 million deaths occurred before the age of 70 years. The percentage of deaths due to diabetes that occurs before the age of 70 is higher in low and middle income countries than in high income countries (WHO, 2016).

The incidence of diabetes in the world in 2015, there were 415 million adults from countries: North America, the Caribbean, South and Middle America, Africa, the Middle East, North Africa, the Western Pacific, Europe diabetes increased 4-fold from 108 million in 1980s. By 2040 it is estimated that the number will be 642 million (IDF Atlas 2015). Nearly 80% of people with diabetes are in low and middle income countries. In 2015, the percentage of adults with diabetes was 8.5% (1 out of 11 adults with Diabetes) (WHO, 2015). The Stepwise data functions among others, as information, the new NCD risk factor finder and a reference for the government for future state-level NCD countermeasures. In addition, the benefits of using Stepwise each country can have robust data on NCD risk factors and can be used as a government program in overcoming priority NCD in the last 15 years, for example Togo, Benin, Mauritania and Cabo Verde (Riley, 2016).

In 2015, Indonesia ranked seventh in the world for the highest prevalence of Diabetes along with China, India, the United States, Brazil, Russia and Mexico with an estimated number of people with diabetes of 10 million people (IDF Atlas 2015). WHO estimates that in 2030 the number of sufferers of Diabetes Mellitus in Indonesia will be ranked 4th same like in 2000 but with the number of sufferers increasing from 8.4 million in 2000 to 21.3 million in 2030 among the 10 largest countries with diabetes mellitus (WHO, 2016). Diabetes with complicated deaths (6.7%) is the third highest cause of death in Indonesia (SRS, 2014). The percentage of deaths due to Diabetes in Indonesia is the second highest after Sri Lanka, the prevalence of Diabetics in Indonesia shows an increase from 5.7% in 2007 to 6.9% in 2016 (Riskesdas, 2016). The prevalence of diabetes mellitus in North Sumatera has increased from 2013 (1.3%) to (1.5%) in 2018 (Ministry of Health, 2018). Looking at this data, it is clear that Diabetes Mellitus has an impact on the quality of resources as well as a considerable increase in health costs, therefore it is necessary to control Diabetes Mellitus, one of which is to reduce diabetes risk factors (Ministry of Health, 2015).

The prevalence of Diabetes Mellitus based on a doctor's diagnosis increased from 6.9% in 2013 to 8.5% in 2018. In fact, only 25% of the Indonesian population knows that their condition is suffering from Diabetes Mellitus (The Indonesian Ministry of Health, 2020). From this data, it can be seen that the health screening carried out in Indonesia has not been maximized. Therefore, health screening is very important to be carried out effectively and efficiently so that people can know their actual condition. In addition, it is necessary to know the risk factors that may occur after screening is carried out. Risk factors are an important measure in overcoming non-communicable diseases, including Diabetes Mellitus. Without knowing the risk factors, disease control cannot be carried out optimally. Then, physical activity also contributes to preventing and managing noncommunicable diseases such as Diabetes Mellitus (WHO, 2020). Thus, researchers are interested in conducting a study entitled "Screening of Diabetes Mellitus and Physical Activity Analysis : a Stepwise WHO Approach. The purpose of this study was to determine the general risk factors and specific activities of Diabetes Mellitus in Medan City, North Sumatra Province.

METHOD

The method in this research is a quantitative method with cross-sectional design. The analysis in this research is descriptive analysis with frequency distribution and central distribution. The research site was conducted in Medan, North Sumatra. When the research is in 2019. A total of 799 people were selected and invited to participate in this research. The inclusion criteria were people aged 25 to 64 years. The exclusion criteria were pregnant women and people who were experiencing infection.

This research works in conjunction with several licensed screening checkpoints in Medan city parks so that the samples taken are people who volunteer to come for inspection. Thus the

53

sampling technique used in this research was accidental sampling. Before being examined, the community filled out the approval form. To find out the participants were in the age range of 25 to 64 years, it was seen from the participant's identity card (KTP). Data collection related to blood biochemistry was collected by health workers at the screening post.

The method of data collection is carried out in this research, namely using primary data collected and processed by the researcher directly from the subject and the object of research. Research instruments using the Stepwise WHO questionnaire (WHO, 2004). The WHO stepwise questionnaire contains 3 examinations.

The first examination is about demographic data (gender, age, latest education, occupation) which is measured by the questions in the WHO stepwise questionnaire. The second examination is regarding physical activity data (High Intensity Physical Activity at Workplace, Moderate Intensity Physical Activity at Workplace, High Intensity Exercise, Medium Intensity Exercise and Cycling) which is measured by the questions in the WHO stepwise questionnaire. The third examination is direct measurements namely: measurement of height using the Stature Meter (stadiometer), weight measurement using scales, measuring cholesterol levels using cholesterol check tool, measurement of current level of glucose with blood sugar check tool, blood pressure measurements with a Spigmomanometer with a cuff type on the upper arm. Univariate analysis was carried out in this research to describe the distribution and frequency of each variable. Furthermore, bivariate analysis was also carried out in this research to see the risk factors for diabetes mellitus using the *Chi Square* test.

RESULT AND DISCUSSION

Table 1. Risk Factors for Diabetes Mellitus Incidence Based on the Demographic Characteristics

Variable	n	Glucose		Sig	PR	95% CI of OR	
		High	Normal			lower	Upper
Gender							
Man	358 (44.8%)	77 (21.5%)	281 (78.5%)	0.286	0.870	0.673	1.124
Woman	441 (55.2%)	109 (24.7%)	332 (75.3%)				
Age (years)							
60-64	53 (6.6%)	17 (32.1%)	36 (67.9%)	0.001*	6.768	2.339	10.342
55-59	76 (9.5%)	27 (35.5%)	49 (64.5%)	0.001*	7.897	2.704	10.975
50-54	160 (20%)	49 (30.6%)	111 (69.4%)	0.001*	6.327	2.395	9.207
45-49	100 (12.5%)	24 (24.0%)	76 (76%)	0.001*	4.526	1.788	7.572
40-44	119 (14.9%)	30 (25.2%)	89 (74.8%)	0.001*	4.831	1.913	7.811
35-39	79 (9.9%)	15 (19.0%)	64 (81.0%)	0.005*	3.359	1.336	6.343
30-34	74 (9.3%)	15 (20.3%)	59 (79.7%)	0.003*	3.644	1.430	6.758
25-29	138 (17.3%)	9 (6.5%)	129 (93.5%)	reference	reference	reference	reference
Last Education							
No education	2 (0.3%)	0 (0%)	2 (100%)	0.481	0	1.177	1.325
Primary School	63 (7.9%)	26 (41.27%)	37 (58.73%)	0.001*	3.727	1.578	5.053
Junior High School	79 (9.9%)	19 (24.05%)	60 (75.95%)	0.426	8.270	0.764	1.907
Senior High School	379 (47.4%)	86 (22.69%)	293 (77.31%)	0.395	8.923	0.843	1.538
College	276 (34.5%)	55 (19.93%)	21 (80.07%)	reference	reference	reference	reference
Occupation							
Housewife	236 (29.5%)	58 (24.6%)	178 (75.4%)	0.093	0.944	0.387	1.043
Self-employment	261 (32.7%)	62 (23.8%)	199 (76.2%)	0.070	0.987	0.375	1.005
Government Officials	170 (21.3%)	40 (23.5%)	130 (76.5%)	reference	reference	reference	reference
Non Government Officials	71 (8.9%)	8 (11.3%)	63 (88.7%)	0.076	2.423	0.362	1.022

3

54

Variable	n	Glucose		Sig	PR	95% CI of OR	
		High	Normal			lower	Upper
Private employees	30 (3.8%)	6 (20%)	24 (80%)	0.001*	1.231	0.547	2.529
Unemployment	31 (3.9%)	12 (38.7%)	19 (61.3%)	0.109	0.487	0.223	1.199

* Information: The variable is significant at 5% alpha

Based on table 1, it is known that the sex distribution of all participants shows that the majority of the participants' gender are women as many as 441 (55.2%) with a significance value of 0.286; meaning that there is no relationship between Gender with people having high blood sugar.

Age distribution shows the majority of lparticipants aged are 50-54 years, as many as 160 participants (20%) with a significance value of 0.001; PR: 6.327 and CI: 2.395-9.207. The 55-59 age category was the age category that had the highest PR value, namely 7.897 with a significance value of 0.001 and CI: 2.704-10.975. Furthermore, the distribution of the latest education shows that the majority of participants have the latest education at the high school level, namely 379 participants (47.4%) with a significance value of 0.395; PR: 8.923 and CI: 0.843-1.538. Participants who had the latest education at the elementary level had a relationship with the risk of diabetes mellitus with a significance value of 0.001, PR: 3.727 and CI: 1.578-5.053. The majority of the participants worked as entrepreneurs, namely 261 participants (32.7%) with a significance (Pvalue of 0.070) meaning that there is no relationship between enterlreneurs with people having high blood sugar. Participants who work as private employees have a relationship with the risk of diabetes mellitus with a significance value of 0.001, PR: 1.230 and CI: 0.132-0.641.

Table 2. Risk Factors for Diabetes Mellitus Based on the physical activity of the participants

Variable	n	Glucose		Sig	PR	95% CI of PR	
		High	Normal			lower	Upper
High Intensity Physical Activity in The Workplace							
Yes	40 (5%)	0 (0.0%)	40 (100%)	0.355	1.173	1.079	1.275
No	759 (95%)	112 (14%)	647 (85.3%)				
Moderate intensity physical activity in The Workplace							
Yes	224 (28%)	16 (2%)	248 (31%)	0.108	0.338	0.180	1.425
No	575 (72%)	96 (12%)	439 (55%)				
High intensity exercise							
Yes	40 (5%)	0 (0.0%)	40 (100%)	0.355	0.853	0.777	0.918
No	759 (95%)	112 (14%)	647 (85.3%)				
Moderate exercise intensity							
Yes	224 (28%)	199 (88.8%)	25 (11.2%)	0.663	0.947	0.136	3.237
No	575 (72%)	484 (84.2%)	91 (15.8%)				
Cycling							
Yes	343 (43%)	32 (9.3%)	311 (90.7%)	0.240	1.886	0.640	8.069
No	456 (57%)	80 (17.5%)	376 (82.5%)				

Based on table 2, it is known that the distribution of participants who did High Intensity Physical Activity in the Workplace were 40 participants (5%) and did not do High Intensity Physical activity in the Workplace was 759 participants (95%) with a significance value of 0.355 meaning that there is no relationship between High Intensity Physical activity at Workplace with people having high blood sugar.

The distribution of participants who did the moderate intensity physical activity at Workplace were 224 participants (28%) and did not do moderate intensity physical activity at Workplace were 575 participants (72%) with a significance value

4

of 0.3338 that means there is no relationship between not doing moderate intensity physical activity at work with people having high blood sugar.

The distribution of participants who did high intensity exercise were 40 participants (5%) and did not do high intensity exercise were as many as 759 participants (95%) with a significance value of 0.355 that means there is no relationship between not doing high intensity exercise with people having high blood sugar.

Then, the distribution of participants who did moderate intensity exercise were 224 participants (28%) and did not do moderate intensity exercise were 575 participants (72%) with a significance value of 0.663 that means there is no relationship between not doing moderate intensity exercise with people having high blood sugar.

The distribution of participants who did exercise cycling were 343 participants (43%) and did not exercise cycling were 456 participants (72%) with a significance value of 0.355 that means there is no relationship between cycling with people having high blood sugar.

Tabel 3. Risk Factors for Diabetes Mellitus Based on the physical Behavioral of the participants

Variable	N	Glucosa		Sig	PR	95% CI of PR	
		High	Normal			Lower	Upper
Smoking							
Yes	237 (29.7%)	57 (24.1%)	180 (75.9%)	0.738	1.048	0.798	1.376
No	562 (70.3%)	129(22.9%)	433(77.04%)				
Fruit consumption a day (portion)							
Do not consume	30 (3.75%)	5 (16.7%)	25 (83.3%)	0.331	0.611	0.296	1.547
1	153 (19.14%)	30(19.60%)	123 (80.39%)	0.236	0.746	0.543	1.167
2	187 (23.4%)	44 (23.52%)	143 (76.47%)	0.786	3.130	0.686	1.331
3	157 (19.64%)	40 (25.47%)	117(74.52%)	0.845	1.229	0.737	1.451
≥4	272 (34.04%)	67 (24.63%)	205 (75.36%)	Reference	Reference	Reference	Reference
Consumption of vegetables a day (portion)							
Do not consume	61 (7.63%)	37(60.65%)	24(39.34%)	0.000*	6.294	2.383	3.989
1	31 (3.87%)	10(33.5%)	21(67.74%)	0.089	1.944	0.961	2.798
2	38(4.75%)	8(21.05%)	30 (78.94%)	0.836	1.088	0.566	2.021
3	54(6.75%)	10 (18.51%)	44(81.48%)	0.837	0.927	0.526	1.684
≥4	615(76.97%)	121 (19.67%)	494 (80.32%)	Reference	Reference	Reference	Reference

* Information: The variable is significant at 5% alpha

Based on table 3, it is known that distribution of participants who smoking as many as 57 participants (24.1%) with a significance value of 0.738 that means there is no relationship between smoking and the risk of people having high blood sugar.

The distribution of participants who rarely ate fruit was 5 participants (16.7%) with a significance value of 0.331 that means there is no relationship between rarely ate fruit and the risk of people having high blood sugar.

Then the distribution of participants who rarely consumed vegetables was 37 participants (60.65%) with a significance value of 0.000; PR: 6.294 and CI: 2.383-3.989. Then the distribution of participants who rarely consume vegetables is 37 participants (60.65%) with a significance value of 0.000; PR: 6.294 and CI: 2.383-3.989. It means that there is a relationship between rarely eating vegetables and the risk of people having high blood sugar.

Tabel 4. Diabetes Mellitus Risk Factors Based on Biochemical Measurements

Variable	N	Glucose		Sig	PR	95% CI of PR	
		High	Normal			Lower	Upper
IMT							
Normal	272 (34.04%)	46 (16.91)	226 (83.08%)	Refrence	Reference	Reference	Reference
Under weight	31 (3.87%)	6 (19.35%)	25 (80.64%)	0.732	1.179	0.532	2.460

56

Variable	N	Glucose		Sig	PR	95% CI of PR	
		High	Normal			Lower	Upper
Over Weight	85 (10.63%)	17 (20%)	68 (80%)	0.514	2.197	0.717	1.950
Obesity	411 (51.43%)	117 (28.46)	294(71.53%)	0.001	1.955	1.241	2.283

This measurement of high blood sugar levels refers to the theory of the Indonesian Ministry of Health which states that high blood sugar levels are> 140 mg/dl. Based on table 4. It is known that 51.4% were obese, where as many as 117 participants (62.9%) of them had high blood sugar levels with a significance value of 0.001; PR 1.955 and CI: 1.241-2.283. It means that there is a relationship between obese with the risk of people having high blood sugar.

Risk Factors for Diabetes Mellitus Based on Demographic Characteristics

Age

The results of this research indicate that the age of 55-59 years has a significant relationship with the incidence of diabetes mellitus with a significance value of 0.001, where 27 participants (35.5%) who are in this age category have high blood sugar levels. This is in line with Yosmar's research (2018) which reported that age has a close relationship with an increase in blood sugar, meaning that the older you get, the risk of experiencing type 2 diabetes is higher.

At the age of 55-59 years, a person will be 7.897 times more likely to suffer from diabetes mellitus. This is in line with Isnaini & Ratnasari's research (2018) which showed that age ≥ 45 years has a significant relationship with the incidence of type 2 diabetes mellitus (p value = 0.010; OR: 0.312 and CI: 0.126-0.770). Age causes a decrease in all body systems, including endocrine, where this causes insulin to be in a state of resistance so that blood sugar becomes unstable (Isnaini & Ratnasari, 2018). In addition, the older a person is, there will be a decrease in mitochondrial activity in muscle cells by 35%, where this decrease will cause an increase in fat levels in muscle by 30% and lead to insulin resistance (Sari & Purnama, 2019). 40 years generally do not realize that he has diabetes mellitus (Phillips et al., 2018).

Education

The results of this research indicate that participants who have the latest education at the Primary School level have a relationship with the risk of diabetes mellitus with a significance value of 0.001, PR: 3.727 and CI: 1.578-5.053. This means that people who have last primary school education will be 3,727 times more likely to suffer from diabetes mellitus. In this research it can be seen in Table 1 that as many as 26 participants (41.27%) in the last elementary education category had diabetes mellitus. This research is in line with Isnaini & Ratnasari's research (2018) that low education has a significant relationship to the incidence of type 2 diabetes mellitus (p value = 0.007; OR: 0.272 and CI: 0.103-0.721). Education is related to health knowledge that a person has (Wang et al., 2018). With health knowledge, people will have awareness in maintaining their health (Notoadmojo, 2010).

Research conducted by Yosmar (2018) also showed the same thing as the results of this research, namely that there is a relationship (p value = 0.000) of the level of education to the risk of the incidence of type 2 diabetes mellitus. When a person has low education, their knowledge of health will be low so that it increases the risk of diabetes mellitus (Notoadmojo, 2010).

Occupation

Type of occupation is also closely related to the incidence of Diabetes mellitus, where a person's occupation affects a person's level of physical activity (Sari & Purnama, 2019; Wulandari et al., 2019). This research shows the results that work as an private employees has a relationship with the incidence of diabetes mellitus with a significance value of 0.001, PR: 1.231 and CI: 0.132-0.641. This means that people who work as private employees have a risk of 1,231 times higher than people who do not work as private employees. In the occupation category as private employees, as many as 6 participants (20%) who suffer from diabetes mellitus. This may occur because of being busy at work causing a person's eating frequency to be irregular and eating out of control (Sukmaningsih, 2016; Shafitra et al., 2020).

Risk Factors for Diabetes Mellitus Based on Physical Activity

Physical activity is the movement of limbs that produces simple energy which is very important for the body, spirit and the quality of a healthy lifestyle (Widyasari & Turnip, 2019), besides that physical activity is also a major determinant of energy expenditure so it is important for energy balance and weight control. Based on Riskesdas 2018 data, non-communicable diseases were caused by the proportion of less physical activity of 35.5%. Inadequate physical activity is one of the ten main

6

57

risk factors for global death (The Indonesian Ministry of Health, 2018).

Physical activity can control blood sugar in the body. Glucose will be converted into energy during physical activities. In people who rarely do physical activity such as exercising, all the food substances that enter the body will not be burned, but stored in the body as fat and sugar. If the insulin in the body is not enough to convert glucose into energy, it can cause diabetes mellitus (Agusti, 2017). Isnaini & Ratnasari's research (2018) states that diabetes mellitus occurs due to several risk factors, namely lack of physical activity, genetic factors, unhealthy lifestyles, and smoking behavior. This was also reported in Riskesdas 2018 that people who do not do physical activity (20-30%) are more at risk of contracting non-communicable diseases and even causing death (The Indonesian Ministry of Health, 2018).

The physical activity variables in this research were categorized into 5, namely high intensity physical activity in the Workplace, moderate intensity physical activity in the Workplace, cycling, high intensity exercise and moderate intensity exercise. But this research shows that there is no significant relationship between the participants' physical activity and the incidence of diabetes mellitus. That is, physical activity is not a risk factor for diabetes mellitus. This is inversely proportional to the results of Amelia et al. research (2020) which showed that there was a relationship between physical activity and fasting blood sugar levels of participants with type 2 Diabetes Mellitus with p value = 0.000.

It's also inversely proportional to the results of Sari & Purnama's research (2019) which showed that there was a relationship between physical activity and fasting blood sugar levels of participants Diabetes Mellitus with p value = 0.009. Where in Sari & Purnama's (2019) study most of the participants were in the non-working group and were also female. This group is housewives. Therefore, based on the results of this study, the researchers assessed that physical activity was not a risk factor for diabetes mellitus because the majority of participants in this study were not housewives but they were a group of workers, whose occupations included self employment (32.7%), Government Officials 170 (21.3%), Non Government Officials (8.9%) and Private employees (3.8%) compared to participants who were only a housewife (29.5%).

Risk Factors for Diabetes Mellitus Based on Participants' Physical Behavior in Vegetable Consumption

This research in Medan City shows that participants who rarely consume are at risk of suffering from diabetes mellitus with a significance value of 0.000; PR = 6,294. These findings indicate that rarely eating vegetables makes individuals at risk of 6,294 times to suffer from Diabetes Mellitus.

Supported by previous research that consumption of vegetables and fruit has a relationship with increased blood sugar levels obtained p = 0.037 less than 0.05 (Nurohmi, 2017). It is because the consumption of fruits and vegetables can reduce the risk of developing Diabetes Mellitus. Consumption of fiber found in vegetables can reduce insulin resistance in the body. When a person has eaten foods that contain fiber, it can make a person feel full and can delay hunger and slow down the intake of glucose in the blood. Increased glucose occurs because foods containing fiber can reduce total cholesterol levels in the body because there is a hypocholesterolemic effect that can reduce cholesterol absorption (Nurohmi, 2017).

Risk Factors for Diabetes Mellitus Based on Biochemical Measurements

Participants were categorized as obese with BMI's status > 25. In this research, the calculation of PR 1.955 means that obese people will be at risk of 1.955 to suffer from diabetes. Obesity is a risk factor that plays an important role in diabetes mellitus. A person who is obese in his body accumulates excess fat. Fat tissue is an active endocrine tissue that can release adipose cytokines. These adipose cytokines have a proinflammatory effect and can interfere with insulin signaling pathways which can lead to insulin resistance. This situation causes an increase in blood glucose levels in a person (Putri et al., 2015). A research was conducted by Kabosu et al. (2019) at Bhayangkara Hospital, Kupang City showed that subjects who were obese had 3,826 times greater risk of suffering from type 2 diabetes than subjects who were not obese. It's also in line with Trisnawati & Setyorogo's research (2013) that showed obesity had a significant relationship with the incidence of diabetes mellitus where participants who were obese were 4.43 times greater than those who were not obese.

The results showed that the participants who were obese were 51.4%. Diabetes Mellitus sufferers are expected to be able to control their blood sugar levels properly by adjusting the diet of each patient according to the 3J principle, namely jumlah makanan (the amount of food), jenis makanan (type of food), and jadwal makan yang teratur (a regular eating schedule).

CONCLUSION

58

Risk factors for the incidence of diabetes mellitus in this researchs included age with the most risk age category in the 55-59 years age category, last primary school education, work as a private employees and not consuming vegetables. The advice given by researchers to reduce high blood sugar levels is that local health workers should provide health education through outreach to the community, especially the people of Medan City about how to reduce the risk of increased blood sugar or diabetes mellitus. In addition, participants or the community are expected to be able to maintain a good diet, namely by implementing balanced nutrition, especially paying attention to adequate vegetable consumption.

AKNOWLEDGEMENT

REFERENCES

Antimas, N.A., Lestari, H. & Ismail, C.S. 2017. Survey of Risk Factors for Non-Communicable Diseases in 2017 Halu Oleo University Students. *Jimkesmas*, 2 (6): 1-12. DOI: http://dx.doi.org/10.37887/jimkesmas.v2i6.2878. http://ojs.uho.ac.id/index.php/JIMKESMAS/article/view/2878.

Amelia, R., Harahap, J., Lelo, A., Ariga, R. & Harahap, N. *Effect of Physical Activity on Fasting Blood Sugar Level, HbA1c and Total Cholesterol among Type 2 Diabetes Mellitus Patients in Medan City, Indonesia.* In Proceedings of the International Conference of Science, Technology, Engineering, Environmental and Ramification Researches (ICOSTEERR 2018) - Research in Industry 4.0 (528-533). https://doi.org/10.5220/0010077205280533

International Diabetes Federation (IDF). 2015. *IDF Diabetes Atlas Seventh Edition 2015.* Brussels: International Diabetes Federation

Isnaini, N. & Ratnasari. 2018. Risk Factors Was Affects of Diabetes Mellitus Type. *Jurnal Kebidanan dan Keperawatan Aisyiyah*, 14 (1): 59-68. DOI: https://doi.org/10.31101/jkk.550. Available at : https://ejournal.unisayogya.ac.id/ejournal/index.php/jkk/article/view/550.

Kabosu, R.A.S., Adu, A.A. & Hinga, I.A.T. 2019. Risk Factors for Type Two Diabetes Mellitus at Bhayangkara Hospital, Kupang City. *Timorese Journal of Public Health*, 1 (1):

11-23. https://doi.org/10.35508/tjph.v1i1.2122. https://ejurnal.undana.ac.id/TJPH/article/view/2122study

Notoadmodjo, S. 2010. *Behavioral Health Sciences.* Jakarta: Rineka Cipta.

Nurohmi, S. 2017. Differences in Consumption of Vegetables and Fruit in Normal Subjects and People with Type 2 Diabetes Mellitus. *Darussalam Nutrition Journal*, 1 (2): 37-44. http://dx.doi.org/10.21111/dnj.v1i2.1344.

Phillips, E., Rahman, R. & Mattfeldt-Beman, M. 2018. Relationship Between Diabetes Knowledge, Glycemic Control, and Associated Health Conditions. *Diabetes Spectr*, 31 (2): 196-199. https://doi.org/10.2337/ds17-0058

Putri, A.F.Y., Decroli, E. & Nasrul, E. 2015. The Relationship between Obesity Degree and Fasting Blood Sugar Levels in Communities in Batung Taba Village and Korong Gadang Village, Padang City. *Jurnal Kesehatan Andalas*, 4 3: 707-711. https://doi.org/10.25077/jka.v4i3.351.

Riley, L., Guthold, R., Cowan, M., Savin, S., Bhatti, L., Armstrong, T. & Bonita, R. 2016. The Wold Health Organization STEPwise Approach To Noncommunicable Disease Risk-Factors Surveillance: Methods, Challenges, and Opportunities. *American Journal of Public Health*, 106 (1): 74–78. https://doi.org/10.2105/AJPH.2015.302962

Sari, N. & Purnama, A. 2019. Physical Activity and Its Relationship with the Incidence of Diabetes Mellitus. *Window of Health : Jurnal Kesehatan*, 2 (4): 368-381. Availabe at : http://jurnal.fkmumi.ac.id/index.php/woh/article/view/woh2408

Shafitra, M., Permatasari, P., Agustina, A. & Ery, M. 2020. Hubungan Status Gizi, Pola Makan dan Aktivitas Fisik dengan Produktivitas Kerja Pada Pekerja di PT Gatra Tahun 2019. *Media Kesehatan Masyarakat Indonesia*, 19 (1): 50-56. https://doi.org/10.14710/mkmi.19.1.50-56

Sukmaningsih, W.R. 2016. *Risk Factors for Type II Diabetes Mellitus in the Work Area of Puskesmas Purwodiningratan Surakarta.* Thesis Undergraduate. Surakarta: Muhammadiyah University Surakarta. http://eprints.ums.ac.id/42800/

The Indonesian Ministry of Health. 2015. *Disease, Control; Environment, Health. Technical*

guidelines for Measuring Risk Factors for Diabetes Mellitus.

The Indonesian Ministry of Health. 2017. *Non-Communicable Disease Control Program.*

Trisnawati, S.K. & Setyorogo, S. 2013. Risk Factors for Type 2 Diabetes Mellitus at the Cengkareng District Health Center, West Jakarta, 2012. *Jurnal Ilmiah Kesehatan,* 5 (1), 6-11. https://docplayer.info/29559379-Faktor-risiko-kejadian-diabetes-melitus-tipe-ii-di-puskesmas-kecamatan-cengkareng-jakarta-barat-tahun-2012.html

Wang, M., Han, X., Fang, H., Xu, C., Lin, X., Xia, S., Yu, W., He, J., Jiang, S., Tao, H. 2018. Impact of Health Education on Knowledge and Behaviors toward Infectious Diseases among Students in Gansu Province, China. *Biomed Res Int.* https://doi.org/10.1155%2F2018%2F6397340

WHO. 2020. *Physical Activity.* https://www.who.int/news-room/fact-sheets/detail/physical-activity

Widyasari, D.C. & Turnip, S.S. 2019. Does Healthy Lifestyle Contribute to Physical and Mental Health among University Students?. *Makara J Health Res,* 23 (3): 150-156. https://doi.org/10.7454/msk.v23i3.1155

Wulandari, A.R., Widari, D. & Muniroh, L. 2019. Hubungan Asupan Energi, Stres Kerja, Aktifitas Fisik, dan Durasi Waktu Tidur dengan IMT pada Manajer Madya Dinas Pemerintah Kota Surabaya. *Amerta Nutrition,* 40-45. https://www.e-journal.unair.ac.id/AMNT/article/download/10977/6962

Yosmar, R., Almasdy, D. & Rahma, F. 2018. Survey of Diabetes Mellitus Risk to the Community of Padang City. *Jurnal Sains Farmasi & Klinis,* 5 (2): 134–141. https://doi.org/10.25077/jsfk.5.2.134-141.2018. Available at :http://jsfk.ffarmasi.unand.ac.id/index.php/jsfk/article/view/261.

(Shafitra et al., 2020)
(Wulandari et al., 2019)

KETERANGAN:
Jurnal yang tidak terindeks, namun sulit untuk dicari penggantinya: (Kabosu et al., 2019)

Jurnal Tambahan terindeks:
(Widyasari & Turnip, 2019)
(Phillips et al., 2018)
(Wang et al., 2018)
(Amelia et al., 2020)

9

60

Screening of Diabetes Mellitus and Physical Activity Analysis a Stepwise WHO Approach

6   "1st Annual Conference of Midwifery", Walter de Gruyter GmbH, 2020   1%
Publication

7   Alwiyah Mukaddas, Amelia Rumi, Tri Yulianti. "Effect of Metformin Therapy on Low Density Lipoprotein (LDL) Levels in Type 2 Diabetes Mellitus Patients at Undata Hospital in Palu City Central Sulawesi", Jurnal Farmasi Galenika (Galenika Journal of Pharmacy) (e-Journal), 2022   1%
Publication

8   Suliyanto, Marisa Rifada, Eko Tjahjono. "Estimation of nonparametric binary logistic regression model with local likelihood logit estimation method (case study of diabetes mellitus patients at Surabaya Hajj General Hospital)", AIP Publishing, 2020   1%
Publication

9   scitepress.org   1%
Internet Source

10   repository.unair.ac.id   1%
Internet Source

11   eprints.ums.ac.id   1%
Internet Source

12   repo.stikesicme-jbg.ac.id   <1%
Internet Source

63

22 Nur Fitriah Ayuning Budi, Hafizh Rafizal Adnan, Feri Firmansyah, Achmad Nizar Hidayanto, Sherah Kurnia, Betty Purwandari. "Why do people want to use location-based application for emergency situations? The extension of UTAUT perspectives", Technology in Society, 2021
Publication

<1%

23 mba.cbs.chula.ac.th
Internet Source

<1%

24 Pomarida Simbolon, Nagoklan Simbolon, Magda Siringo-ringo, Vinsensia A.Sihotang. "Hubungan Karakteristik dengan Peningkatan Tekanan Darah di Sumbul, Sumatera Utara", JURNAL DUNIA KESMAS, 2020
Publication

<1%

25 ir.library.dc-uoit.ca
Internet Source

<1%

26 journal2.um.ac.id
Internet Source

<1%

27 lasanteglobal.wordpress.com
Internet Source

<1%

28 repository.uhamka.ac.id
Internet Source

<1%

29 www2.gec.jp
Internet Source

<1%

64

| Exclude quotes | On | Exclude matches | Off |
| Exclude bibliography | On | | |

Screening of Diabetes Mellitus and Physical Activity Analysis a Stepwise WHO Approach

FINAL GRADE

/0

GENERAL COMMENTS

Instructor

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9

M Gmail

Zata Ismah <zataismah@gmail.com>

Permohonan kelengkapan dokumen dan administrasi
4 pesan

Unnes Journal Of Public Health <ujph@mail.unnes.ac.id> 18 September 2021 pukul 22.27
Kepada: Zata Ismah <zataismah@gmail.com>, citracahyati73@gmail.com, wahidahtaniyah03@gmail.com

Yth. Bapak/Ibu Author
di tempat

Dengan hormat,

Kami sampaikan bahwa naskah Bapak/Ibu telah lolos pada tahap review dan direncanakan untuk diterbitkan pada **Volume 11 Nomor 2 (Edisi Juli 2022).** Sebelum proses kami lanjutkan, kami mohon kesediaan Bapak/Ibu untuk menandatangani surat pernyataan terlampir dan mengembalikannya kepada kami dalam bentuk hasil scan atau file PDF yang dikirimkan melalui e-mail ke ujph@mail.unnes.ac.id.
Kami juga persilakan Bapak/Ibu untuk menyelesaikan pembayaran sesuai dengan informasi terlampir.
LoA akan kami kirimkan setelah hal tersebut di atas diselesaikan.

Atas perhatiannya kami sampaikan terima kasih.

--
==
Unnes Journal of Public Health
Jurusan Ilmu Kesehatan Masyarakat, Universitas Negeri Semarang
Gedung F5 Lantai 2, Kampus UNNES Sekaran, Gunungpati, Semarang 50209
Indonesia
https://journal.unnes.ac.id/sju/index.php/ujph

---

2 lampiran

📄 **surat biaya artikel.pdf**
98K

📄 **UJPH Copyright form.docx**
27K

Zata Ismah <zataismah@gmail.com> 18 September 2021 pukul 22.43
Kepada: Unnes Journal Of Public Health <ujph@mail.unnes.ac.id>

Dear editor,
Terimakasih atas kabar membahagiakan nya.
Izin bertanya utk konfirmasi, pada jurnal artikel penulis kami ada 5 orang, namun saat mengisi metadata di OJS penulis ke 4 dan 5 terskip. Waktu itu sy mau mengubah, sudah tdk bisa lagi.
Apakah penulis ke-4 dan 5 kami bisa masuk sbg penulis ? 🙏🙏

[Kutipan teks disembunyikan]

Unnes Journal Of Public Health <ujph@mail.unnes.ac.id> 19 September 2021 pukul 07.18
Kepada: Zata Ismah <zataismah@gmail.com>

Bisa bu.
Apakah sudah dituliskan pada revisi terakhir?
Jika belum, silahkan dituliskan semua nama author pada balasan email ini atau bersama dengan pengiriman kelengkapan admin yg lain.
Terima kasih.
[Kutipan teks disembunyikan]

Zata Ismah <zataismah@gmail.com> 19 September 2021 pukul 07.30
Kepada: Unnes Journal Of Public Health <ujph@mail.unnes.ac.id>

Baik, Sudah ditulis pada revisi jurnal terakhir, dan akan kami tambahkan pada kelengkapan admin yg lain.
Terimakasih
[Kutipan teks disembunyikan]

Declaration & Copyright Transfer Form *UNNES Journal of Public Health (UJPH)*

TO BE SIGNED BY ALL AUTHORS
Untuk ditandatangani seluruh penulis

I/We, the undersigned author(s) of the manuscript entitled :
Saya/kami, penulis yang menandatangani manuskrip yang berjudul :

Screening of Diabetes Mellitus and Physical Activity Analysis : a Stepwise WHO Approach

hereby declare that
menyatakan bahwa

(a) the above manuscript which is submitted for publication in the UNNES Journal of Public Health (UJPH) is NOT under consideration elsewhere.
Manuskrip di atas yang diajukan untuk diterbitkan dalam UNNES Journal of Public Health (UJPH) TIDAK sedang dipertimbangkan untuk dipublikasikan di jurnal lain.

(b) the manuscript is NOT published already in part or whole (except in the form of abstract) in any journal or magazine for private or public circulation.
Manuskrip TIDAK diterbitkan sebagian atau seluruhnya (kecuali dalam bentuk abstrak) di jurnal atau majalah apa pun untuk sirkulasi pribadi atau publik.

(c) I/we give consent for publication in the UJPH in any media (print, electronic, or any other), and assign copyright to the UJPH in the event of its publication in the UJPH.
Saya / kami memberikan izin untuk publikasi di UJPH di media apapun (cetak, elektronik, atau lainnya), dan menetapkan hak cipta kepada UJPH dalam hal publikasi dalam UJPH.

(d) I/We affirm that the manuscript does not violate the intellectual property rights of any third party. I/ We agree to indemnify and hold harmless the UJPH in respect of any claim on account of violation of intellectual property rights.
Saya / Kami menegaskan bahwa naskah tidak melanggar hak kekayaan intelektual pihak ketiga. Saya / Kami setuju untuk mengganti kerugian dan membebaskan UJPH sehubungan dengan klaim apa pun karena pelanggaran hak kekayaan intelektual.

(e) I/we give consent to UJPH to retract the manuscript (print, electronic, or any other) in case of intellectual property rights violation.
Saya/ Kami memberikan izin kepada UJPH untuk melakukan penarikan manuskrip (cetak, elektronik, atau lainnya) jika ditemukan pelanggaran hak kekayaan intelektual.

(f) I/we do not have any conflict of interest (financial or other) other than those declared*.
*Saya / kami tidak memiliki konflik kepentingan (keuangan atau lainnya) selain yang dinyatakan *.*

(g) I/we have read the final version of the manuscript and are responsible for what is said in it.
Saya / kami telah membaca versi terakhir dari naskah dan bertanggung jawab atas apa yang dikatakan di dalamnya.

(h) The work described in the manuscript is my/our own and my/our individual contribution to this work is significant enough to qualify authorship.
Pekerjaan yang dijelaskan dalam naskah adalah kontribusi saya / kami sendiri dan / individu saya kepada karya ini cukup signifikan untuk mengkualifikasi kepenulisan.

(i) No one who has contributed significantly to the work has been denied authorship and those who helped have been duly acknowledged.
Tidak ada orang yang telah berkontribusi secara signifikan terhadap pekerjaan yang telah ditolak kepenulisannya dan mereka yang membantu telah mendapat pengakuan.

(j) I/we also agree to the authorship of the article in the following sequence:
*Saya / kami menyetujui pengarang artikel dalam urutan berikut:*

Authors Name(s) :
1. Zata Ismah
2. Citra Cahyati Nst
3. Wahidah
4. Emma Novita
5. Nofi Susanti

NOTE:
1. First authors are required to sign this form.
   Penulis pertama diharuskan menandatangani formulir ini
2. No addition, deletion or change in the sequence of authors is allowed at the later stage without valid reasons.
   Tidak ada penambahan, penghapusan atau perubahan dalam urutan penulis diperbolehkan pada tahap selanjutnya tanpa alasan yang sah.
3. If the authorship is contested at any stage, the manuscript will be either returned or kept in abeyance till the issue is resolved.
   Jika kepenulisan diperebutkan pada tahap apa pun, naskah akan dikembalikan atau disimpan dalam ketaatan sampai masalah teratasi.
4. This form may be photocopied and used.
   Formulir ini dapat difotokopi dan digunakan.

Place of sign, date/month/year

No	Name	Signature
1.	*Zata Ismah*	*19 September 2021*
2.	*Citra Cahyati Nst*	*19 September 2021*
3.	*Wahidah*	*19 September 2021*
4.	*Emma Novita*	*19 September 2021*
5.	*Nofi Susanti*	*19 September 2021*

M Gmail

Zata Ismah <zataismah@gmail.com>

LoA
3 pesan

Unnes Journal Of Public Health <ujph@mail.unnes.ac.id>   22 September 2021 pukul 12.39
Kepada: Zata Ismah <zataismah@gmail.com>

Dear Author,
Here we send you the LoA.
Your article will be published in Volume 11 Issue 2 (July 2022).
We wait for your next manuscript to be submitted in our journal.
Thank you.

Best regards,
Arum Siwiendrayanti
Chief Editor

--
==
Unnes Journal of Public Health
Jurusan Ilmu Kesehatan Masyarakat, Universitas Negeri Semarang
Gedung F5 Lantai 2, Kampus UNNES Sekaran, Gunungpati, Semarang 50209
Indonesia
https://journal.unnes.ac.id/sju/index.php/ujph

📄 LoA - zata.pdf
    201K

UNNES JOURNAL OF PUBLIC HEALTH
Jurusan Ilmu Kesehatan Masyarakat, Fakultas Ilmu Keolahragaan,
Universitas Negeri Semarang
Gedung F5 Lantai 2, Kampus Sekaran, Gunungpati, Semarang 50229
e-mail: ujph@mail.unnes.ac.id
http://journal.unnes.ac.id/sju/index.php/ujph

LETTER OF ACCEPTANCE
No. 016/UJPH/IX/2021

Dear Author,

We are pleased to inform you that your manuscript as follow has now been
accepted for publication in Unnes Journal of Public Health and will be
published in Volume 11 Issue 2 (July 2022). Please check the website
https://journal.unnes.ac.id/sju/index.php/ujph/ occasionally to see your
manuscript uploaded.

Author	Zata Ismah[1] , Citra Cahyati Nst[1,] Wahidah[1] ,Emma Novita[2], Nofi Susanti[1]
Institution(s)	[1]Public Health Faculty of State Islamic University of North Sumatra [2]Medical Faculty of Sriwijaya University
Title	Screening of Diabetes Mellitus and Physical Activity Analysis : a Stepwise WHO Approach

Semarang, 22 September 2021
Chief Editor,

Arum Siwiendrayanti, S.KM, M.Kes
NIP. 198009092005012002

M Gmail

Zata Ismah <zataismah@gmail.com>

[UJPH] New notification from Unnes Journal of Public Health
2 pesan

Efa Nugroho <efa.nugroho@gmail.com>
Balas Ke: Fitri Indrawati <ujph@mail.unnes.ac.id>
Kepada: zata ismah <zataismah@gmail.com>
25 Juli 2022 pukul 14.25

You have a new notification from Unnes Journal of Public Health:

An issue has been published.

Link: https://journal.unnes.ac.id/sju/index.php/ujph/issue/current

Fitri Indrawati

Zata Ismah <zataismah@gmail.com>
Kepada: Fitri Indrawati <ujph@mail.unnes.ac.id>
27 Juli 2022 pukul 02.32

Dear editor terimakasih atas pemberitahuan nya.
Izin mengajukan permohonan revisi pada metadata author kami, pada tampilan depan OJS dan how to citednya 2 penulis terakhir tidak masuk dalam penulis yaitu Emma Novita dan Nofi Susanti. Sebelumnya, Dalam paper kami nm tsbt sdh masuk sbg penulis. Mhon ditambahkan nm ybs dlm metadata author penulis ke 4 dan 5 kami. Atas perkenannya kami ucapkan Terimakasih 🙏

Unnes Journal of Public Health   Current   Archives   Announcements   About ▾   [Search]   Search

About Journal

Unnes Journal of Public Health (UJPH) is an open access and peer-reviewed journal. It publishes original papers, reviews and short reports on all aspects of the science, philosophy, and practice of public health, especially in low-income and middle-income countries which have many problems in technology, human resources, economics, social welfare, etc impacting public health.

Unnes Journal of Public Health is Nationally Accredited (SINTA 2) based on the Decree of The Minister of Research, Technology and Higher Education of Republic Indonesia, Number 10 / E / KPT / 2019, starts from Volume 7 Issue 2 (July 2018). Unnes Journal of Public Health is published by Universitas Negeri Semarang (UNNES) in cooperation with Association of Indonesian Public Health Experts (Ikatan Ahli Kesehatan Masyarakat Indonesia (IAKMI)).

It is aimed at all public health practitioners and researchers and those who manage and deliver public health services and systems. It will also be of interest to anyone involved in provision of public health programmes, the care of populations or communities and those who contribute to public health systems in any way.

Screening of Diabetes Mellitus and Physical Activity Analysis: A Stepwise WHO Approach

Download

PDF

Statistic

Vol 11 No 2 (2022): Unnes Journal of Public Health

Zata Ismah
Universitas Islam Negeri Sumatera Utara

Citra Cahyati Nst
Universitas Islam Negeri Sumatera Utara

Wahidah Wahidah
Universitas Islam Negeri Sumatera Utara

Abstract

By 2030 it is predicted that there will be 52 million deaths per year due to NCD, an increase of 9 million from 38 million people today. The purpose of this research was to describe the risk factors for NCD in Medan using the stepwise WHO. This research method is a quantitative method with a cross-sectional design. Univariate and Bivariate analysis using the Chi Square test were carried out in this research. 799 participants were recruited using accidental sampling technique. The place of this research was conducted in Medan City, North Sumatra Province. The results of this research indicate that age 55-59 years, last elementary school education, work as an entrepreneur and not eating vegetables are risk factors for diabetes mellitus in this research. It is suggested that local health workers provide health education through outreach to the community, especially the people of Medan City, on how to reduce the risk of increased blood sugar or diabetes mellitus incidence. In addition, participants or the community are expected to be able to maintain a good diet, namely by implementing balanced nutrition, especially paying attention to adequate vegetable consumption.

Home   Journal Rankings   Country Rankings   Viz Tools   Help   About Us

Jnnes Journal of Public Health 🔓

COUNTRY	SUBJECT AREA AND CATEGORY	PUBLISHER	H-INDEX
Indonesia	Health Professions	Universitas Negeri Semarang	**4**
Universities and research institutions in Indonesia	└ Health Professions (miscellaneous)		
Media Ranking in Indonesia	Medicine		
	├ Epidemiology		
	├ Health Policy		
	└ Public Health, Environmental and Occupational Health		

PUBLICATION TYPE	ISSN	COVERAGE
Journals	22526781, 25487604	2019-2023

Scopus Preview   🔍 Author Sea

Source details

Feedback ❯   Compare sources ❯

Unnes Journal of Public Health

Open Access ⓘ

Years currently covered by Scopus: from 2019 to 2024

Publisher: Universitas Negeri Semarang

ISSN: 2252-6781   E-ISSN: 2548-7604

Subject area: (Health Professions: Health Professions (miscellaneous)) (Medicine: Health Policy) (Medicine: Epidemiology)

(Medicine: Public Health, Environmental and Occupational Health)

Source type: Journal

[View all documents ❯]   [Set document alert]   🖺 Save to source list

CiteScore 2023 **0.8**	ⓘ
SJR 2023 **0.137**	ⓘ
SNIP 2023 **0.106**	ⓘ

CiteScore   CiteScore rank & trend   Scopus content coverage

CiteScore 2023

$0.8 = \dfrac{\text{61 Citations 2020 - 2023}}{\text{80 Documents 2020 - 2023}}$

Calculated on 05 May, 2024

CiteScoreTracker 2024 ⓘ

$0.4 = \dfrac{\text{31 Citations to date}}{\text{69 Documents to date}}$

Last updated on 05 May, 2024 • Updated monthly

CiteScore rank 2023 ⓘ

Category	Rank	Percentile
Medicine └ Health Policy	#246/310	20th
Medicine └ Epidemiology	#120/148	19th
Medicine └ Public Health, Environmental and Occupational Health	#545/665	18th

View CiteScore methodology ❯   CiteScore FAQ ❯   Add CiteScore to your site 🔗

Document details - Screening of Diabetes Mellitus and Physical Activity Analysis: A Stepwise WHO Approach

⊟ Export ⬇ Download More... ›

Screening of Diabetes Mellitus and Physical Activity Analysis: A Stepwise WHO Approach(Article)(Open Access)

Ismah, Z., Nst, C.C., Wahidah, Novita, E., Susanti, N. ஃ

a Public Health Faculty of State Islamic, University of North Sumatra, Indonesia
b Medical Faculty of Sriwijaya University, Indonesia

Abstract

The largest number of diabetics is estimated to come from Southeast Asia and West Pacific, accounting for about half of diabetes cases in the world. The purpose of this research was to determine the general risk factors and specific activities of Diabetes Mellitus in Medan City, North Sumatra Province. This research method is a quanti-tative method with a cross-sectional design. Univariate and Bivariate analyses using the Chi-Square test were carried out in this research. 799 participants were recruited using the accidental sampling technique. The place of this research was conducted in Medan City, North Sumatra Province. The results of this research indicate that age 55-59 years old, last elementary school education, working as an entrepreneur and not eating vegetables are risk factors for diabetes mellitus in this research. It is suggested that local health workers provide health education through outreach to the community, especially the people of Medan City, on how to reduce the risk of increased blood sugar or diabetes mellitus incidence. In addition, participants or the community are expected to be able to maintain a good diet, namely by implementing balanced nutrition, especially paying attention to adequate vegetable consumption. © 2022, Universitas Negeri Semarang. All rights reserved.

Author keywords

(Diabetes Melitus) (NCD) (Stepwise WHO)

ஃ Ismah, Z.; Public Health Faculty State Islamic University of North Sumatra, Medan, Indonesia;

SciVal Topic Prominence ⓘ

Cited by 0 documents

Inform me when this document is cited in Scopus:

Set citation alert ›   Set citation feed ›

Related documents

Find more related documents in Scopus based on:

Authors ›   Keywords ›

View PDF

https://www.scopus.com/record/display.uri?eid=2-s2.0-85159602184&origin=inward&txGid=38eec18d9df4c180ba94b518784107d4