Hypertension and Type 2 Diabetic Mellitus in the Middle-ages Persons

Ade Heryana[1], Intam Silviana Mustikawati[1], Prima Darma Bekti[2] and Iin Desmiany Duri[3]
[1]*Faculty of Health Sciences,Esa Unggul University*
[2]*Public Health Department, Respati Indonesia University*
[3]*Faculty of Public Health, Diponegoro University*

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Abstract: Type-2 Diabetic Mellitus (NIDDM) is a chronic disease that glucose blood level elevated significantly without dependency to insulin level. Diabetes gave medical and non-medical impacts for patients if adequacy prevention was not arranged. Sedentary lifestyle made a significant positive trend to the prevalence of diabetes. This study is a quantitative analytic investigated association between type-2 DM with age and hypertension. Total of 680 health records from primary health service involved with systematic random sampling. This study provided significance association between age and type-2 DM (OR = 5.859), hypertension and type-2 diabetes (OR = 4.173) and age and hypertension (OR = 3.081). Conclusion: people above or at 45 years old should be aware of the risk of hypertension that a gateway to type-2 diabetes. They should routinely control blood pressure and modify healthy lifestyle to prevent hypertension and type-2 diabetic mellitus.

1 INTRODUCTION

Diabetes Mellitus (DM or diabetes) is a group of disease primarily characterized by chronic hyperglycemia due to a lack of sufficient insulin action (American Diabetes Association, 2014; Nowotny et al., 2015; Areosa et al., 2017). One type of DM is type 2 Diabetes or Noninsulin-Dependent Diabetes (NIDM) is called adult-onset diabetes, although there is tend to suffer among overweight children (Sone, 2018).

The condition of diabetes will cause chronic complications in various organs of the body if there is no adequate treatment. The chronic compilations are 1) stroke, in the cerebral blood vessels; 2) blindness, in the blood vessels of the eye; 3) coronary heart disease, in the heart blood vessels; 4) chronic kidney disease, in the kidney blood vessels; and 5) wounds difficult to heal, in the leg veins (Waspadji, 2011; Huang et al., 2014; Sjöström et al., 2014; Mostafa et al., 2018). This complication definitely will reduce employee work productivity for the productive age group.

There is an elevated level of prevalence of diabetes in 2013 (diagnosed by doctors or symptoms) compared to 2007 in the age group ≥ 15 years. In 2007 the prevalence of diabetes was 1.1% while in 2013 it was 2.1% throughout Indonesia. Prevalence of diabetes in Indonesia diagnosed by doctors was 1.5% in 2013(Balitbangkes Kemenkes RI, 2013). Diabetes Care Report projected the prevalence of diabetes in Indonesia in 2030 is about 21.3 million peoples (Puskom Publik Kemenkes RI, 2009).

Hypertension or high blood pressure is a condition where a person's blood pressure against the arterial wall is consistently high, when the heart contracted (systolic) greater than 140 mmHg and when the heart weakened (diastolic) greater than or equal to 90 mmHg (Boslaugh, 2008).This is a chronic condition that could lead to heart disease, stroke, and other diseases that can result in premature death (Kung and Xu, 2015). Most of the disease burden caused by high blood pressure is borne by low-income and middle-income countries, by people in middle age, and by people with prehypertension. Prevention and treatment strategies restricted to individuals with hypertension will miss a much blood-pressure-related disease (Lawes et al., 2008). RISKESDAS 2013 reported that the prevalence of hypertension is 26.5% among peoples ≥ 18 years old. It is declined compared to the

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prevalence in 2007,i.e. 31.7% (Balitbangkes Kemenkes RI, 2013).

Arterial hypertension reported came upon a two-third person with type 2 diabetes. Hypertension increases the incidence of both micros- and macrovascular complications. A person with hypertension and type 2 diabetes leads to four-foldincreased risk for cardiovascular disease (CVD) compare to type 2 diabetes with normal tension (Pavlou et al., 2018). The inaccuracy of salt and water storage and the elevated of pressure from the body in the peripheral blood circulation caused of blood pressure closely related to insulin resistance as the originator of the incidence of diabetes (Fatimah, 2015).

Hypertension strongly associated with the risk of developing type 2 diabetes mellitus, as well as a significant predictor of the incidence of nephropathy, retinopathy, and cardiovascular disease that accompanies DM. A study conducted in Osaka (Osaka Health Survey), the relative risk of the development of type 2 diabetes mellitus was 1.76 in hypertensive men compared to 1.39 in normal tension men. The incidence of hypertension is increased in patients with 1.5 to 3 times diabetes compared to normal patients. A study shows 40% of people with diabetes experienced hypertension at 45 years old, and more than 60% at the 60 years old (Cordario, 2005).

Diabetes risk factors due to hypertension in the 18 and above years old population reached 25.8% (Ministry of Health, 2014). In general, the proportion of people with diabetes who suffer from hypertension is almost the same (Soewondo and Pramono, 2011). The association of diabetes and hypertension study in Indonesia showed that A significant relationship between blood pressure and the incidence of diabetes with odd ratio 6.85 times compared to people with normal blood pressure (Trisnawati and Setyorogo, 2013). There was a significant relationship between hypertension and the incidence of diabetes, with the risk of diabetes in the group who had a higher history of hypertension than the group with the normal tension of 3.41 times. Hypertension and diabetes are interconnected risk factors (Nainggolan et al., 2013).

The term “age” according to WHO is the amount of time a person has gone through to date by calculating the day/date of birth as zero. Humans generally experienced a faster physiological decline at 40 years old, and diabetes is more common at above 40 years old (Yuliasih and Wirawanni, 2009). In (Cho et al., 2018) state the prevalence of diabetes 8% (peaked) in the low-income countries among the 55-64 age group.

Some study in Indonesia showed the relationship between age and diabetes. Indonesian mostly suffered diabetes at the 38-47 years old with a proportion of 25.3%. The risk of DM increases gradually according to the development of age (Soewondo and Pramono, 2011), the older had tendency to suffer from diabetes and the group of 55-64 years old had a 14 times risk of diabetes compared to the 25-34 years old group (Nainggolan et al., 2013),84% of diabetes cases could be prevented by taking into account age risk factors, and the probability of diabetes occurring at below 45 years old and at 45 years is around 1 in 6 (Zahtamal et al., 2007),diabetes risk in the <45 years old group is 72% lower than the group ≥ 45 years old (Trisnawati and Setyorogo 2013).

The Hypertension report by the World Health Organization states that aging is one of the main factors that contribute to the development of high blood pressure and its complications (World Health Organization, 2013).

The risk of hypertension higher with the increasing of person’s life stages (Rahajeng and Tuminah, 2009). Several studies in Indonesia is proventhe association between age and hypertension. Study at Public Health Careshowed that there is an association between age and hypertension with risk 13,34 times to peoples > 30 years old (Mutmainah and Heryana, 2017).Study at rural community showed that peoples ≥ 31 years old 3,76 times likely to hypertension than others (Yogaswara and Heryana, 2018).

2 RESEARCH METHOD

This study held in Cempaka Putih public health service district that we called “Puskesmas Cempaka Putih.” Type 2 diabetes is a 3rd rank disease at Puskesmas Cempaka Putih with the incidence increased from 2014 to 2015. In 2014 the cases of type 2 DM patients reached 2,022 while in 2015 increased to 2,446. Thus according to the whole population in 2012, the prevalence of type 2 DM in 2015 is about 2.67%.

The objective of this study is to proof (1) the association between age with type 2 DM and hypertension; and (2) the association between age and hypertension. From several studies we state the model age-DM-hypertension as follow:

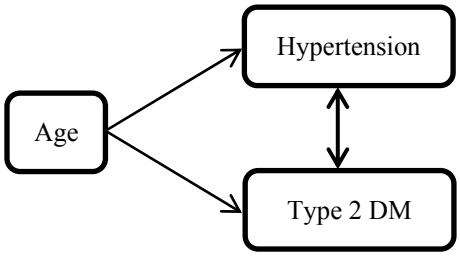

Figure 1: Age-Diabetes-Hypertension Model

We propose three hypothetical testing: positive association between age and hypertension, positive association between age and type-2 diabetes; and positive association between hypertension and type-2 diabetes (see Figure 1).We defined: (1) Type 2 diabetes is a condition of hyperglycemia in patients that is stated with a doctor's diagnosis or ICD-X code on a health record; (2) Hypertension is blood pressure at the time of the study based on medical record. Measurement classified by (1) Hypertension if hystolic blood pressure ≥ 140 mmHg and or systolic blood pressure ≥ 90 mmHg; and (2) Normal tension if hystolic blood pressure <140 mmHg and or systolic blood pressure <90 mmHg; and (3) Age is the period of the respondent at the time of the study which is known from the health records data. The measurement classified into (1) Risk, if age ≥ 45 years old; and (2) Not at risk, if the age is <45 years old.

Case-Control design held for the association between type-2 diabetes and age/hypertension, and Cross-sectional design for the association between age and hypertension. Cases group was people with diabetes mellitus ≥ 15 years old during 2016-2017 who were obtained from the healthrecord, while Control group was patients ≥ 15 years old who visitedgeneral medical service thatwere not type 2 diabetes diagnosed by a medical doctor. The population were all of the patients visited general medical service in 1 year period,it isabout 2.540 peoples in 2016. Total of 680 sample size counted with Hypothesis Test for the Odds Ratio methods, obtained 340Case and 340 Control group.Systematic randomsampling was carried out to this study. Inclusion criteria are above 15 years old, no barrier in communication, and willing to be a respondent. Exclusion if pregnant women and in illness condition.

3 RESULTS

Table 1 showed that the mean of systolic blood pressure is 120.4 mmHg (CI 95% : 119.1 – 121.6 mmHg), with a range from 80 to 200 mmHg. Diastolic blood pressure's mean is 78.7 mmHg (CI 95% = 78.1 – 79.4 mmHg), with range from 30 to 110 mmHg. The range of age from 16-74 years with the mean 45.5 (CI 95% = 44.7 – 46.3 years).

Table 2 showed that 313 participants (55.6%) diabetesin hypertension condition, and 90 participants (76.9%) non type-2 diabetes in normal tension, there is a significant association with risk 4.173 times likely suffering type-2 DM for hypertension participants.

Table 1: Age and Blood pressure Profiles (N=680)

No	Characteristics	Mean	CI95%	SD	SE	Min	Max
1	Systolic blood pressure	120.4	119.1 – 121.6	16.9	0.647	80	200
2	Diastolic blood pressure	78.7	78.1 – 79.4	9.0	0.346	30	110
3	Age	45.5	44.7 – 46.3	10.8	0.413	16	74

Table 2: Association between Type-2 DM with Hypertension and Age (N=680)

No	Independent variables	Type-2 Diabetic Mellitus						p-value	Odds Ratio (CI 95%)
		Case (+)		Control (-)		Total			
		Freq.	%	Freq.	%	Freq.	%		
1	Blood pressure								
	Hypertension	313	55.6	250	44.4	563	100.0	0.000	4.173 (2.589 – 6.880)
	Normal tension	27	23.1	90	76.9	117	100.0		
2	Age								
	≥ 45 years old	199	75.1	66	24.9	265	100.0	0.000	5.859 (4.096 – 8.406)
	< 45 years old	141	34.0	274	66.0	415	100.0		

Table 3: Association between Age with Hypertension (N=680)

No	Age	Blood Pressure						p-value	Odds Ratio (CI 95%)
		Hypertension		Normal		Total			
		Freq.	%	Freq.	%	Freq.	%		
1	≥ 45 years old	94	22.7	321	77.3	415	100.0	0.000	3.081 (1.868 – 5.245)
2	< 45 years old	23	8.7	241	91.3	265	100.0		

Table 2 also showed that 199 participants (75.1%) with type-2 DM were above and at 45 years old. Otherwise, 241 participants (91.3%) non type-2 DM were below 45 years old. Thisresults proof that age and type-2 DM had a significant association, with risk 5.859 times likely suffering type-2 DM for participants above and at 45 years old compared to below 45 years old.

In another analysis, Table 3 showed that 94 participants (22.7%) above and at 45 years old had hypertension. Otherwise,241 participants (76.9%) below 45 years oldhad normal tension. Thisresults proof that age and hypertension had a significant association, with risk 3.081 times likely suffering hypertension for participants above and at 45 years oldcompared to below 45 years old participants.

4 DISCUSSION

4.1 High Blood Pressure and Diabetic Mellitus

This study provided that The mean of systolic blood pressure is 120.4 mmHg (95 CI = 119.1 – 121.6 mmHg) and diastolic is 78.7 (78.1 – 79.4), hypertension has a significant association with type 2 diabetes mellitus. This result linear with other hypertension studies.

According to Joint National Committee Report, participants in this study on average have a normal tension both systolic and diastolic, but if we look the maximum value, there are some participants in stage 2 hypertension. JNC VII stated that normal tension if systolic < 120 mmHg and diastolic and< 80 mmHg (National Institute of Health, 2004). It isimportant for the authority of the health system to take action in controlling blood pressure especially to peoples above 45 and at years old.

Early detection of blood pressure is an effective intervention and treatment to prevent hypertension and more impact of cumulative cardiovascular risk (Volpe et al., 2018). Furthermore this healthy action effective in the association with diabetes risk factors. Unfortunately, this healthy behavior is rarely seen in our community. This condition includes the prevention of hypertension with decreasing risk factors and routine blood pressure control.

Blood pressure controlling in Indonesia showed that only 18% of hypertension participants were under control (Herwati and Sartika, 2013). Maharani and Syafrandi (2017) reported that 60% of hypertension persons had unhealthy behavior in controlling blood pressure. This study proofed that people's awareness of the importance of routinely blood pressure control already in low level, especially among people with high-risk factors.

For persons who are suffering diabetes should manage and control hypertensionshould be < 130/85 mmHg (Niakan and Cushman, 2018). In (Grenier et al., 2018) only about one-third of patients with diabetes achieved the target blood pressure below 130/80 mmHg. Patients with blood pressure ≥ 130/80 mmHg were also less likely to achieve optimal guideline-recommended glycated hemoglobin and low-density lipoprotein-cholesterol targets. Improved comprehensive management of all risk factors in patients with diabetes is warranted.

The empowerment of older health integrated unit and chronic disease control program at public health care in Indonesia is a useful intervention to promote controlling blood pressure. It is the cross-section tasks that public healthcare has to collaborate with all stakeholders.

4.2 Association between Age and Diabetes and Hypertension

This study provided that age has a significant association with type 2 diabetes and hypertension. This result linear with other studies. Middle-ages is human life stages that decline some organ function (Knopman et al., 2001). It isimportant for the authority of health system to promote healthylifestyle among ≥ 45 age group, especially for the older group. IDF predicted by 2050 the proportion of older people in the population will increase from 15% to 25%. Itis led to the prevalence of type 2 diabetes in older people,andunfortunately, the management of diabetes for this group is not easy(Colagiuri et al., 2014).

One of national levelhealth program that aids action to prevent hypertension and diabetes at middle-ages is “Prolanis”.Since 2014 Prolanis is health programdirected by primary health care and supervised by national health insurance to maintain the healthy condition of NHI member that suffering chronic disease. “Prolanis” aims to reach optimal quality of life with effective and efficient in service cost(BPJS Kesehatan, 2014).

Prolanistargeted for peoples who registered as NHI members (BPJS Kesehatan, 2014). Study conducted at one of primary health care in Indonesia showed that the members of Prolanis largely women, above 45 years old, had lower education, unemployment, and had obesity condition. Most of members are disobedient to routinely implement the education of this program and physical activity and had unstable glucose level in blood.The obedient to implement Prolanis associated with stability of glucose level in blood(Primahuda and Sujianto, 2016).It is suggested that Prolanis program should be empower by all stakeholders in diabetes prevention Prolanis is an appropriate way to increase health statue for people who above or at 45 years old.

Prevalence of hypertension in elderly higher than adult, wich is most of primary hypertension and isolated systolic hypertension. Hypetension management in elderly basically similar with adult, it is included life-style modification and pharmacotherapy intervention. Several life-style should be improved are decreasing body weight if obesity or overweight, restricted to alcohol, pyshical activity, low salt intake, adequate potasiumand magnesium intake, stop smoking, and decreasing intake of saturated fat and cholesterol (Kuswardhani, 2006).

Some of foods and beverages should avoid to prevent hypertension include: high level of saturated-fat, process with natrium salt, Cans food/drink, preserved meal, full cream milk, margarine, mayonnaise, eggs, seasonings with high natrium, alcohol, and alcohol contained food like durian (Kemenkes RI, 2014).

Theaction of hypertension intervention above should undertake with others activity to prevent diabetes. In (Chatterjee et al., 2017) prevention of type 2 diabetes should attempted with widespread national prevention programmes. Prolanis is the right intervention for controlling prevalence of hypertension and diabetes focus on middle-aged.

5 CONCLUSIONS

This study provided significance association between age and type-2 DM (OR = 5.859), hypertension and type-2 DM (OR = 4.173) and age and hypertension (OR = 3.081). People above or at 45 years old should be aware with the risk of hypertension that a gateway to type-2 diabetes. They should routinely control blood pressure and modify healthy life-style to prevent hypertension and type-2 diabetic mellitus. Primary health care should intensively arrange “Prolanis” program that supervised by National Health Insurance.

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