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PATTERN AND RISK FACTORS OF NON-COMMUNICABLE DISEASES OF SUKU ANAK DALAM AT NYOGAN VILLAGE THAT HAVE ENVIRONMENTAL AND SOCIAL TRANSITIONS IN MUARO JAMBI DISTRICT, JAMBI

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ABSTRACT

Hypertension and Diabetes Mellitus (DM) are increasingly prevalent and the main cause of death in Indonesia, as well as in Jambi. The environmental and social transition that occurred in Suku Anak Dalam (SAD) in Nyogan Village since year 2004 has resulted to lifestyle changes and has an impact on changing patterns of disease. The purpose of this study was to determine risk factors associated with the incidence of Hypertension and DM in SAD Nyogan Village. The research design was cross sectional. Sample used a total population of 193 SAD, aged ≥ 18 years-old, living in the SAD residential area of Nyogan Village. Time of data collection during April 2019. Research variables were age, gender, family history, diet, smoking and physical activity obtained by interviews, blood pressure measurements and glucose checks. Data analysis using Chi-Square and Multiple Logistic Regression. The results of the study found the prevalence of hypertension in SAD 4.32% and DM were 0.72%. Risk factors of hypertension in SAD were age and diet, while DM were age, sex, family history, diet and physical activity. The most dominant factor associated with the incidence of hypertension was age (Odds Ratio (OR)=4,63; 95% Confidence Interval (CI)=1,58-13,68) and the most dominant factor of DM was a diet (OR=11,23; 95% CI=0,84-150,57). The SAD needs to regulate their diet, especially when they are > 40 years-old, check blood pressure and blood glucose regularly and also carry out a healthy lifestyle.

Keywords: Hypertension, DM, SAD, non-communicable, transition

1. INTRODUCTION

Today's public health problems are double burden diseases. Double burden is the situation where non-communicable diseases (NCD) continue to grow, but infectious diseases are still not eradicated. The transition from infectious diseases to non-communicable diseases, such as cardiovascular disease, cancer, hypertension and diabetes [1].

Hypertension can damage the kidneys, heart and brain if not detected early [2]. Diabetes Mellitus

(DM) can increase the risk of heart disease, stroke, blindness and so on [3]. Hypertension cause the deaths around of eight million people each year, of which 1.5 million deaths occur in Southeast Asia, with 1/3 of the population suffering from hypertension [4]. In 2015, 415 million adults with diabetes (8.5%) [5]. The prevalence of hypertension and Diabetes Mellitus in Indonesia has increased where the prevalence of hypertension is 25.8% (2013) to 34.1% (2018) and DM prevalence is 1.5% (2013) to 2.0% (2018) [6,7]. In Jambi Province the prevalence of hypertension is 24.6% and DM prevalence is 1.1%.⁶ In Muaro Jambi district,

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there has been an increase over the past three years by 4.19% (2015), 4.28% (2016) to 4.79% (2018) [8,9,10].

Based on the data above, there is a tendency to increase the prevalence of NCD caused by the epidemiological transition, which starts from the dominance of infectious diseases and ends with the dominance of non-communicable diseases, one of which is social change, which is currently occurring in remote or indigenous communities known as Suku Anak Dalam (SAD), which was previously a nomad, now has a permanent shelter [11,12]. So it is thought that there has been a change in the pattern of diseases from infectious diseases to non-communicable diseases such as Hypertension and Diabetes Mellitus.

Data from the Department of Social Workforce and Transmigration (2010) of the Suku Anak Dalam (SAD) population that has been fostered and which has not been fostered from 1973 to 2010 were 6,733 households or 28,883 people spread across 8 regencies, one of them in Muaro Jambi Regency precisely in Nyogan Village. Nyogan Village consists of 4 hamlets, namely Nyogan Hamlet, Jerat Harimau, Nebang Parah and Selapik. The characteristics of the Nyogan Village community are 60% consisting of SAD and have had permanent occupancy since 2004 which is concentrated in Nyogan Hamlet, it means that after 14 years of occupying permanent housing, it experiences lifestyle

changes that have an impact on changing patterns of disease [13].

The pattern of diseases often suffered by SAD is generally in the form of infectious diseases, namely intestinal worms, malnutrition, ulcers/scabies, cough, diarrhea, Malaria Fever, abdominal pain, respiratory diseases, phlegm and ringworm [13]. However, due to epidemiological (include the environmental and social) transitions, there is a possibility that SAD will experience changes in disease patterns, from infectious diseases to non-communicable diseases such as Hypertension and Diabetes Mellitus. Previous research on SAD in Sungai Terap Village, Bathin XXIV Subdistrict showed that SAD has risk factors related to non-communicable diseases, namely smoking, likes to consume sweet drinks, low-fiber diet and fatty foods [14].

The results of the previous studies showed that the most risk factors of the incidence of hypertension are age, sex, family history, diet, smoking and physical activity. Age ≥ 40 years is at risk of developing hypertension and is more common among women than men [15]. Someone who has a family history of hypertension is likely to have hypertension [16]. Related to diet, more fat intake and sodium affect the incidence of hypertension [17]. Someone who has a smoking habit and not having exercise habits is at risk of developing hypertension [18].

The most risk factors of type II DM are age, gender, family history, diet, smoking and physical activity. Most people with Type II Diabetes Mellitus is ≥ 45 years (90-95%) [19]. More women experience DM compared to men [20]. Women who have families with DM sufferers are at risk of developing DM [18]. Someone with a poor diet that is diagnosed with type II diabetes accompanied by complications cause of their food consumption affects diabetes [21]. Someone who has smoke > 10 cigarettes per day and > 20 years old, also who rarely exercise at risk developing diabetes [22,23].

Research conducted on Fulani natives on the epidemiology of hypertension showed risk factors for grade 1,2 and 3 hypertension are sex, smoking and family's history with diabetes [24]. Research on type II Diabetes in Aboriginal people found the risk factors of DM are smoking, obesity, and hypertension [25]. Research on patterns of non-communicable diseases in SAD in Jambi, has never been done, especially in looking at the changes in their lifestyle in the SAD community who have settled in a hamlet and the risk factors. The purpose of this study was to analyze the prevalence and risk factors of non-communicable diseases in the Suku Anak Dalam in Nyogan Village, Muaro Jambi Regency, Jambi Province.

2. MATERIALS AND METHODS

2.1 Design Study

The design of this study was cross sectional conducted in Nyogan Village, Muaro Jambi Regency. Time of data collection during April 2019. The population in this study were Suku Anak Dalam aged ≥ 18 years as many as 203 peoples. The sample in this study was SAD that fulfilled the inclusion criteria (SAD or one level of descendants of SAD both father or mother, willing to be participants and living in the Nyogan Village's SAD settlement area) and exclusion criteria (pregnant, taking drugs certain medications that increase blood pressure and consume the alcohol), as many as 193 peoples (total sampling).

2.2 Data Collection Technique

Data were collected by interviews and measurements, where the variables of age, sex, family history, diet, smoking and physical activity were collected by interview, while the dependent variables were hypertension and diabetes mellitus collected by measuring blood pressure using digital tension meters and measuring glucose levels using a digital glucose test. Interviews were conducted by a team of enumerators of six peoples who had been trained by the Researcher Team, coming from students of Semester VI and VIII of the Public Health Faculty, Jambi University. The diet was interviewed using the Semi Food Frequency Questionnaire. Blood pressure and glucose measurements were carried out by Professional Health Workers (the Nyogan Village Midwife)

who had also been given training by the Researcher Team.

2.3 Statistical Analysis

Data analysis used Chi-Square test and Multiple Logistic Regression which produced the final model of the most dominant risk factors of Hypertension and DM at 95% confidence level.

3. RESULTS

Distribution of respondents according to sociodemographic characteristics was the average age of 38 years, minimum 18 years-old and maximum 90 years-old. The average number of household members was 4 peoples.

The distribution of men and women was similar. Most respondents were married. The most education level was low with the majority of the work were being farmers/fishermen/laborers. Most of the respondents were have low income. The average score of respondents' food consumption was 214.59 and the average number of calories was 971.4 kcal. Respondents who smoke on average consume almost 16 cigarettes per day. In carry out mild physical activity the average respondent did 270.26 minutes per day and for moderate physical activity 196 minutes per day, while for the average of heavy physical activity was 3539.7 MET minutes (Table 1).

Table 1 Numerical Conclusions on Sociodemographic and Lifestyle Characteristics in Nyogan Village, Muaro Jambi Regency in 2019 (n=193)

Variables	Minimal-Maximal	Mean (95% CI)	SD	Median
Age (years-old)	18-90	37.82 (35.96-39.68)	13.07	37
Family Size (person)	1-9	4.18 (3.95-4.40)	1.61	4
Diet				
Food Consumption score	65-465	214.59 (203.05-226.12)	81.26	205
Energy (kcal)	204.8-4236.5	971.42 (907.74-1035.11)	448.55	927.70
Smoking				
cigarettes (stick)	2-48	15.55 (13.95-17.15)	7.88	16
Physical Activity				
Mild (minutes)	30-720	270.26 (242.80-297.72)	193.39	180
Moderate (minutes)	20-720	195.89 (171.92-219.87)	143.47	120
Haevy (MET <i>minute</i>)	1680-7200	3539.7 (3279.97-3799.44)	1081.21	3360

SAD had no family history of Hypertension (87.0%) and DM (96.4%). The SAD diet is in the good category (79.3%). The distribution of respondents who smoke and not smoke was similar distributed. SAD have active physical activity about 60.6% (Table 2). The proportion of hypertension events was 9.3% with a prevalence of hypertension was 4.32%. While

the proportion of DM was 1.6% with a prevalence of DM was 0.72% (Figure 1).

The results of the bivariate analysis found that there was a relationship between age and hypertension, where someone aged ≥ 40 years had a risk almost 5 times greater for suffering of hypertension than those aged <40 years. However, it was not proven to be related

between variables of gender, family history, diet, smoking and physical activity to the occurrence

of hypertension (Table 3).

Table 2. Frequency Distribution According to Sociodemographic and Lifestyle Characteristics in Nyogan Village, Muaro Jambi Regency in 2019

Characteristics	n	%
Age		
< 40 year	118	61.1
≥ 40 year	75	38.9
Sex		
Male	93	48.2
Female	100	51.8
Marital Status		
Not Married	32	16.6
Married	161	83.4
Education		
Moderate to high	12	6.2
Low	181	93.8
Work		
Private Employment/Business	56	29.0
Farmers/Fisherman/Laborers	129	66.8
Not Work/Others	8	4.1
Family Size		
Little	159	82.4
Big	34	17.6
Income		
High	6	3.1
Low	187	96.9
Family History of Hypertension		
Yes	25	13.0
No	168	87.0
Family History of Diabetes Mellitus Type II		
Yes	7	3.6
No	186	96.4
Diet		
Good	153	79.3
Poor	40	20.7
Smoking		
Ya	91	47.2
No	102	52.8
Phisocal Activity		
Active	117	60.6
Poor (Less)	76	39.4

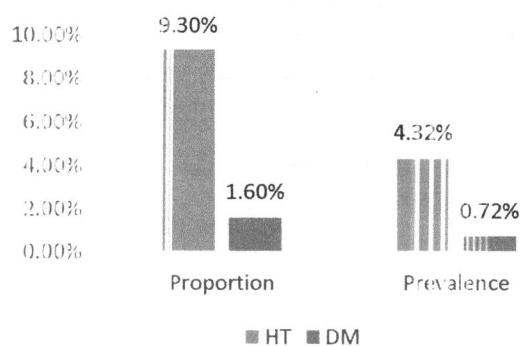


Figure 1. Proportion and Prevalence of Hypertension and DM Type II of SAD in Nyogan Village, Muaro Jambi Regency, 2019

There was no proven relationship statistically between age, sex, family history, diet, smoking and physical activity to the incidence of DM. However, it can be seen that there was a tendency of age ≥ 40 years, poor eating patterns, smoking increases the risk of DM (table 4).

The final model of the risk factors of hypertension in SAD were age and diet with a P-value of 0.010. The dominant factor causing hypertension was age, where the age of ≥ 40 years-old more likely 4.63 times to suffer from hypertension than age <40 years-old after being controlled by dietary variables (Table 5).

The final model of the incidence of DM in SAD were age, sex, family history, diet, smoking and

physical activity. The dominant factor that causes DM was diet. SAD which has an unhealthy diet has a risk of 11.23 times to suffer from DM compared to SAD who have a good diet after controlling for the variables of age, sex, family history, smoking and physical activity. Age ≥ 40 years has a risk of 2.63 times greater suffering from type II DM compared to age <40 years, after being controlled by variables of sex, family history, diet, smoking and physical activity. SAD who have less in carrying out physical activity have a risk of 2.17 times more likely to suffer from DM than those who actively engage in physical activity, after being controlled for variables such as age, sex, family history, diet and smoking. The SAD who have a smoking habit at 1.26 times greater risk of developing diabetes compared to non-smokers, after being controlled by variables of age, sex, family history, diet and physical activity. Female was protective than men, in other words, men were more at risk of developing DM than women, after being controlled by age, family history, diet, smoking and physical activity. SAD that has a family history of DM was protective compared to those without a family history of DM after being controlled by variables of age, sex, diet, smoking and physical activity (Table 6).

Table 3. Risk Factors of Hypertension in SAD at Nyogan Village, Muaro Jambi District, Jambi Province

Variables	Hypertension				Sum		POR (95% CI)	P-Value
	Yes		No					
	n	%	n	%	N	%		
Age								
≥ 40 years	13	17.3	62	82.7	75	100	4.73 (1.61-13.91)	0.005*
< 40 years	5	4.2	113	95.8	118	100		
Sex								
Female	8	8.0	92	92.0	100	100	0.72 (0.27-1.92)	0.682
Male	10	10.8	83	89.2	93	100		
Family History								
Yes	2	8.0	23	92.0	25	100	0.82 (0.18-3.83)	1.000
No	16	9.5	152	90.7	168	100		
Diet								
Poor	5	12.5	35	87.5	40	100	1.53 (0.51-4.60)	0.540
Good	13	8.5	140	91.5	153	100		
Smoking								
Yes	9	9.9	82	90.1	91	100	1.13 (0.43-3.00)	0.995
No	9	8.8	93	91.2	102	100		
Physical Activity								
Less	6	7.9	70	92.1	76	100	0.75 (0.27-2.10)	0.766
Active	12	10.3	105	89.7	117	100		

4. DISCUSSION

This study proves some of the study hypotheses that there has been a change in patterns of disease due to lifestyle changes in the Suku Anak Dalam that have lived in Nyogan Village for almost 15 years (since 2004). It has been known that the pattern of diseases commonly suffered by the SAD community was infectious diseases, but the results of this study prove that there has been a transitions towards to non-communicable diseases such as hypertension and type II DM.

The prevalence of hypertension and diabetes mellitus in SAD in the Nyogan Village is similar

to the prevalence of hypertension in Muaro Jambi regency, but the prevalence of DM in SAD is higher than the prevalence of type II DM in Muaro Jambi District at 4.79%, while the prevalence of type II DM based on data from the Ministry of Health, Republic of Indonesia in 2013 was 0.3% [6,10]. In contrast to the prevalence of Remote Indigenous Communities in Fulani in 2013 which was higher at 31.1%. In this population, older women suffer from hypertension more than older men. In addition, Hypertensive patients were active smokers and ex-smokers and have a family history of hypertension [24]. Prevalence that is much higher, in the Aboriginal and Torres tribes in Far

Nort Queensland in 2011, found pre-hypertension

Table 4. Risk Factors of DM Type II in SAD at Nyogan Village, Muaro Jambi District, Jambi Province

Variables	Diabetes Mellitus Tipe II				Sum		POR (95% CI)	P-Value
	Yes		No					
	n	%	n	%	n	%		
Age								
≥ 40 years	2	2.7	73	97.3	75	100	3.20 (0.27-35.98)	0.561
< 40 years	1	0.8	117	99.2	118	100		
Sex								
Female	1	1.0	99	99.0	100	100	0.46 (0.04-5.51.)	0.610
Male	2	2.2	91	97.8	93	100		
Family History								
Yes	0	0.0	7	100.0	7	100	Not Applicable	1.000
No	3	1.6	183	98.4	186	100		
Diet								
Poor	2	5.0	38	95.0	40	100	8.00 (0.71-90.56)	0.110
Good	1	0.7	152	99.3	153	100		
Smoking								
Yes	2	2.2	89	97.8	91	100	2.27 (0.20-25.46)	0.603
No	1	1.0	101	99.0	102	100		
Physical Activity								
Less	1	1.3	75	98.7	76	100	0.76 (0.07-8.61)	1.000
Active	2	1.7	115	98.3	117	100		

Table 5. Final Model of Risk Factors of Hypertension in SAD

Variables	B	POR (95 % CI)	P-Value
Age	1.53	4.63 (1.57-13.68)	0.006
Diet	0.23	1.26 (0.41-3.92)	0.681

prevalence (34.0%), stage I hypertension (17.7%) and stage II hypertension (3.3%). In this population the risk factors for hypertension were sex (OR = 4.37; 95% CI = 2.92-6.54), overweight (OR = 2.46; 95% CI = 1.53- 3.97), obesity (OR = 4.59; 95% CI = 2.87-7.36), high triglycerides (OR = 2.38; 95% CI = 1.61-3.52) [26]. This difference is due to differences in the characteristics of social demographics of remote

indigenous communities and the culture of each population.

The prevalence of type II DM in SAD at Nyogan Village which shows a higher prevalence than prevalence in the general population supported by National Survey Data in First Nations showed that the prevalence of diabetes was 3-5 times higher than the general population with a prevalence of 26% based on the results of screening in each-one community [25]. In the profile of health status in Manitoba, DM prevalence in remote indigenous communities was 11.8% higher than the general population of 8.8% [25].

Table 6. Final Model of Risk Factors of Diabetes Mellitus in SAD

Variables	B	POR (95 % CI)	P-Value
Age	0.97	2.63 (0.22-32.14)	0.447
Sex	-1.16	0.31 (0.01-12.01)	0.531
Family History	-18.31	0.00 (0.00)	0.999
Diet	2.41	11.23 (0.84-150.57)	0.068
Smoking	0.23	1.26 (0.20-8.22)	0.803
Physical Activity	0.77	2.17 (0.12-38.97)	0.598

This study found that there was a change in disease patterns in SAD. So far, SAD disease was often dominated by infectious diseases, but currently the prevalence of non-communicable diseases has increased and is almost the same as the prevalence of non-communicable diseases in the general population. Epidemiological transitions have occurred due to environmental and social transitions that are closely related to morbidity patterns or public health status in remote indigenous communities.

The results of this study also found that the risk factors of hypertension were age and diet, where the dominant factor of hypertension in SAD was age. Age ≥ 40 years is more at risk for suffering from hypertension compared to age <40 years after being controlled by diet. SAD with more than 40 years of age with a poor diet will increase the risk of hypertension, compared to younger age and with a good diet.

This result is in line with the theory which states that in the older people, the arterial wall gets thickened due to the accumulation of collagen in the muscle layer so that the blood vessels will gradually narrow and become stiff.

Hypertension is a degenerative disease, with increasing age, blood pressure will also increase, which is caused by several physiological changes. In the physiological process there is an increase in preffer resistance and an increase in sympathetic activity, the arterial wall will be thickened because collagen accumulates in the muscle layer, so that the blood vessels gradually become narrow and stiff. In addition, the sensitivity of the blood pressure regulator, the baroreceptor reflex, begins to decrease, as does the role of the kidney where renal blood flow and glomerular filtration rate decrease, which triggers hypertension [27].

This research is in line with the results of the research conducted by Pradono where the most dominant factors related to the incidence of hypertension was age. Someone aged 45 years or more has a risk of 2.40 times suffering from hypertension compared to someone aged less than 45 years after being controlled by variable marital status, economic status, duration of smoking, overweight, abdominal circumference, hyperglycemia, mental disorders, baked foods and preservatives [28]. However, this study result is different with the research conducted by

Andika and Safitri at the Zainoel Abidin Regional General Hospital in the Province of Aceh in 2018 which found that the dominant factor associated with the incidence of hypertension was family history, where a person with a family history of hypertension had seven times the chance greater suffer from hypertension than someone who does not have a family history of hypertension after being controlled by age variables [29].

Another factor that increases the risk of developing hypertension in SAD was diet after controlling with age. The results of this study similar to the research conducted by Anwar at the S. Parman Health Center, Banjarmasin City, which found a significant relationship between fruit and vegetable consumption, where someone who ate less fruits and vegetables had 6.41 times greater to the possibility of hypertension than someone who consumed enough fruit and vegetables [30]. However, this study is different with the research conducted by Mahmudah, et al., in the Sawangan Baru Village of Depok City in 2015 that showed fat intake was the dominant factor affecting the incidence of hypertension. Person with excessive sodium intake was 4.62 times greater suffering from hypertension than someone whose sodium intake was good after being controlled by variable fat intake [31].

Non-communicable diseases are multicusal in nature, so that if a person is ≥ 40 years old and

has a poor diet, it will increase the risk for hypertension. So, if a person is near 40 years old should adopt a healthy lifestyle such as regulating a diet with a variety of food, balanced and healthy.

This study also found that DM risk factors were age, sex, family history, diet, smoking and physical activity where the dominant factor causing DM was diet. SAD who has an unhealthy diet has a risk of 11.23 times suffering from DM compared to SAD who have a good diet after controlling for age, sex, family history, smoking and physical activity.

The diet of type II DM patients in SAD related to majority of SAD never consumed fresh fruit in one week (66.7%) and for the average portion of consumption of fresh fruits only consume one portion in one day (33.7%) while for vegetable consumption the majority of SAD already consume every day (66.7%) but only one serving per day (66.7%) so that the consumption of fruits and vegetables of people with hypertension in SAD were a poor diet because they consume less than five servings of fruits and / or vegetables per day for seven days a week (data not shown).

The further analysis of the SAD diet related to risky food consumption include sweet drinks and flavoring, most SAD consume sweet drinks one time per day (66.7%) and flavoring one time per day (100%). In addition, the diversity of

food consumption assessed from the score of food consumption, the average DM patient in SAD has a score of 228.33 which shows above the average food consumption score of 214.59 and the average SAD energy intake of 1153, 53 kcal/cap/day, this figure is below the energy adequacy standard according to Kepmenkes 1593/2005 which is 2,000 kcal/cap/day [32].

The quality and amount of food consumed by people affects the incidence of diabetes, this is because most SAD were classified have poor consuming food. Based on the results of this study, SAD consumes large amounts of food, but does not meet calories every specified meal time. Food plays a role in the incidence of type II DM. It is important to pay attention to the amount of food consumed, because if the amount of food consumed is not in accordance with the fulfillment of predetermined needs, it will cause type II DM. In addition, a high salt diet, sugar and fat causes people to consume food excessively, especially instant foods that are currently very popular with some people who can increase glucose blood levels [33].

This study is similar with the research conducted by Zulfah, et al. In Mudung Laut Village, Jambi City in 2015. The final model was consumption of high carbohydrates, high consumption of protein and less vegetables and fruit where the dominant factor causing type II DM was lack of vegetables and fruit after being controlled by consumption of high carbohydrates and high

consumption of protein. Zulfah study results showed P-value = 0.001; POR 95% CI = 18,023 (3,981-81,671) which means that someone who consumed vegetables and fruits <25 grams at risk 18 times suffering from type II DM compared to someone who consumed vegetables and fruits ≥ 25 gram [34].

In contrast to research conducted by Wardiah and Emilia in the Langsa Lama Community Health Center Working Area of Langsa City, Aceh in 2017 produced the final model of age, family history, diet and body mass index where the dominant factor that causes type II DM was age after being controlled by variables of family history, diet and body mass index. Although diet was not the dominant factor causing type II DM but the results of statistical tests show that diet was associated with the incidence of type 2 DM (P-value = 0.045; OR = 2.75), it means, someone with an excess diet has a chance of 2.75 times greater to suffer from type II diabetes mellitus compared to someone with a diet according to or less [35].

Degenerative diseases occur more due to lifestyle including eating patterns, so that if a person has a poor diet, aged ≥ 40 years, lacks physical activity and has a smoking habit, it will increase the risk for type II DM. As a preventative measure, if a person is ≥ 40 years old better to adopt a healthy lifestyle, such as regulating diet, pay attention to the type of food

consumed and energy. Also by doing active physical activity and not smoking.

There were some limitations to this study, including the use of cross-sectional designs that have limitations in withdrawing causal relationships. There is a possibility of bias arising from recall when conducting interviews about diet using semi FFQ to remember the portion of food consumed during the past week by respondents, but it has been probed and uses a help table to explore respondent's answers. Further studies need to be carried out in further exploring diet and lifestyle in the SAD using case-control design or with a more appropriate design to get a causal relationship in an effort to find the right prevention and better solution for a specific community.

5. CONCLUSIONS AND RECOMMENDATIONS

The prevalence of hypertension and diabetes mellitus in SAD is similar to the prevalence in the general population. Hypertension prevalence 4.32% and type II DM 0.72%. The dominant factor associated with the incidence of hypertension is age, a person aged ≥ 40 years is more at risk of suffering from hypertension after controlled dietary variables. The dominant factor that causes type II DM is diet, where a person with an unhealthy diet has a risk of 11.23 times to suffer from type II diabetes after controlled for variables of age, sex, family history, smoking and physical activity.

SAD communities in particular need to adopt good eating patterns such as low fat, low sweetness, high fiber (consumption of various fruits and vegetables), and avoiding the use of seasonings, especially when they are more than or equal to 40 years old. Dinas Kesehatan (Health District Office) through Primary Health Center (PHC) need to improve promotive and preventive efforts such as health education to recognize risk factors for hypertension and type II DM, run mobile health clinics for free health checks periodically for example once a week and activated cadres to run Integrated Non-Communicable Disease Development Post (Posbindu PTM) in remote indigenous communities that have a lot of limitations in their area of residence, routinely and actively.

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