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Smokers' Diet Pattern and Nutritional Status in Sulawesi Tengah: Analysis of 2018 Basic Health Research

Pola Makan dan Status Gizi Perokok di Sulawesi Tengah: Analisis Data Riset Kesehatan Dasar 2018

Dian Kurniasari Yuwono[1]*, Nitro Galenso[1], Fahmi Hafid[2]

[1]Luwuk D-III Nursing Study Program, Nursing Department, Health Polytechnic Ministry of Health Palu, North Palu, Central Sulawesi, Indonesia
[2]Department of Nutrition, Poltekkes Ministry of Health Palu, North Palu, Central Sulawesi, Indonesia

ABSTRACT

Background: According to the National Basic Health Research of Indonesia (Riskesdas) in 2018, the prevalence of non-communicable diseases (NCDs) in Central Sulawesi Province surpassed the national rate. This province is also home to 31.3% of active smokers. The main risk factor for NCDs is an unhealthy lifestyle such as physical inactivity, smoking, alcohol consumption, and unhealthy diet pattern.
Objectives: This study aims to investigate diet patterns and nutritional status of adults in Central Sulawesi based on their smoking status.
Methods: This is a cross-sectional study using data from Riskesdas 2018. Smoking status, diet pattern and nutritional status were the variables assessed from 12,211 respondents. The statistical analyses used in this study were chi-square test and Generalized Linear Model (GLM).
Results: Thirty-six-point two per cent of the respondents were active smokers. The prevalence of overweight (BMI ≥25 kg/m^2) and central obesity in smokers were significantly lower than that in the non-smoker group (p<0.05). The smoker group consumed sweetened drinks at least once a week, which increased the prevalence ratio as the weekly consumption frequency increased (PR=1.17 to 1.49; p<0.05). They also had a lower prevalence ratio of consumption a maximum of 3-4 portions/day of vegetable and consuming salty food (high sodium) 1-2 times a week.
Conclusions: Although the prevalence ratio of overweight and central obesity are lower in smokers, they have unhealthy diet patterns, which are shown in lower consumption of vegetables and high in salty food. In the future, an advanced longitudinal study with representative number of respondents is needed to explore the causality of these variables.

INTRODUCTION

Unhealthy dietary patterns and smoking habits are predominant risk factors for the incidence of non-communicable diseases (NCDs). Smokers are aware of this risk, but ironically, the number of smokers in Indonesia in the last decade has only decreased slightly from 36.1% in 2011 to 34.5% in 2021. On the contrary, the number of users of electric cigarettes, or e-cigarettes, is increasing by 10%[1]. The Riskesdas 2018 shows that 36.2% of respondents admitted to smoking cigarettes or chewing tobacco daily or occasionally in the past 30 days[2].

Meanwhile, the prevalence rates of NCDs, such as coronary heart disease, diabetes mellitus, and hypertension, in Central Sulawesi Province are higher than the national prevalence rates[2]. The determinant factors of NCDs are physical inactivity, unhealthy dietary patterns, smoking habits, and alcohol consumption[3]. Consumption of high-fat and high-sugar foods, which are low in fiber, high in sodium, and high in calories is categorized as unhealthy dietary patterns. Nutrition

deficiency could also affect individual health status and productivity. Furthermore, these risk factors are interrelated and complex, making NCDs harder to tackle. The combination of these unhealthy lifestyles is the risk factor of NCDs, and even death[4].

Previous research shows that the dietary patterns of smokers tend to be different from those of non-smokers. Research in the Portuguese community showed that vegetable and fruit consumption in smokers is lower than that in non-smokers[5]. Smokers also tend to have lower Body Mass Index (BMI)[6], even malnutrition[7]. In the context of obesity incidence, the role of smoking behavior, either as a risk or a protective factor, is undefined[8,9]. However, other research shows that smokers tend to have central fat accumulation[10] and excess body weight[11] compared to non-smokers because of their unhealthy lifestyle, poor diet, and excess alcohol consumption.

Studies about smokers' dietary patterns conducted in Indonesia with a representative number of

respondents are limited. A study by Suryadinata et al. (2017)[12], with 110 respondents at a university in Surabaya, Indonesia cannot be generalized to the whole country due to the specific age of the respondents. Meanwhile, mapping all risk factors of NCDs with routine surveillance and research is important to combat NCDs[13]. This research aims to determine the dietary patterns and nutritional status of adult smokers and non-smoker. The results of this study could provide information about dietary patterns needed in NCD prevention program in Central Sulawesi Province.

METHODS

This research was analytic descriptive research using data from Riskesdas 2018. It is a national survey with a cross-sectional design conducted by the National Institute of Health Research and Development of the Indonesian Ministry of Health in 2018[14]. The study population of this research was households in Central Sulawesi Province. The sampling methods were the same as those used by the Indonesian Central Bureau of Statistics in the national socio-economic survey (SUSENAS), which were the probability proportional to size and linear systematic sampling with two-stage sampling. For this study, 12,211 adults were selected from 21,904 individuals interviewed. These respondents were selected because they fell under the age cut-off point (>18 years old), and their data were complete.

Variables observed in this study were smoking status, dietary pattern, and nutritional status of the respondents. The respondent's dietary pattern variables consisted of the consumption of fatty/fried/high cholesterol foods (FFC), sweet foods (SWFC), sweetened drinks/beverages (SDC), high salt food (SFC), and fruits (FC) and vegetables (VC). The respondent's nutritional status was defined by BMI indicator and central obesity (abdominal obesity) indicator, which was determined by waist circumference. These two indicators are the common nutritional status indicators used in Indonesia because not only are they easy and cheap to carry out, they also have high sensitivity in predicting obesity risk and NCDs-related obesity[15]. Level of education, age, sex, occupation, and marital status were the respondents' characteristics being observed, and the operational definition of each characteristic followed the Riskesdas 2018[16].

In the analysis process, we adjusted the variables that might interfere with the relationship between independent and dependent variables. Age and sex were adjusted in analyzing the relationship between smoking status and nutritional status. Meanwhile, in analyzing the relationship between smoking status and dietary patterns, we adjusted sex, age, occupation, and level of education variables. The statistical analyses used in this study were chi-square test and GLM and the results of the analysis were presented in the descriptive tables.

RESULTS AND DISCUSSION

Bivariate analysis using a chi-square test showed that marital status was the only variable that did not differ significantly in both groups (Table 1). The majority of respondents in the non-smoking group were female (77.2%), had normal BMI (50.3%), did not suffer from abdominal obesity (50.9%), and were aged between 30-39 years old (24.4%), finished elementary school (30.3%) and unemployed (39.4%).

Table 1. Respondents' characteristic

Variables	Respondents (n=12,211)				p-value
	Non-smoker (n=7,780)		Smoker (n=4,431)		
	n	%	n	%	
Nutritional Status					
Abdominal Obesity status					
Normal	3959	50.89	3842	86.7	0.000
Obese	3821	49.11	589	13.29	
BMI					
Underweight	634	8.15	519	11.71	
Normal	3913	50.30	3016	68.07	0.000
Overweight	1200	15.42	437	9.86	
Obese	2033	26.13	459	10.39	
Age					
<20 years old	389	5	197	4.45	
20-29 years old	1568	20.15	897	20.24	
30-39 years old	1899	24.41	1169	26.38	
40-49 years old	1774	22.80	1065	24.04	0.004
50-59 years old	1214	15.6	647	14.6	
>60 years old	936	12.03	456	10.29	
Sex					
Male	1775	22.81	4189	94.54	0.000
Female	6005	77.19	242	5.46	
Education					
Not attending school	265	3.41	178	4.02	
Not finished elementary school	965	12.4	639	14.42	
Finished elementary school	2359	30.32	1439	32.48	0.000
Finished junior high school	1349	17.34	809	18.26	

| Variables | Respondents (n=12,211) | | | | p-value |
| | Non-smoker (n=7,780) | | Smoker (n=4,431) | | |
	n	%	n	%	
Finished high school	1915	24.61	1105	24.94	
Completed diploma/vocational school	285	3.66	78	1.76	
Graduated from college	642	8.25	183	4.13	
Marital Status					
Not married	1787	22.97	1083	24.44	0.556
Married	5993	77.03	3348	75.56	
Occupation					
Unemployment	3067	39.42	340	7.67	
At school	251	3.23	97	2.19	
ASN/TNI/POLRI/BUMN/BUMD*	480	6.17	167	3.77	
Private employee	250	3.21	152	3.43	
entrepreneur	666	8.56	491	11.08	0.000
Farmer/farm worker	1856	23.86	2280	51.46	
Fishermen	80	1.03	311	7.02	
Laborer/driver/household servant	200	2.57	320	7.22	
Other	930	11.95	273	6.16	

*) People who worked at the government office and at the military and police office

Meanwhile, most of the respondents in the smoker group were male (94.5%), aged between 30-39 years old (26.38%), and finished elementary school (32.48%). Several previous studies found that social determinants in Indonesia that shape and promote smoking habits are low cigarette price[17], massive cigarette advertising campaign[1], and culture in which people offer cigarettes in community gathering. These factors are closely related to the characteristics of smokers group in this study, which were male in the productive age. They had the resources and freedom to access cigarettes and this group attended social gathering more often in their community. A low level of education (less than 12 years) also dominates the smoker group. This is probably because lower educational level heightens the risk of someone having a smoking habit[18].

In this study, more than half of the smoker group were farmers and farm workers (51.5%). The income of farmers in Central Sulawesi Province in 2018 was IDR 884,100[19]. This is below the regional minimum wage, which is IDR 2,303,711[20]. It is much lower than the minimum wage of Central Sulawesi Province, which is IDR 1,965,232 [21]. This may indicate that, on average, farmers in Central Sulawesi can be classified as economically disadvantaged. However, people in this economically disadvantaged group often spent the most money on cigarettes. This is in line with a previous study using data from BPS, which found that cigarette consumption increased by 1.9% for each increase in poverty indicator. This might be caused by psychological conditions as a results of economic pressure and end up amplifying the smoking habit[22].

Thirty-three point eight percent of respondents in this study had BMI ≥25 kg/m^2, and 36.11% had abdominal obesity. The BMI significantly differed between groups, with the proportion of healthy and underweight categories were higher in the non-smoker group than in the smoker group. On the contrary, the proportion of overweight and obese respondents was higher in the smoker group. This finding is contrary to that of Suryadinata et al. (2017), who found that BMI among

college students who smoked did not differ from that of non-smokers[12]. This contrasting finding may be due to the absence of information about smoking duration, that is, the longer the cigarette consumption, the more significant its effect on the body. In addition, the number of respondents and the narrow range of age in the previous study cannot captivate the relationship between variables observed.

Our analysis showed significant proportion differences between groups for FFC, SDC, SFC, and VC and FC (p<0,05). After using the generalized linear model method and adjusting several variables, we determined the significant dietary patterns in the smoker group, which can be seen in Table 2.

The prevalence of overweight and obese smokers was lower than those with a normal/healthy range of nutritional status (PR=0.84; 95% CI=0.79-0.89 dan PR=0.74; 95% CI=0.69-0.79). This result is similar to that of a cohort study that found that smokers' BMI is 0.7 kg/m^2, lower than that of ex-smokers[23]. Expert have not reached a consensus about the biological mechanism on how smokers have lower BMI than non-smokers. However, it is widely held view that nicotine in cigarettes can increase the basal metabolism rate and reduce smokers' appetite[24]. In addition, the determinants of someone having a BMI ≥25 kg/m^2 in Indonesia are physical inactivity, living in an urban area, lower education level, higher socio-economic status, and consumption of instant and junk foods[25].

Similar to the BMI pattern, smoking could also lower the risk of abdominal obesity by 27% (Table 2). The effect of smoking on lowering the prevalence of obesity and abdominal obesity in this study appeared to support the assumption that smoking could prevent someone being obese. However, previous studies have shown the opposite, not only statistically but also clinically. Smoking behavior significantly correlates with metabolic syndromes like abdominal obesity, hypertriglyceridemia, and lower HDL concentration[26]. The contradiction between the results of this study and those of previous studies was also reported in an investigation by Wang et

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al. (2022), who showed that smoking behavior is not correlated with abdominal obesity but positively related with other metabolic syndrome indicators such as hypertension, hyperglycemia, and lower HDL concentration[27]. This inconsistency is inevitable considering the fact that biological mechanism of cause and effect relation still not understandable[28].

Furthermore, Table 2 also depicts that smoking habit only affects one category in VC consumption variable. We found that smokers tended to have a lower habit of VC consumption of 1-4 portions per day (p<0.05), while there were no effects of smoking in all of the categories in FC consumption patterns. This result is in agreement with that of a study of 99 outpatients in Poland[29] and a study with 1,000 smoker respondents, which shows that the higher the fruit and vegetable consumption, the lower the cigarette consumption[30]. In both this study and the previous study, there is an inverse relationship between cigarette consumption and vegetable consumption. In term of biological mechanism, it has long been reported that nicotine could negatively affect the tastebuds of smokers. The longer the nicotine exposure, the worse the tastebud is disrupted[31], and it may then affect the smokers' food preferences. In this study, we found that smokers tended to prefer sweet and salty flavor.

Table 2. Nutritional status and smokers' dietary pattern

Variables	Non-smoker (n=7780)		Smoker (n=4,431)							
						Unadjusted			Adjusted**		
	n	%	n	%	PR	95% CI		p-value	PR	95% CI		p-value
Nutritional Status											
Abdominal Obesity status*											
Normal	3959	50.89	3842	86.7	Ref						
Obese	3821	49.11	589	13.29	0.27	0.25	0.29	0.000	0.73	0.68	0.78	0.000
BMI*											
Underweight	3913	50.30	3016	68.07	Ref						
Normal	634	8.15	519	11.71	1	0.96	1.1	0.342	1	1.01	1.12	0.01
Overweight	1200	15.42	437	9.86	0.61	0.56	0.66	0.000	0.84	0.79	0.89	0.000
Obese	2033	26.13	459	10.39	0.42	0.38	0.46	0.000	0.74	0.69	0.79	0.000
Dietary pattern											
High fat food consumption*											
Never	374	4.81	209	4.72	Ref				Ref		
>1 x/day	1052	13.52	504	11.37	0.90	0.79	1.02	0.127	1.01	0.92	1.12	0.747
1x/day	1385	17.8	725	16.36	0.95	0.84	1.08	0.501	1.09	0.99	1.19	0.069
3-6 x/week	2156	27.7	1241	28.01	1.01	0.90	1.14	0.752	1.04	0.95	1.15	0.294
1-2 x/week	2236	28.74	1389	31.35	1.06	0.95	1.20	0.261	1.05	0.96	1.15	0.250
<3 x/month	577	7.42	363	8.19	1.07	0.94	1.23	0.281	1	0.90	1.11	0.912
Sweet food consumption*											
Never	270	3.47	159	3.59	Ref						
>1 x/day	1038	13.34	623	14.06	1.01	0.88	1.16	0.866	1.01	0.91	1.13	0.437
1x/day	1550	19.92	800	18.05	0.91	0.80	1.05	0.219	1.04	0.94	1.15	0.767
3-6 x/week	1840	23.65	958	22.91	0.92	0.80	1.05	0.245	1.02	0.93	1.14	0.592
1-2 x/week	2575	33.10	1539	34.73	1.0	0.88	1.14	0.88	1.03	0.94	1.14	0.476
<3 x/month	507	6.52	352	7.94	1.1	0.95	1.28	0.181	1.03	0.93	1.16	0.522
Sweetened drink consumption*											
Never	555	7.13	128	2.89	Ref						
>1 x/day	1709	21.97	1780	40.17	2.72	2.32	3.19	0.000	1.49	1.31	1.70	0.000
1x/day	2472	31.77	1422	32	1.94	1.65	2.29	0.000	1.36	1.19	1.55	0.000
3-6 x/week	1149	14.77	484	10.92	1.58	1.33	1.88	0.000	1.27	1.11	1.46	0.000
1-2 x/week	1456	18.71	499	16.01	1.36	1.14	1.62	0.000	1.17	1.02	1.35	0.022
<3 x/month	439	5.64	118	2.66	1.13	0.9	1.41	0.283	1.14	0.95	1.36	0.141
Fruit consumption*											
≥5 portions/day	209	2.69	150	3.39	Ref						
Never	1233	15.85	867	19.57	0.98	0.86	1.12	0.859	1.08	0.98	1.20	0.104
1-2 portions/day	5488	70.54	2906	65.58	0.82	0.73	0.93	0.003	1.04	0.94	1.14	0.383
3-4 portions/day	850	10.93	508	11.46	0.89	0.78	1.02	0.122	1.02	0.93	1.14	0.595

Variables	Respondents (n=12,211)									
	Non-smoker (n=7780)		Smoker (n=4,431)							
	n	%	n	%	Unadjusted			Adjusted**		
					PR	95% CI	p-value	PR	95% CI	p-value
Vegetable consumption*										
≥5 portions/day	172	2.21	122	2.75	Ref					
Never	194	2.49	151	3.41	1	0.88	1.26	0.564	0.96	0.85	1.09	0.569
1-2 portions/day	6214	79.87	3445	77.75	0.85	0.74	0.98	0.032	0.90	0.83	0.99	0.040
3-4 portions/day	1200	15.42	713	16.09	0.89	0.77	1.04	0.154	0.89	0.81	0.98	0.023
Salty food consumption*										
Never	2301	29.58	1129	25.48	Ref					
>1 x/day	294	3.78	199	4.49	1.22	1.09	1.37	0.001	1.04	0.96	1.13	0.316
1 x/day	465	5.98	265	5.98	1.10	0.99	1.22	0.074	1	0.92	1.08	0.922
3-6 x/week	881	11.32	514	11	1.11	1.02	1.21	0.008	1.05	0.99	1.11	0.079
1-2 x/week	2285	29.37	1432	32.32	1.17	1.09	1.24	0.000	1.04	1	1.09	0.048
<3 x/month	1554	19.97	892	20.13	1.10	1.03	1.19	0.005	1.04	0.98	1.09	0.119

*) Significantly different between both groups (p<0.05)

**) Variables that adjusted in the analysis of smoking status and nutritional status relationship are sex and age. Variables adjusted in the analysis of smoking status and dietary pattern relationship are sex, age, education, and occupation.

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The habit of SDC consumption for at least once a week was higher in the smoker group (p<0.05). However, this pattern was not observed in SWFC consumption. An article reported that the frequency of sweetened drink/beverage consumption is higher than sweet food consumption because the price of sweetened drink/beverage is lower, the product is more diverse, and because their availability, and Indonesian people's history and culture[32]. Similarly, in our study, in addition to SDC, smokers also consumed SFC 1-2 times per week (PR=1.04; 95% CI=1-1.09). This outcome corroborates the findings of the previous research which found that smokers prefer salty food[33], especially if the smoker is also an alcohol drinker[34]. Furthermore, salt is important to Indonesian culture and cuisine. Salt has been used for preserving foods for generations, especially for meat and eggs, and traditional food confirm the Indonesian people's high sodium intake[35,36].

Meanwhile, for FFC consumption, prior studies found that smokers tend to crave fatty foods in between their smoking times[37,38]; therefore, their consumption is higher than that of the non-smoking group. Nevertheless, this pattern was no observed in the results of this study. No particular pattern of FFC consumption was significant in the smoker group, even though the frequency of its consumption differed between both groups (p<0.05). This result is in line with a previous study conducted in Airlangga University[39].

The limitation of a cross-sectional study is that the researcher can not determine the causal effect of the observed variables. In this study, we could not determine whether smoking habit caused specific dietary patterns and specific nutritional status or vice versa. Self-reported smoking habits also become the limitation of this study because of memory bias. It could affect the statistical analysis, especially if 14% of the respondents in the smoker group were occasional smokers who may misremember the last time they smoked cigarettes. As mentioned before, the data used in this study were from Riskesdas 2018; therefore, the strength of this study lies in the large number of respondents, standardized data collection, validated questionnaire utilization, and there were quality assurance efforts during the process.

CONCLUSIONS

This study found that the risk of being overweight/obese and having abdominal obesity is lower in adult smokers in Central Sulawesi Province compared to the non-smoker group, even though they have unhealthy dietary patterns, such as higher consumption of sweetened drinks and high salt foods and lower consumption of vegetables. Further research with a longitudinal method and a representative number of respondents is needed to determine the causal effect between variables. Our finding could provide information for planning NCDs prevention program in the future.

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