Kesmas

Volume 20
Issue 5 *Special Issue 1, July*

Article 13

7-31-2025

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Recommended Citation

Kalsum U , Andini MP , Sitanggang HD , et al. Noncommunicable Diseases (Hypertension or Diabetes Mellitus) Among Private University Lecturers and Related Factors. *Kesmas*. 2025; 20(5): 107-115
DOI: 10.7454/kesmas.v20isp1.2135
Available at: https://scholarhub.ui.ac.id/kesmas/vol20/iss5/13

Kalsum *et al. Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)*. 2025; 20 (Special Issue 1): 107-115
DOI: 10.7454/kesmas.v20isp1.2135

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Noncommunicable Diseases (Hypertension or Diabetes Mellitus) Among Private University Lecturers and Related Factors

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Abstract

Excessive workload, lack of rest, poor diet, stress, and insufficient physical activity are some contributing factors to a high risk of noncommunicable diseases (NCDs) for lecturers. This study aimed to develop a predictive model for the risk of NCDs among lecturers at a private university in Jambi City, Indonesia. A cross-sectional design was used, and the sample included 93 lecturers who met the inclusion criteria. The independent variables were workload, rest pattern, diet, physical activity, stress, smoking, and family history. The dependent variable was NCDs (hypertension or diabetes mellitus), measured through interviews based on a doctor's diagnosis. Data analysis was performed using Cox multivariate regression analysis. The proportion of NCDs among the lecturers was 25.8%. The factors associated with NCDs include workload, rest patterns, and family history. Lecturers are advised to adopt preventive behaviors, and universities must implement early detection of NCD programs to foster health-promoting environments.

Keywords: lecturer, noncommunicable diseases, rest pattern, university, workload

Introduction

Noncommunicable diseases (NCDs) are chronic due to their prolonged duration and gradual progression. In 2018, the World Health Organization (WHO) reported that approximately 71% or 41 million of the 57 million deaths worldwide occurred, with a prevalence of cardiovascular disease (44%), cancer (22%), chronic respiratory diseases (9%), and diabetes (4%).[1] The Indonesian Ministry of Health stated that the occurrence of NCDs in Indonesia was 69.91% in 2019.[2] According to data from the 2018 Indonesian Basic Health Research, the prevalence of NCDs has increased compared to the 2013 risks, including cancer, stroke, chronic kidney disease, diabetes mellitus (DM), and hypertension. The prevalence of cancer increased from 1.4% to 1.8%, stroke increased from 7% to 10.9%, chronic kidney disease increased from 2% to 3.8%, DM increased from 6.9% to 8.5%, and hypertension increased from 25.8% to 34.1%.[3-4]

The increase in the prevalence of NCDs is related to lifestyle factors, including smoking, consumption of alcoholic beverages, physical activity, and consumption of fruits and vegetables. The Indonesian Basic Health Research stated that the proportion of smoking among adolescents (10-18 years) continued to increase from 7.2% in 2013 to 9.1% in 2018. The proportion of alcohol consumption has increased from 3% (2013) to 3.3% (2018). The proportion of poor physical activity increased from 26.1% (2013) to 33.5% (2018). In addition, the proportion of poor fruit and vegetable consumption is still high in the population at 95.5% in 2018.[3-4] According to WHO, the major seven risk factors that cause NCDs are closely related to unhealthy lifestyle, including alcohol consumption, insufficient physical activities, smoking habbit, high blood pressure, sodium consumption, diabetes, and obesity, aside from low socioeconomic factors, which then cause a decrease in life expectancy by 2.1 years at the age of 40-85 years.[5] NCDs are beginning to threaten the productive age group.[5]

Lecturers are vulnerable to NCDs. A previous study found that 31% of lecturers had less rest, 76% had a poor diet, 23% experienced stress, 18.7% lacked physical activity, and 40% had a heavy workload.[6] In Indonesia, lecturers must fulfil the Three Pillars of Higher Education both at state and private universities. The Three Pillars of Higher Education consist of education, research, and community service activities simultaneously performed and reported at each

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Received : September 26, 2024
Accepted : January 20, 2025
Published: July 31, 2025

semester's end. The Three Pillars approach enables universities to develop superior human resources possessing skills in education, research, and community service. It also guides students towards social services to enhance their academic and non-academic abilities and, consequently, to demonstrate their competencies to institutions and society.[7]

A study conducted in Jambi City shows that the main causes of death among public university lecturers are NCDs (96%), with DM and heart attacks each accounting for 28%, followed by hypertension (8%), liver cancer (8%), and autoimmune disorders (8%).[8] Another study reveals that the causes of NCDs in lecturers are workload, work stress, family history, poor eating, and poor rest patterns.[6] This study aimed to obtain a prediction model for the risk of NCDs among lecturers at a private university in Jambi City. This study contributes to developing efforts to prevent NCDs in special groups of workers among high-risk occupational categories, specifically the intellectual worker group, by identifying the dominant cause. The implementation of preventive behavior needs to continue through campaigns, and the development of a healthy campus model on all campuses, including private universities whose management is more oriented towards profit and competition between universities, including competition with public universities.

Method

This cross-sectional study was conducted in 2023 at one of the private universities in Jambi City, Indonesia. The total population was 204 lecturers, while the eligible population consisted of 168 lecturers. However, 75 participants refused to be interviewed because they were busy, leaving 93 participants who met the criteria (the response rate for this study was 55.35%). A total sampling was performed in this study. The inclusion criteria were permanent lecturers with at least three years of work experience (since 2020) who were willing to participate. The factors of workload, diet, stress, rest patterns, sleep habits, physical activity, smoking, and family history of NCDs (hypertension or DM) were analyzed.

The NCDs' status was assessed through interviews and-clinical measurements, including blood pressure and blood glucose testing. Respondents were classified as having NCDs if they were identified as having hypertension or DM based on a doctor's diagnosis. The occurrence of NCDs was calculated based on the proportion of lecturers who experienced hypertension or DM to the number of subjects who responded (actual subjects).

Participants were categorized into two age groups: "Young Adults" (aged <60 years) and "Elderly" (aged ≥60 years). The sex of participants was categorized as either "Male" or "Female." Participants were grouped as "Single" if they were unmarried and "Married" if they had a spouse. The number of household members was classified as having "less than 4 people" or "equal to or more than 4 people." The number of children was categorized as having "less than 2 children" or "equal to or more than 2 children." Respondents who had financial or caregiving responsibilities for individuals outside their nuclear family (e.g., parents, relatives) were marked as "Yes," while those without such dependents were marked as "No."

Participants were classified based on their highest level of education: "Bachelor/Master" or "Doctorate." Duration of employment was divided into two groups: "less than 14 years" and "equal to or more than 14 years." Participants were grouped into academic rank categories of "III" and "IV." Functional positions were categorized as "Non-professors" or "Professor." Respondents were classified as "Yes" when they had other duties than teaching (e.g., administrative roles); otherwise, they were classified as "None." Income level was grouped into "less than USD 306" and "equal to or more than USD 306." Participants were grouped by faculty affiliation: "Agriculture," "Technical," "Economics," "Law," and "Education."

The diet was described as a pattern of consuming high-risk foods, including the frequency of consuming items high in saturated fat, salt, or sugar, which were grouped based on the median number reported in the Food Frequency Questionnaire. Participants were categorized into "Poor" if total score < median and "Good" diet quality if total score ≥ median. Rest pattern was categorized as "Sufficient" if participants slept ≥8 hours per day and "Poor" if they slept <7 hours per day. Participants were marked "Yes" if they currently smoked and "No" if they did not. Participants assigned to more than 12 credits per semester were considered to have a "Heavy" workload, while those with fewer than 12 credits per semester were classified as having a "Light" workload. Stress was categorized into two groups: "Yes" and "No."

Family history of NCDs was categorized as "Yes" if there was a history of hypertension or DM from their grandparents, parents, and siblings, and "No" if there were none. The Global Physical Activity Questionnaire (GPAQ), a measuring tool based on the Metabolic Equivalent Task (MET) indicator, was used to quantify physical activity, and a standard questionnaire was used to measure stress. A MET of more than 3,000 was classified as "High," a MET of 600 to

3,000 as "Moderate," and a MET of less than 600 as "Light" physical activities. Participants diagnosed with hypertension were marked "Yes," otherwise "No." Diagnosis of DM was recorded as "Yes" or "No." Participants were grouped as "Yes" if diagnosed with any or both NCDs (hypertension and DM), otherwise "No."

The authors explained the explanatory script on the questionnaire to the participants before they decided to accept or refuse participation, providing informed consent prior to the interview and measurement. Explanations for the participants were provided by the authors via phone (for those who could not be met in person) or by leaving an explanatory manuscript and an informed consent sheet with the education staff or the head of Academic Affairs to explain this study. Data were collected over a two-month period, from March to April 2023. Data collection was approved in advance by the university rector. Sampling frames and supporting data were obtained by communicating directly with the education staff. Data were collected through interviews and physical measurements, including blood pressure and blood sugar assessments.[8]

The data analysis conducted in this study included univariate, bivariate, and multivariate approaches. Univariate analysis aimed to describe categorical variables based on their frequency distribution or proportion, whereas the description of numeric data variation uses the mean, median, standard deviation, and minimum-maximum values. Bivariate analysis was performed using the Chi-square test with a 95% confidence interval. The conclusion was determined if the p-value ≤α (0.05), the null hypothesis was rejected, indicating a relationship between the independent and dependent variables. The association measure used was the Prevalence Ratio (PR).

Multivariate analysis aimed to simultaneously analyze the relationship between several independent variables and the dependent variable, and determine the dominant independent variable based on the Cox Regression test. This analysis was used because the occurrence of NCDs in this study was >15% (not a rare disease). The steps in conducting multivariate Cox Regression analysis began with screening candidate models using the Chi-square test on each independent variable with the dependent variable. If the Chi-square test results produced a p-value of <0.25, the variable becomes a multivariate candidate.

However, suppose the independent variable produced a p-value of >0.25 but is substantially important and related to the respondents, it can be included as a candidate variable for the multivariate model. Multivariate modeling was performed using the enter method. The next step was performing initial modeling, i.e., entering all candidate variables. A confounding test was conducted based on the statistical significance value. If an independent variable had a p-value of >0.05, it was removed from the model. Variables were removed gradually, starting from the largest p-value. The Cox Regression test was repeated after removing the variables until no variables had a p-value of >0.05.

Results

This study found that the proportion of NCD was 24 among 93 lecturers (25.8%) since the lecturers diagnosed with any or both hypertension or diabetes mellitus were included. Most lecturers were aged <60 years (95.7%), female (52.7%), married (93.5%), having more than 4 family members (74.2%), having more than 2 children (62.4%), having no dependents (86%), having a master's degree (78.5%), working for ≥14 years (50.5%), rank III (73.1%), not a professor in a functional position (77.4%), having no additional duties (55.1%), and having an income of ≥USD 306 (60.2%). Else, most lecturers had poor diets (51.6%), poor rest patterns (63.4%), heavy workloads (60.2%), stress (74.2%), family histories of NCDs (54.8%), high physical activity (77.4%), and did not smoke (82.8%). Approximately 17.2% had hypertension, and 3.2% had DM (Table 1).

Table 1. Characteristics of Lecturers at a Private University in Jambi City, Indonesia

Characteristic	Frequency (n)	Percentage (%)
Age		
Young adults (<60 years)	89	95.7
Elderly (≥ 60 years)	4	4.3
Sex		
Male	44	47.3
Female	49	52.7
Marital status		
Single	6	6.5
Married	87	93.5
Number of household members		
<4 people	24	25.8
≥4 people	69	74.2
Number of children		
<2 people	35	37.6
≥2 people	58	62.4
Dependents outside the nuclear family		
No	80	86.0
Yes	13	14.0
Last education		
Bachelor/Master	73	78.5
Doctorate	20	21.5
Working period		
<14 years	46	49.5
≥14 years	47	50.5
Rank		
III	68	73.1
IV	25	26.9
Functional positions		
Non-professors	72	77.4
Professors	21	22.6
Additional tasks		
None	52	55.9
Yes	41	44.1
Income		
<USD 306	37	39.8
≥USD 306	56	60.2
Faculty		
Agriculture	13	14.0
Technical	21	22.6
Economics	25	26.9
Law	15	16.1
Education	19	20.4
Diet		
Poor	48	51.6
Good	45	48.4
Rest pattern	59	63.4
Poor	34	36.6
Sufficient		
Smoking habits		
Yes	16	17.2
No	77	82.8
Workload		
Heavy	56	60.2
Light	37	39.8
Stress		
Yes	69	74.2
No	24	25.8
Family history of NCDs		
Yes	51	54.8
No	42	45.2
Physical activity		
Light	2	2.2
Moderate	19	20.4
High	72	77.4
Hypertension status		
Yes	16	17.2
No	77	82.8
Diabetes Mellitus status		
Yes	3	3.2
No	90	96.8

Characteristic	Frequency (n)	Percentage (%)
NCD status		
Yes	24	25.8
No	69	74.2

Notes: NCD = noncommunicable diseases, USD 1 = IDR 16,310.

The Chi-square test and calculation of the PR were employed to determine the strength of the relationship. The results of the association size, precision, and significance tests between risk factors for NCDs and NCDs are shown in Table 2. Risk factors were included in the multivariate analysis based on the range of prevalence ratios and the results of the bivariate significance test (p-value <0.05). These variables had a p-value of <0.25. The variables in the question were rest pattern, workload, and family history of NCDs. As all variables were included in the multivariate analysis, the results showed that rest patterns, workload, and family history of NCDs were not related to the proportion of NCDs because the p-value was >0.05 (Table 3).

Table 2. Cross-Tabulation Between Risk Factors of Noncommunicable Diseases

Variable	Noncommunicable Diseases						PR (95% CI)	p-value
	Yes		No		Total			
	n	%	n	%	n	%		
Diet								
Poor	14	29.2	34	70.8	48	100	1.31	0.598
Good	10	22.2	35	77.8	45	100	(0.65-2.64)	
Rest pattern								
Poor	20	33.9	39	66.1	59	100	2.88	0.035
Sufficient	4	11.8	30	88.2	34	100	(1.07-7.73)	
Smoking habits								
Yes	4	25.0	12	75.0	16	100	0.96	1.000
No	20	26.0	57	74.0	77	100	(0.38-2.43)	
Workload								
Heavy	8	14.3	48	85.7	56	100	0.33	0.004
Light	16	43.2	21	56.8	37	100	(0.15-0.69)	
Stress								
Yes	16	23.2	53	76.8	69	100	0.69	0.470
No	8	33.3	16	66.7	24	100	(0.34 – 1.41)	
Family history of NCDs								
Yes	20	39.2	31	60.8	51	100	4.11	0.003
No	4	9.5	38	90.5	42	100	(1.52 –11.11)	
Physical activity								
Light	1	50.0	1	50.0	2	100	1.89 (0.45-7.98)	0.470
Moderate	4	21.1	15	78.9	19	100	0.79 (0.30–2.06)	0.770
Heavy	19	26.4	53	73.6	77	100	Reff	

Table 3. Prediction Model of Noncommunicable Diseases Proportion

Variable	β	PR	95% CI	p-value	p-value (Omnibus)
Heavy workload	-0.693	0.500	(0.204-1.225)	0.130	0.003
Family history of NCDs	1.122	3.072	(0.992-9.510)	0.052	
Poor rest pattern	0.946	2.577	(0.877-7.571)	0.085	

Discussion

The proportion of NCDs among lecturers in this study was relatively higher than that among lecturers working at the public Polytechnic in the same year (17.3%).[6] The disparity in the proportion of NCDs can be attributed to the varying operational definitions employed. The proportion of NCDs in the previous study was assessed solely through two disease categories: hypertension and DM. Conversely, this study encompassed all potential types of NCDs rather than being limited to DM and hypertension.[6]

According to the 2018 Indonesian Basic Health Research, the prevalence of NCDs in the general population of Indonesia varied from 1.8% for cancer and 8.5% for DM to 34.1% for hypertension in 2018.[4] The 2023 Indonesian Health Survey results showed that the prevalence of cancer in people of all ages was 1.2% (Indonesia), while in Jambi Province was 0.7% (95% CI, 0.4 – 1.1% per mile).[9] The prevalence of cancer based on lecturer diagnosis in the age group ≥15 years was 14.3% per mile, of which more were in women with higher education and who were not working (2.4%) and employed as government officers (2%), living in urban areas (1.5%), and with the top quintile socioeconomic level (1.8%).[9]

Meanwhile, the prevalence of DM in the population aged ≥15 years in Indonesia is 2.2%; in Jambi Province, it is only 1.3%, with a 95% CI of 1.1 – 1.5%.[9] The prevalence of DM, when analyzed by age group, is most pronounced in individuals aged 65-74 years (6.7%), with a higher incidence among women, those possessing a university degree (2.9%), individuals employed as government officers (4.1%), residents of urban areas (2.7%), and those belonging to the highest socioeconomic quintile (3.3%).[4]

The prevalence of hypertension in Indonesia, as reported by the 2023 Indonesian Health Survey, is 8.6% based on physician diagnosis and 30.8% based on measurement results.[9] In Jambi Province, the prevalence is 5.7% according to physician diagnosis and 23.6% based on measurements (95% CI, 22.3-24.9%).[9] Higher prevalence is observed among women, particularly in the elderly demographic, and is more pronounced in communities with lower educational attainment. Additionally, urban residents exhibit a prevalence of 9.1% based on clinical diagnosis and 29.7% based on measurements. Regarding socioeconomic status, the highest quintile has a 9.1% prevalence, as determined by clinical diagnosis, whereas the lowest socioeconomic status shows a prevalence of 31.8% based on measurements.[9]

The pattern observed in the 2023 Indonesian Health Survey data supports the findings of this study.[9] The lecturers, at least, hold a master's degree, with an average income of USD 306 (in the top quintile), and reside in urban areas with a prevalence of NCDs that is relatively similar to this study's results.[9] Factors related to the occurrence of NCDs among participants in this study were family history, rest patterns, and workload. Meanwhile, diet, smoking habits, stress, and physical activity were not proven to be significantly related. A prediction model revealed that family history was the dominant factor, even after controlling for the rest pattern and workload. Another study reported similar results, indicating that factors related to the incidence of DM and hypertension among lecturers included workload, family history, diet, rest pattern, and stress, with workload being the most dominant factor.[9]

This study found that family history was the dominant factor in the occurrence of NCDs. The participants with a family history of NCDs had a greater risk of suffering from NCDs than those without a family history after being controlled for the variables of rest patterns and workload. This study's finding supported another study, which found that family history is the dominant factor in the proportion of NCDs, especially hypertension, where families with a history of suffering from hypertension are 38.86 times (95%CI 7.76-194.50) more likely to suffer from hypertension than those who do not have a family history of hypertension.[10] Similarly, another study stated that family history is the dominant factor in the proportion of NCDs, especially DM; families with a history of DM have 11.074 times (95%CI 2.538-48.310) greater chance of occurrence of NCDs than those who do not have a family history of DM.[11]

Another study in Bandar Lampung revealed that family history is a dominant factor in the occurrence of noncommunicable diseases, especially breast cancer. A person whose parents had breast cancer was 10.9 times more likely to develop breast cancer (p-value <0.001, OR= 10.9).[12] The results indicated that family history is the primary determinant, presenting an 11.2-fold increased risk for individuals with parents who have coronary heart disease (CHD). The familial factor plays a very close role in the pathogenesis of CHD, and it tends to occur among people who have parents suffering from early CHD.[12] Another study in Tacoma, Washington, also revealed the same results, which found that a person with a family history of maternal (female) hypertension and type 2 DM has increased risk factors for NCDs.[13] A person with a family history of a father or grandfather (male) has a level of risk similar to that of the mother. This result shows that fathers and mothers who have a history of hypertension and DM are 2.1 times more likely to suffer from NCDs compared to fathers and mothers who do not have a history of NCDs.[13]

The bivariate analysis results showed a significant relationship between rest patterns and the proportion of NCDs. The lecturers who had poor rest patterns were more likely to suffer from NCDs than those who had good or adequate rest patterns. The multivariate analysis in this study revealed that lecturers with poor rest patterns were 2.57 times more likely to develop NCDs than lecturers with good or sufficient rest. A correlation exists between sleep patterns and the proportion of NCDs, such as DM, attributed to inadequate sleep quality, characterized by frequent nocturnal awakenings.[14] This sleep pattern disorder affects the balance of the body, including blood sugar levels.[14] A connection between resting patterns and the occurrence of DM.[15] Sleep quality is divided into qualitative and quantitative categories: the duration of one night's sleep, the time needed to sleep, and whether or not it is restful.[15] However, another study stated that there is no relationship between resting patterns (sleep) and increased blood sugar levels (p-value: 0.822), where age and activity in the movement are risk factors for the occurrence of NCDs, especially DM.[16]

This study also demonstrated a relationship between workload and the proportion of NCDs. Lecturers with heavy workloads were at greater risk of developing NCDs than lecturers with light workloads, as stated in the bivariate analysis results. However, the results of multivariate analysis showed that workload was a confounding factor for the occurrence

of NCDs. The multivariate analysis in this study showed that lecturers with a heavy workload had a 0.500 times higher risk of suffering from NCDs compared to lecturers with a light workload after being controlled for workload and NCD family history. These findings aligned with a previous study that found a relationship between workload and the occurrence of hypertension (p-value = 0.002). Lecturers burdened with excessive workloads report diminished performance, which correlates with occupational exhaustion; individuals suffering from exhaustion and elevated stress levels may face a heightened risk of various ailments, particularly hypertension. A lecturer's obligation, known as the Three Pillars of Higher Education, coupled with the excess of credits, generally 12 credits per semester, is the obligation to conduct research and service. It is not uncommon for lecturers to experience fatigue.[17]

Heavy workload influences the occurrence of NCDs, especially hypertension. Factors such as age, education, working period, and stress contribute to this susceptibility. Elderly individuals with higher education levels are more prone to degenerative diseases, thus necessitating regular health assessments for lecturers.[17] Fatigue leads to depression, which becomes the second killer NCD after heart disease, so the death rate due to fatigue at work tends to be higher.[18] However, another study found no relationship between mental workload and blood pressure in educators; this is because the lecturers in this study have been exposed to accurate information about health, causing their increased awareness to conduct health checks (medical check-ups).[19]

The workload of lecturers that the law has regulated includes planning lessons, conducting the learning process, evaluating learning outcomes, conducting research, assigning additional assignments, guiding and training students, and participating in community services. According to Law Number 13 of 2003 Concerning Manpower, the working hours for employees working 6 days a week are 7 hours a day and 40 hours a week. As for employees with 5 days a week, their work obligations are 8 hours/day and 40 hours/week. However, most lecturers' working hours exceed normal working hours. Even on Saturdays and Sundays or even on national holidays, most lecturers still carry out their work activities, such as conducting research or carrying out community service, as well as guiding and testing the students and preparing teaching materials.[6,20]

Workload is a significant source of stress that gives rise to a type of psychological reaction that is damaging and fosters symptoms of burnout.[21] A study in Semarang City found that the mental workload of lecturers can be quantified by the amount of work they must complete.[20] The lecturers' workload includes planning to learn, carrying out the learning process, evaluating learning, guiding and training, conducting research, performing additional tasks, and engaging in community services, collectively referred to as the Three Pillars of Higher Education. The workload is at least equivalent to 12 credits and a maximum of 16 credits per semester; however, many are found to exceed 16 credits per semester. A workload that is too high can cause stress that triggers adrenaline and gradually affects the heart rate, which results in the occurrence of NCDs.[20]

A study conducted in Padang City found a relationship between stress and CHD, where a person who feels stress increases the frequency of heart workload, causing CHD. People who experience stress are twice as likely to suffer from CHD, which can also increase blood pressure and cholesterol.[22] A relationship between work stress and the occurrence of hypertension was due to an increase in blood pressure, the release of the hormone adrenaline, and the narrowing of arterial blood vessels, as well as an increase in heart rate.[23] A person who experiences continuous stress is likely to increase the risk of developing hypertension, heart disease, stroke, and death.[23]

Lecturers with heavy workloads tended to have limited time for exercise or engage in low physical activity. Continuous low physical activity poses the danger of the emergence of NCDs, especially hypertension.[24] A person with difficulty performing physical activity easily gains weight because the calories stored in the body are not burned and continue to accumulate. If a person regularly exercises, their heart rate increases, the heart muscle contracts more strongly, and blood vessels dilate, allowing the pumped blood to contain more oxygen.[24] One way to reduce the risk of NCD incidents among lecturers is to implement several programs, such as periodical health checks and early detection of NCDs. These programs should include eliminating cigarette smoke, engaging in diligent exercise, maintaining a balanced diet, getting adequate rest, and practicing stress management. The university also needs to reactivate the Health Promoting University program to reduce the risk of NCDs. It is essential to adopt a healthy lifestyle to prevent NCDs, particularly among lecturers with a family history of NCDs, who often face heavy workloads and inadequate rest patterns.[25]

A limitation of this study was the low response rate among lecturers as research subjects, which raised concerns about non-response bias. However, the characteristics of lecturers who refused were relatively similar to those of lecturers who were willing to participate. Hence, the results of this study were sufficient to accurately represent the

existing subjects. The study design employed cross-sectional data, which introduced the possibility of ambiguous temporality bias and the potential for recall bias in dietary assessment variables, as dietary measurement was conducted solely through semi-structured interviews using the food frequency questionnaire.

Conclusion

Variables associated with NCDs include workload, rest patterns, and family history. The dominant factor in NCDs was family history, controlled by workload and rest patterns. Lecturers are advised to adopt preventive behaviors and implement several programs, including periodic health checks, early detection of NCDs, and reactivation of the Health Promoting University.

Abbreviations

NCD: noncommunicable disease; WHO: World Health Organization; DM: diabetes mellitus; GPAQ: Global Physical Activity Questionnaire; MET: Metabolic Equivalent Task; PR: prevalence ratio; CHD: coronary heart disease.

Ethics Approval and Consent to Participate

This study was approved by the Research Ethics Committee of the Health Polytechnic of the Ministry of Health Jambi with the number LB.02.06/2/15/2023.

Competing Interest

The authors declare no significant competing financial, professional, or personal interests that might have affected the performance or presentation of the work described in this manuscript.

Availability of Data and Materials

The primary author can provide all data and materials used in this study.

Authors' Contribution

UK, MPA, and HSN contributed to the design and implementation of the study, as well as manuscript preparation. HDS was involved in the data analysis, while the UK provided supervision and finalization of the manuscript. All authors have reviewed and contributed to the final manuscript.

Acknowledgment

The authors express their sincerest gratitude to the Faculty of Medicine and Health Sciences, Universitas Jambi, LPPM/Institute for Research and Community Services of Universitas Jambi, which has funded this research through the internal budget based on Decree Number 1656/UN21/PT/2023 and contract number: 179/UN21.11/PT.01.05/SPK/2023 dated April 17, 2023. The authors also thank the private university in Jambi City, which became the study area, and all of the participants.

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