



HEALTH PROMOTION

Factors Associated with Hypertension and Diabetes Mellitus among University Students and Staff in Indonesia: A Cross-Sectional Study

HENI TRISNOWATI¹, RIKA YULIANTI FITRI², ROSYIDAH¹, LINA HANDAYANI¹¹ Public Health Department, Faculty of Public Health, Universitas Ahmad Dahlan, Yogyakarta, Indonesia;² Occupational Safety and Health Study Program, Faculty of Public Health, Universitas Ibnu Sina. Riau Island, Indonesia

Keywords

Hypertension • Diabetes mellitus • Non-communicable diseases • Risk factors • University students
• University Staff • Cross-sectional study

Summary

Introduction. Hypertension and diabetes are among the most prevalent non-communicable diseases (NCDs) and contribute substantially to premature morbidity and mortality worldwide. Early identification of factors associated with these conditions is essential for developing effective prevention strategies. However, evidence regarding factors associated with hypertension and diabetes among university students and staff in Indonesia remains limited. This study aimed to identify factors associated with hypertension and diabetes among university students and staff.

Methods. A cross-sectional study was conducted among 503 students, lecturers, and administrative staff at a private university in Yogyakarta, Indonesia. Data were collected using a structured online questionnaire to obtain information on socio-demographic characteristics, smoking status, physical activity, fruit and vegetable consumption, body mass index (BMI), and self-reported physician-diagnosed hypertension and diabetes. Fisher's exact test was performed for bivariate analysis, followed by multivari-

able logistic regression to identify factors independently associated with hypertension and diabetes.

Results. The prevalence of self-reported hypertension and diabetes was 6.6% and 1.8%, respectively. Participants aged 46–65 years had significantly higher odds of hypertension than those aged 17–45 years (adjusted odds ratio [AOR]=3.23; 95% confidence interval [CI]: 1.11–9.43; $p=0.032$). Fruit and vegetable consumption was also independently associated with hypertension (AOR=2.56; 95% CI: 1.11–5.90; $p=0.027$). For diabetes, age (AOR=35.37; 95% CI: 3.07–407.40; $p=0.004$) and sex (AOR=0.16; 95% CI: 0.03–0.89; $p=0.037$) remained independently associated with the outcome.

Conclusion. Hypertension and diabetes mellitus among university students and staff were independently associated with selected demographic and lifestyle-related factors. Identifying individuals at increased risk may facilitate targeted health promotion, routine screening, and preventive interventions to reduce the burden of NCDs in university populations.

Introduction

Non-communicable diseases (NCDs) are the leading cause of mortality and disability worldwide, accounting for approximately 41 million deaths annually, equivalent to nearly three-quarters of all global deaths. Cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes are responsible for more than 80% of premature NCD-related deaths, particularly in low- and middle-income countries. Beyond their impact on mortality, NCDs contribute substantially to disability, reduced quality of life, increased healthcare expenditure, and socioeconomic burden [1, 2].

Indonesia is currently experiencing an epidemiological transition characterized by an increasing burden of NCDs. According to the National Basic Health Survey (*Riskesdas*), the prevalence of hypertension increased from 25.8% in 2013 to 34.1% in 2018, while diabetes mellitus increased from 6.9% to 8.5%. In the Special Region of Yogyakarta, hypertension and diabetes mellitus remain among the most common chronic

diseases, emphasizing the need for effective prevention strategies targeting modifiable risk factors [3].

The development of hypertension and diabetes is strongly influenced by multiple modifiable behavioral and demographic factors, including unhealthy dietary habits, physical inactivity, tobacco use, overweight and obesity, age, and sex [4, 5]. These factors often coexist and interact throughout the life course, substantially increasing the risk of developing chronic diseases [6, 7]. Previous studies have consistently demonstrated that behavioral risk factors are important predictors of NCD occurrence and represent key targets for preventive interventions [8–10]. Universities comprise heterogeneous populations with diverse demographic characteristics and lifestyle behaviors, including students, lecturers, and administrative staff. These population groups may experience different levels of exposure to behavioral risk factors associated with hypertension and diabetes, making universities an appropriate setting for identifying individuals at increased risk of NCDs. Understanding the distribution of these risk factors

within university populations may facilitate early risk identification, targeted preventive interventions, and routine screening programmes for hypertension and diabetes.

Despite the growing body of evidence on NCD risk factors, evidence regarding hypertension and diabetes mellitus among university populations in Indonesia remains limited. Most previous studies have focused on individual behavioral risk factors or single population groups, providing limited evidence to support comprehensive health promotion planning within higher education institutions. A better understanding of demographic and behavioral factors associated with hypertension and diabetes mellitus among university students and staff may provide valuable evidence for strengthening institutional policies and preventive interventions aimed at reducing NCD risk [11].

This study aimed to identify factors associated with hypertension and diabetes among university students and staff at a private university in Yogyakarta, Indonesia, using a cross-sectional study design. The findings are expected to contribute to the identification of high-risk groups and support evidence-based preventive strategies for reducing the burden of hypertension and diabetes in university populations.

Methods

STUDY DESIGN AND PARTICIPANTS

This cross-sectional study was conducted at a private university in Yogyakarta, Indonesia [12, 13].

The study design was selected to examine the association between demographic and lifestyle-related factors and hypertension and diabetes among university students and staff [14].

Data were collected using a structured online questionnaire. The study population comprised active students, lecturers, and academic staff affiliated with the university.

Participants were recruited using consecutive sampling, whereby all eligible individuals who met the inclusion criteria and voluntarily completed the online questionnaire were consecutively included in the study. A total of 503 respondents participated in the study. For analytical purposes, participants were classified into two groups: students ($n=396$) and lecturers and academic staff ($n=107$).

Eligible participants were students, lecturers, and academic staff aged 17–65 years who voluntarily agreed to participate by providing electronic informed consent and completing the questionnaire. Questionnaires with incomplete responses for the variables included in the analysis were excluded.

STUDY VARIABLES AND DATA COLLECTION

Data were collected using a structured online questionnaire. The independent variables included participant group (students; lecturers and academic

staff), faculty affiliation, sex, age, physical activity (frequency and duration per week), fruit and vegetable consumption (frequency per day), smoking behaviour, smoking duration, number of cigarettes smoked per day, and body mass index (BMI). Age was categorized into 17–45 years and 46–65 years based on the university population structure and to ensure sufficient observations in each category for statistical analysis. Body mass index (BMI) was calculated from self-reported body weight and height using the standard formula of weight in kilograms divided by height in meters squared (kg/m^2). Based on the Asia-Pacific BMI classification, participants were categorized into two groups for analysis: normal BMI ($18.5\text{--}22.9 \text{ kg}/\text{m}^2$) and abnormal BMI ($<18.5 \text{ kg}/\text{m}^2$ or $\geq 23.0 \text{ kg}/\text{m}^2$) [15]. The abnormal BMI category included underweight, overweight, and obese participants. The dependent variables were self-reported physician-diagnosed hypertension and diabetes, based on participants' reports of having previously received a diagnosis from a physician.

STATISTICAL ANALYSIS

Descriptive statistics were used to summarize participants' characteristics and are presented as frequencies and percentages. Associations between categorical variables and hypertension or diabetes were initially examined using Fisher's exact test [16, 17]. Variables with a p -value <0.25 in the bivariate analysis were entered into multivariable binary logistic regression models using the purposeful selection approach recommended by Hosmer, Lemeshow, and Sturdivant [18]. Model fit was assessed using the Hosmer-Lemeshow goodness-of-fit test, while correlations among independent variables were examined before model interpretation to identify potential multicollinearity. Adjusted odds ratios (AORs) with 95% confidence intervals (95% CIs) were reported, and statistical significance was defined as $p<0.05$ [18].

ETHICAL APPROVAL

This study was approved by the Research Ethics Committee of Universitas Ahmad Dahlan, Yogyakarta, Indonesia (Approval No. 228.3/FIKES/PL/XI/2021). Electronic informed consent was obtained from all participants before completing the questionnaire. Participation was voluntary, and participant confidentiality and anonymity were maintained throughout the study.

Results

A total of 503 participants were included in the study, comprising 396 (78.7%) students and 107 (21.3%) lecturers and academic staff. Female participants accounted for the majority of the study population (80.3%), and most respondents were aged 17–45 years (94.8%). Regarding lifestyle-related factors, 390 participants (77.5%) reported engaging in physical activity three times or less per week, while 428 (85.1%)

Tab. I. Sociodemographic Characteristics, Lifestyle-Related Factors, and Prevalence of Hypertension and Diabetes Among University Students and Staff (n=503).

Variable	n	%
Participant group		
Student	396	78.7
Lecturer and Academic staff	107	21.3
Sex		
Male	99	19.7
Female	404	80.3
Age (years old)		
17-45	477	94.8
46-65	26	5.2
Physical activity (times/week)		
≤ 3 Times	390	77.5
>3 Times	113	22.5
Fruit and vegetable consumption (times/day)		
≤3 Times	428	85.1
>3 Times	75	14.9
Smoking Status		
Yes	30	6
No	473	94
Body mass index (BMI)		
Abnormal	207	41.2
Normal	296	58.8
Hypertension		
Yes	33	6.6
No	470	93.4
Diabetes Mellitus		
Yes	9	1.8
No	494	98.2

consumed fruits and vegetables three times or less per day. Current smokers represented only 6.0% of the study population, whereas 41.2% of participants had an abnormal body mass index. The prevalence of self-reported hypertension and diabetes mellitus was 6.6% and 1.8%, respectively (Tab. I).

Subsequent bivariate analyses were performed to examine the associations between participants' characteristics, lifestyle-related factors, and the prevalence of hypertension and diabetes mellitus.

Bivariate analysis demonstrated that age, fruit and vegetable consumption, and body mass index (BMI) were significantly associated with self-reported hypertension (Tab. II). Participants aged 46-65 years had a significantly higher prevalence of hypertension than those aged 17-45 years (PR=2.998; 95% CI: 1.027-8.753; $p=0.004$). Participants reporting fruit and vegetable consumption of three times or less per day also had a significantly higher prevalence of hypertension than those consuming them more than three times daily (PR=2.709; 95% CI: 1.233-5.953; $p=0.019$). In addition, body mass index was significantly associated with hypertension ($p=0.030$). No statistically significant associations were observed between hypertension and participant group, sex, physical activity, or smoking status (all $p>0.05$).

STATISTICALLY SIGNIFICANT AT $P<0.05$

Variables with a p -value <0.25 in the bivariate analysis were included in the multivariable logistic regression models. After adjustment for potential confounding variables, age and fruit and vegetable consumption remained independently associated with self-reported hypertension (Tab. III). Participants aged 46-65 years had significantly higher odds of reporting hypertension than those aged 17-45 years (AOR=3.231; 95% CI: 1.107-9.425; $p=0.032$). Likewise, participants reporting fruit and vegetable consumption of three times or less per day had significantly higher odds of hypertension than those consuming fruits and vegetables more than three times per day (AOR=2.563; 95% CI: 1.114-5.900; $p=0.027$). Sex, physical activity, and body mass index were not independently associated with hypertension after adjustment (all $p>0.05$).

For diabetes mellitus, age and sex remained independently associated with the outcome. Participants aged 46-65 years had markedly higher odds of reporting diabetes mellitus than those aged 17-45 years (AOR=35.370; 95% CI: 3.071-407.404; $p=0.004$). Female participants had significantly lower odds of diabetes mellitus than male participants (AOR=0.161; 95% CI: 0.029-0.892; $p=0.037$). Participant group, physical activity, fruit and vegetable consumption, and body mass index were not independently associated with diabetes mellitus after adjustment (all $p>0.05$).

Overall, the multivariable analysis demonstrated that age was the only factor consistently associated with both hypertension and diabetes mellitus, whereas limited fruit and vegetable consumption remained independently associated only with hypertension.

Discussion

This study identified several sociodemographic and lifestyle-related factors associated with self-reported hypertension and diabetes mellitus among university students and staff in Indonesia. In the multivariable analysis, older age and lower fruit and vegetable consumption remained independently associated with hypertension, whereas older age and male sex were independently associated with diabetes mellitus. In contrast, physical activity and body mass index were not independently associated with either outcome after adjustment for potential confounding variables. These findings suggest that non-communicable disease (NCD) risk within university communities is influenced by a combination of demographic characteristics and modifiable lifestyle behaviours, underscoring the importance of strengthening preventive health promotion strategies within higher education settings.

Age emerged as the most consistent factor associated with both self-reported hypertension and diabetes mellitus in this study. After adjustment for potential confounding variables, participants aged 46-65 years had significantly higher odds of reporting hypertension and diabetes mellitus than those aged 17-45 years. This

Tab. II. Bivariate Analysis of Factors Associated with Self-Reported Hypertension Among University Students and Staff (n = 503).

Variable	Hypertension			p-value	Prevalence Ratio (95% CI)
	No	Yes	Total		
Participant group					
Student	373 (74.2%)	23 (4.6%)	396 (78.7%)	0.275	1.672 (0.770-3.630)
Lecturer and academic staff	97 (19.3%)	10 (2.0%)	107 (21.3%)		
Sex					
Male	88 (17.5%)	11 (2.2%)	99 (19.7%)	0.066	0.461 (0.215-0.985)
Female	382 (75.9%)	22 (4.4%)	404 (80.3%)		
Age (years old)					
17-45	450 (89.5%)	27 (5.4%)	477 (94.8%)	0.004	2.998 (1.027-8.753)
46-65	20 (4.0%)	6 (1.2%)	26 (5.2%)		
Physical activity (times/week)					
≤ 3 Times	368 (73.28%)	22 (4.4%)	390 (77.5%)	0.183	1.804 (0.847-3.843)
>3 Times	102 (20.3%)	11 (2.2%)	113 (22.5%)		
Fruit and vegetable consumption (times/day)					
≤3 Times	405 (80.5%)	23 (4.6%)	428 (85.1%)	0.019	2.709 (1.233-5.953)
>3 Times	65 (12.9%)	10 (2.0%)	75 (14.9%)		
Smoking status					
Yes	27 (5.4%)	3 (0.6%)	30 (6.0%)	0.436	1.641 (0.471-5.720)
No	443 (88.1%)	30 (6.0%)	473 (94.0%)		
Body mass index (BMI)					
Abnormal	187 (37.2%)	20 (4.0%)	207 (41.2%)	0.030	0.430 (0.209-0.884)
Normal	283 (56.3%)	13 (2.6%)	296 (58.8%)		

Statistically significant at $p < 0.05$.

finding is consistent with the established epidemiology of non-communicable diseases, which demonstrates that increasing age is an important determinant of hypertension and diabetes because of cumulative exposure to behavioural and metabolic risk factors, progressive vascular changes, reduced insulin sensitivity, and age-related physiological decline [19, 20]. Furthermore, previous epidemiological studies have consistently shown that the prevalence of hypertension and diabetes increases substantially with advancing age [5, 20]. Similarly, Baek et al. (2015) reported that increasing age was strongly associated with hypertension, highlighting the contribution of age-related physiological changes to elevated blood pressure [21].

Although the majority of respondents in the present study were aged 17-45 years, this reflects the demographic composition of the university community rather than a higher age-specific prevalence of hypertension or diabetes within younger adults. Consequently, a greater absolute number of hypertension cases was observed in the younger age group because this group represented nearly the entire study population. Similar considerations have been reported in epidemiological studies, where the distribution of cases is strongly influenced by the age structure of the study population and should therefore be interpreted together with measures of association obtained from multivariable analysis [7, 19]. However, after adjustment for potential confounding variables, older age remained independently associated with both hypertension and diabetes mellitus in the present study. Therefore, these findings should not be interpreted as

indicating that hypertension is more common among younger adults, but rather that the predominance of younger participants influenced the observed distribution of cases. This demographic composition should be considered when interpreting the generalisability of the findings, particularly because the relatively small proportion of participants aged 46-65 years may have reduced the precision of age-specific estimates.

The predominance of younger participants should be considered when interpreting the findings because it may limit the generalisability of the results to university populations with a larger proportion of older adults, which is an important consideration in observational studies [21, 22]. In addition, the relatively small number of respondents aged 46-65 years, particularly among participants with diabetes mellitus, may have contributed to the wide confidence intervals observed in the multivariable model, reflecting limited precision of the estimated associations [18]. Therefore, future studies involving a more balanced age distribution and a larger number of confirmed diabetes cases are warranted to improve the precision and generalisability of the findings.

The present study demonstrated that participants who reported consuming fruits and vegetables three times or less per day had significantly higher odds of self-reported hypertension than those consuming fruits and vegetables more than three times per day. This finding supports the well-established role of adequate fruit and vegetable intake as a protective factor against hypertension and other non-communicable diseases. Previous studies

Tab. III. Multivariable Logistic Regression Analysis of Factors Associated with Self-Reported Hypertension and Diabetes Mellitus Among University Students and Staff.

Variable	B	SE	Wald	p-value	AOR (95% CI)
Hypertension					
Sex	-0.415	0.430	0.932	0.334	0.660 (0.284-1.533)
Age (years old)	1.173	0.546	4.608	0.032	3.231 (1.107-9.425)
Physical activity (times/week)	0.250	0.419	0.355	0.551	1.284 (0.565-2.919)
Fruit and vegetable consumption (times/day)	0.941	0.425	4.897	0.027	2.563 (1.114-5.900)
Body mass index (BMI)	-0.675	0.388	3.019	0.082	0.509 (0.238-1.090)
Diabetes Mellitus					
Sex	-1.825	0.873	4.373	0.037	0.161 (0.029-0.892)
Age (years old)	3.566	1.247	8.178	0.004	35.370 (3.071-407.404)
Physical activity (times/week)	0.434	0.844	0.264	0.607	1.543 (0.295-8.063)
Fruit and vegetable consumption (times/day)	1.004	0.909	1.219	0.269	2.729 (0.459-16.212)
Body mass index (BMI)	0.338	0.848	0.159	0.690	1.402 (0.266-7.395)

AOR: Adjusted Odds Ratio; CI: Confidence Interval. Variables with $p < 0.25$ in the bivariate analysis were included in the multivariable logistic regression model.

have shown that diets rich in fruits and vegetables contribute to blood pressure regulation through multiple biological mechanisms, including increased potassium intake, dietary fibre, antioxidants, and other bioactive compounds that improve endothelial function, reduce oxidative stress, and enhance vascular health [6, 23]. Inadequate fruit and vegetable consumption as one of the major modifiable dietary risk factors for non-communicable diseases, including hypertension, and recommends regular consumption of at least 400 g of fruits and vegetables per day as part of a healthy diet [24]. Although the present study assessed fruit and vegetable consumption using self-reported frequency rather than quantity, the observed association remained significant after adjustment for potential confounding variables. This finding suggests that insufficient consumption of fruits and vegetables may contribute to elevated blood pressure among university populations, even after accounting for demographic and lifestyle-related factors. However, because dietary intake was self-reported and the cross-sectional design precludes establishing temporal relationships, the observed association should be interpreted as an epidemiological association rather than evidence of causality. Future longitudinal studies using more detailed dietary assessment methods are warranted to clarify the dose-response relationship between fruit and vegetable consumption and hypertension among university populations.

The present study also found that sex remained independently associated with self-reported diabetes mellitus after adjustment for potential confounding variables. Female participants had significantly lower odds of reporting diabetes mellitus than male participants. This finding is consistent with previous epidemiological evidence indicating that the distribution of type 2 diabetes differs by sex because of variations in behavioural risk factors, body fat distribution, hormonal regulation, and health-seeking behaviours [25, 26]. Men are generally more likely to be exposed to modifiable risk factors, including tobacco use, unhealthy dietary patterns, and lower utilisation of preventive health

services, which may contribute to a greater burden of diabetes in adulthood [27, 28].

The observed association should be interpreted with caution because the number of participants with self-reported diabetes mellitus in the present study was relatively small, resulting in a wide confidence interval for several estimates in the multivariable model. Moreover, diabetes status was determined through self-reported physician diagnosis rather than biochemical examination, creating the possibility of misclassification due to undiagnosed diabetes or inaccurate reporting. Therefore, future studies incorporating objective clinical measurements, such as fasting blood glucose or glycated haemoglobin (HbA1c), are needed to confirm the observed association between sex and diabetes mellitus among university populations.

The present findings have important implications for public health practice in university settings. From a health promotion perspective, these findings support the implementation of risk-based interventions that combine health education, supportive environments, and behavioural change strategies to reduce modifiable risk factors for non-communicable diseases within university settings. Although university populations are generally perceived as relatively healthy, the identification of age and inadequate fruit and vegetable consumption as factors independently associated with hypertension, together with the association between age and sex and diabetes mellitus, highlights the need for targeted prevention strategies rather than uniform health promotion programmes. Universities provide a strategic environment for implementing evidence-informed interventions that promote healthy dietary behaviours, encourage regular health screening, and facilitate early identification of individuals at increased risk of non-communicable diseases. Such interventions may include periodic blood pressure and blood glucose screening, nutrition education, behavioural counselling, and supportive campus policies that encourage healthy food choices and active lifestyles. These preventive approaches are consistent with the principles of health

promotion and may contribute to reducing the future burden of non-communicable diseases among university communities [6, 29, 30].

STRENGTHS AND LIMITATIONS

This study has several strengths that should be acknowledged. First, it included a relatively large sample of university students, lecturers, and academic staff, providing a comprehensive overview of selected non-communicable disease risk factors within a university community. Second, the use of multivariable logistic regression enabled adjustment for potential confounding variables, thereby providing more robust estimates of the associations between demographic and lifestyle-related factors and self-reported hypertension and diabetes mellitus. These strengths enhance the internal validity of the findings within the study population.

Nevertheless, several limitations should be considered when interpreting the results. First, the cross-sectional design precludes establishing temporal or causal relationships between the identified factors and the study outcomes, and therefore the findings should be interpreted as associations rather than evidence of causation [22, 31]. Second, hypertension and diabetes mellitus were identified based on self-reported physician diagnoses rather than clinical measurements, introducing the possibility of outcome misclassification and underestimation due to undiagnosed cases [22]. Third, most participants were aged 17-45 years, which may limit the generalisability of the findings to university populations with a larger proportion of older adults. Finally, the relatively small number of participants with diabetes mellitus resulted in wide confidence intervals in the multivariable model, indicating limited precision for some estimated associations [18]. Future longitudinal studies incorporating objective clinical assessments and more balanced age distributions are recommended to confirm and extend the present findings. Despite these limitations, the study provides valuable baseline evidence regarding factors associated with hypertension and diabetes mellitus among university students and staff, which may inform future preventive health programmes and longitudinal research in higher education settings.

Conclusion

This study demonstrated that older age and lower fruit and vegetable consumption were independently associated with self-reported hypertension, whereas older age and male sex were independently associated with self-reported diabetes mellitus among university students and staff. These findings highlight the importance of addressing modifiable lifestyle behaviours alongside demographic risk factors in non-communicable disease prevention within university settings. Although causal relationships cannot be inferred because of the cross-sectional design, the findings provide evidence to support targeted health promotion strategies, routine risk screening, and early preventive interventions for

university communities. Future longitudinal studies incorporating objective clinical assessments are recommended to further clarify these associations and strengthen the evidence base for non-communicable disease prevention in higher education institutions.

Acknowledgments

The authors would like to express their sincere gratitude to everyone who provided support, both directly and indirectly, throughout the research process. The authors also thank all respondents for their valuable time and willingness to participate in this study.

Conflict of interest statement

The authors declare that they have no competing interests as defined by the International Committee of Medical Journal Editors (ICMJE). All authors have completed the ICMJE conflict of interest disclosure form, and no conflicts were reported.

Authors' contributions

HT conceived the study, developed the research methodology, and drafted the manuscript. RYF contributed to data analysis and manuscript preparation. R& LH contributed to the critical revision of the manuscript and assisted in manuscript preparation. All authors reviewed, approved the final version of the manuscript, and agreed to be accountable for all aspects of the work.

References

- [1] Luciani S, Nederveen L, Martinez R, Caixeta R, Chavez C, Sandoval RC, Severini L, Cerón D, Gomes AB, Malik S, Gomez F, Ordunez P, Maza M, Monteiro M, Hennis A. Noncommunicable diseases in the Americas: a review of the Pan American Health Organization's 25-year program of work. *Rev Panam Salud Publica* 2023;47:e13. <https://doi.org/10.26633/RPSP.2023.13>.
- [2] WHO. Invisible numbers: the true extent of noncommunicable diseases and what to do about them World Health Organisation. 2022. Available at: <https://iris.who.int/items/4d21314f-587c-43d9-807e-4460dbd441e4>. Accessed on: 05/09/2026.
- [3] Ministry of Health Republic of Indonesia. Laporan RISKES-DAS Tahun 2018. Jakarta: Badan Penelitian dan Pengembangan Kesehatan (Balitbangkes) 2019.
- [4] WHO. "Best buys" and other recommended interventions for the prevention and control of noncommunicable diseases. *World Heal Organ* 2017;17:28. Available at: <http://apps.who.int/iris/bitstream/10665/259232/1/WHO-NMH-NVI-17.9-eng.pdf?ua=1>. Accessed on: 05/09/2016.
- [5] WHO. Global report on hypertension The race against a silent killer. Vol. 01. 2023. Available at: <https://www.who.int/publications/i/item/9789240081062>. Accessed on: 05/09/2026.
- [6] Budreviciute A, Damiati S, Sabir DK, Onder K, Schuller-Goetzburg P, Plakys G, Katileviute A, Khoja S, Kodzius R. Management and Prevention Strategies for Non-communicable

- Diseases (NCDs) and Their Risk Factors. *Front Public Health* 2020;8:574111. <https://doi.org/10.3389/fpubh.2020.574111>.
- [7] Ahmed MT, Jadhav J, Sobagaiah RT. Assessment of risk factors of non-communicable diseases among healthcare workers in Nelamangala: a cross sectional study. *Int J Community Med Public Heal* 2018;5:745.
- [8] Mnatzaganian G, Lee CMY, Cowen G, Boyd JH, Varhol RJ, Randall S, Robinson S. Sex disparities in the prevalence, incidence, and management of diabetes mellitus: an Australian retrospective primary healthcare study involving 668,891 individuals. *BMC Med* 2024;22:475. <https://doi.org/10.1186/s12916-024-03698-0>.
- [9] Sithey G, Li M, Thow AM. Strengthening non-communicable disease policy with lessons from Bhutan: linking gross national happiness and health policy action. *J Public Health Policy* 2018;39:327-42. <https://doi.org/10.1057/s41271-018-0135-y>
- [10] Tian Y, Li C, Shilko TA, Sosunovsky VS, Zhang Y. The relationship between physical activity and diabetes in middle-aged and elderly people. *Medicine (Baltimore)* 2023;102:e32796. <https://doi.org/10.1097/MD.00000000000032796>.
- [11] Rasesemola RM, Mmusi-Phetoe RM, Havenga Y. Social determinants of health in non-communicable diseases prevention policies in South Africa. *Curationis* 2023;46:e1-e8. <https://doi.org/10.4102/curationis.v46i1.2387>.
- [12] Caldas MP. Research design: qualitative, quantitative, and mixed methods approaches. *Rev Adm Contemp* 2009;7:223-3. <https://doi.org/10.1590/S1415-65552003000100015>.
- [13] Creswell JW. *Pengantar Penelitian Mixed Methods*. Cetakan 1. Malini H, ed. Yogyakarta: Pustaka Pelajar 2020.
- [14] Swarjana IK. *Metodologi Penelitian Kesehatan (Edisi Revisi)*. Yogyakarta: ANDI 2016, pp. 1-216.
- [15] World Health Organization RO for the WP, Obesity IA for the S of, Force IOT. *The Asia-Pacific Perspective: Redefining Obesity and Its Treatment*. Sydney: Health Communications Australia 2000. Available at: <https://iris.who.int/handle/10665/206936>. Accessed on: 05/09/2026.
- [16] Sugiyono. *Metode Penelitian Kuantitatif, Kualitatif, R&D*. 6th ed. Bandung: Alfabeta 2024.
- [17] Sugiyono. *Metode Penelitian Kuantitatif*. Bandung: Penerbit Alfabeta 2019.
- [18] Hosmer DW, Lemeshow S, Sturdivant RX. *Applied logistic regression*. 3rd ed. Wiley 2013. Available at: https://onlinelibrary.wiley.com/doi/epdf/10.1002/9781118548387.fmatter?src=getfr&utm_source=mendeley&getft_integrator=mendeley. Accessed on: 04/05/2026.
- [19] WHO. Noncommunicable diseases. 2023;1. Available at: <https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases>. Accessed on: 05/09/2026.
- [20] Ministry of Health Republic of Indonesia. *Laporan Riskesdas 2018 Nasional*. Jakarta: Kemenkes RI 2019, p. 674.
- [21] Baek TH, Lee HY, Lim NK, Park HY. Gender differences in the association between socioeconomic status and hypertension incidence: the Korean Genome and Epidemiology Study (KoGES). *BMC Public Health* 2015;15:852. <https://doi.org/10.1186/s12889-015-2175-6>.
- [22] Rothman KJ, Greenland S, Lash TL. *Modern Epidemiology*. 4th ed. Philadelphia: Wolters Kluwer 2021.
- [23] Li X, Ariell N, Braakhuis A, Li Z, Roy R. How do they eat: a digital diet ethnography of dietary behavior determinants among New Zealand and Chinese university students. *Front Nutr* 2026;12:1729437. <https://doi.org/10.3389/fnut.2025.1729437>.
- [24] Hartley L, Igbinedion E, Holmes J, Flowers N, Thorogood M, Clarke A, Stranges S, Hooper L, Rees K. Increased consumption of fruit and vegetables for the primary prevention of cardiovascular diseases. *Cochrane Database Syst Rev* 2013;2013:CD009874. <https://doi.org/10.1002/14651858.CD009874>.
- [25] Al-Goblan AS, Al-Alfi MA, Khan MZ. Mechanism linking diabetes mellitus and obesity. *Diabetes Metab Syndr Obes* 2014;7:587-91. <https://doi.org/10.2147/DMSO.S67400>.
- [26] Al-Saeed AH, Constantino MI, Molyneaux L, D'Souza M, Limacher-Gisler F, Luo C. An Inverse Relationship Between Age of Type 2 Diabetes Onset and Complication Risk and Mortality: The Impact of Youth-Onset Type 2 Diabetes. *Diabetes Care* 2016;39:823-9. <https://doi.org/10.2337/dc15-0991>.
- [27] Baker P. 1 in 10: the diabetes crisis in men. *Trends Urol Men's Heal* 2018;9:25-8. Available at: <https://wchh.onlinelibrary.wiley.com/doi/10.1002/tre.627>. Accessed on: 05/09/2026.
- [28] Siddiqui S, Zainal H, Harun SN, Sheikh Ghadzi SM, Ghafoor S. Gender differences in the modifiable risk factors associated with the presence of prediabetes: A systematic review. *Diabetes Metab Syndr* 2020;14:1243-52. <https://doi.org/10.1016/j.dsx.2020.06.069>.
- [29] World Health Organization. *Hypertension fact sheet*. 2023. Available at: <https://www.who.int/news-room/fact-sheets/detail/hypertension>. Accessed on: 05/09/2026.
- [30] Li Y, Fan X, Wei L, Yang K, Jiao M. The impact of high-risk lifestyle factors on all-cause mortality in the US non-communicable disease population. *BMC Public Health* 2023;23:1-9. <https://doi.org/10.1186/s12889-023-15319-1>.
- [31] von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP; STROBE Initiative. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *J Clin Epidemiol* 2008;61:344-9. <https://doi.org/10.1016/j.jclinepi.2007.11.008>.

Received on July 23, 2025. Accepted on August 2, 2026.

Correspondence: Heni Trisnowati, Public Health Department, Faculty of Public Health, Universitas Ahmad Dahlan, Jl. Prof. Dr. Soepomo, S.H., Janturan, Warungboto, Umbulharjo, Yogyakarta 55161, Indonesia. E-mail: heni.trisnowati@uad.ac.id

How to cite this article: Trisnowati H, Yulianti Fitri R, Rosyidah, Handayani L. Factors Associated with Hypertension and Diabetes Mellitus among University Students and Staff in Indonesia: A Cross-Sectional Study. *J Prev Med Hyg* 2026;67:E365-E371. <https://doi.org/10.82082/2421-4248/jpmh2026.67.3.3688>

© Copyright by Pacini Editore Srl, Pisa, Italy

This is an open access article distributed in accordance with the CC-BY-NC-ND (Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International) license. The article can be used by giving appropriate credit and mentioning the license, but only for non-commercial purposes and only in the original version. For further information: <https://creativecommons.org/licenses/by-nc-nd/4.0/deed.en>