Medical Laboratory Technology Journal
12(1), 2026, 84-93
Received 2026-11-05; Revised 2026-16-06; Accepted 2026-20-06
Available online at : http://ejurnal-analiskesehatan.web.id

The Relationship between ABO Blood Type, Knowledge Level, Behavior, and Hypertension Status in Young Adults on Campus

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DOI: 10.31964/mltj.v12i1.700

Abstract: Hypertension is a public health problem increasingly found among young adults, including college students. This study aims to analyze the relationship between ABO blood type, knowledge level, behavior, and hypertension status in young adults on campus. This study used an analytical survey method with a cross-sectional design. The study population consisted of all active students in the Medical Laboratory Technology Study Program at the Poltekkes Kemenkes Banjarmasin, with a sample size of 99 respondents selected using a total sampling technique. The researchers collected data through online questionnaires and blood pressure measurements. Data analysis used the Chi-Square test with a significance level of $p<0.05$. The results showed that the majority of respondents were female (80.8%), had normal blood pressure (67.7%), had good knowledge (69.7%), and had good behavior (58.6%). Statistical test results showed that gender ($p=0.533$), ABO blood type ($p=0.916$), and behavior ($p=0.231$) were not significantly associated with hypertension status. Conversely, knowledge level was significantly associated with hypertension status ($p=0.044$). This study concluded that knowledge level was associated with hypertension status, while ABO blood type and behavior showed no significant association. These findings highlight the importance of improving health literacy as part of hypertension prevention efforts in young adults.
Keywords: ABO blood type; behavior; hypertension; knowledge; young adults.

INTRODUCTION

Hypertension is one of the most important public health problems worldwide and a major risk factor for myocardial infarction and stroke, contributing to a high burden of disease and millions of deaths globally (Lawes, C.M.M et al, 2001; Forouzanfar, M.H et al, 2015). Chronically elevated blood pressure can increase the risk of coronary artery disease, peripheral artery disease, heart failure, and stroke due to blood vessel damage that leads to atherosclerosis (Poznyak AV et al, 2022). Therefore, cardiovascular disease remains a major health problem in both developed and developing countries (Teo KK & Rafiq T, 2021). In Indonesia, stroke, heart disease, and hypertension are among the leading causes of death. Globally, these three diseases also remain significant contributors to the mortality rate (WHO, 2020). Hypertension has long been associated with the elderly. However, various studies have shown that it is also common in young adults. High blood pressure has even become a major health problem in young people (Ostchega et al., 2020). A study showed that approximately 22% of young adults aged 18–39 years have hypertension, defined as blood pressure ≥130/80 mmHg or the use of antihypertensive medication (Ostchega et al., 2020). Hypertension in young adults can lead to early target organ damage, increase the risk of premature and lifelong cardiovascular disease, and reduce productivity and quality of life (Aigner A et al., 2017; Yano Y et al., 2018).

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Furthermore, the prevalence of hypertension in young adults in the United States is reported to reach 7.3%, demonstrating the impact of increasingly sedentary lifestyle changes on the younger generation (Ostchega et al., 2020).

Young adults, particularly college students, are a group undergoing the transition from adolescence to adulthood, with various physiological, psychological, and social changes (Jayadilaga, Y, 2025). In college life, students often face academic pressure, irregular sleep patterns, fast food consumption, low physical activity, and prolonged use of mobile devices. These conditions potentially increase the risk of hypertension at a relatively young age (Jayadilaga, Y, 2025). Previous research also shows that stress, poor sleep quality, and a sedentary lifestyle are associated with changes in blood pressure in this age group (Jayadilaga Y, 2025). Furthermore, the increase in unhealthy lifestyles in recent years has led to an increase in the number of individuals at risk of developing hypertension (Huang, Y.L et al., 2013). Research by Jaykumar et al. shows that smoking habits, fruit and vegetable consumption, body mass index, and age are significantly associated with the incidence of hypertension, so behavioral factors and individual characteristics need to be considered in hypertension prevention efforts (Rajkumar, E., & Romate, J, 2020).

In addition to lifestyle factors, biological factors are also suspected to play a role in the incidence of hypertension. Hypertension is a multifactorial disease influenced by environmental, behavioral, and non-modifiable genetic factors (Johnson JD & Louis JM, 2022). One widely studied genetic factor is the ABO blood type system. Research by Putra et al. on a hypertensive population in Bengkulu City showed that blood type B was more common in hypertensive patients than other blood types (Irawan PA & Febriyanto T, 2022). The results of research by Shaikh et al. also showed that blood type B was more dominant in individuals with higher blood pressure than other blood types, thus suggesting a relationship with hypertension (Shaikh, S. A. et al, 2022). These findings suggest a possible link between ABO blood type and the incidence of hypertension, although existing research results are still inconsistent and require further study in different populations.

In addition to biological factors, health knowledge and behavior are important factors in hypertension prevention efforts. Education aimed at improving public knowledge, attitudes, and behavior is crucial for preventing hypertension before it develops (Muntner, P et al, 2004). Individuals with good knowledge tend to better understand the risk factors, complications, and prevention efforts for hypertension. Various lifestyle interventions, such as limiting salt intake, increasing physical activity, and quitting smoking, have been shown to be effective in reducing the risk of hypertension (WHO, 2005). In addition, sociodemographic factors such as age, gender, education level, and income are known to play important roles in influencing a person's level of knowledge, attitudes, and health behaviors (Glanz, K., 2008). Gong et al. reported that although more than 75% of respondents had good knowledge about hypertension and more than 80% had positive beliefs about hypertension prevention, less than 50% of respondents optimally implemented healthy lifestyle behaviors. The study also showed that sociodemographic factors significantly influenced the level of knowledge, attitudes, and behaviors related to hypertension (Gong, D et al, 2020). On the other hand, Jaykumar et al. found no significant association between hypertension knowledge levels and behavioral risk factor indices in rural communities in India. These results suggest that good knowledge does not necessarily translate into good health behaviors, and therefore, the relationship between knowledge, behavior, and hypertension status requires further investigation.

Although various studies have examined risk factors for hypertension in young adults, most have focused on biological or behavioral factors separately. An et al. emphasized the importance of identifying risk factors that influence blood pressure in young adults to identify groups requiring more intensive screening and intervention (Krist, A. H., et al., 2021). Meanwhile, research on the relationship between ABO blood type and hypertension has yielded mixed results (Irawan P.A., 2022), and research on health knowledge and behavior has been mostly conducted in the general population or specific at-risk groups (Yu, M.H. & Huang, Z., 2018). To date, research integrating biological factors, such as ABO blood type, with cognitive and behavioral factors, such as knowledge and health behavior, on hypertension status in young adults on campus, particularly among health students, is still limited.

Therefore, this study was conducted to analyze the relationship between ABO blood type, knowledge level, behavior, and hypertension status in a young adult community on campus. The results are expected to provide more comprehensive information regarding factors associated with hypertension in college students, a productive age group, and thus serve as a basis for developing health promotion strategies and hypertension prevention from a young age.

MATERIALS AND METHODS

This study employed an analytical survey method with a cross-sectional design and a laboratory approach. The population was all active students in the Medical Laboratory Technology Study Program at the Ministry of Health Polytechnic of Banjarmasin, Indonesia. Purposive sampling was employed, resulting in 99 respondents meeting the study criteria.

The researchers collected data through online questionnaires distributed using Google Forms and through blood pressure measurements. ABO blood type data were obtained based on the questionnaires completed by the respondents. The research instruments consisted of a 15-question knowledge questionnaire and a 17-question behavioral questionnaire. Validity and reliability tests for the instruments demonstrated a Cronbach's alpha value of >0.70, indicating that all items were valid and reliable.

The knowledge questionnaire assessed respondents' understanding of the definition of hypertension, risk factors or causes, signs and symptoms, complications, and prevention and management of hypertension. Questions in this questionnaire cover hypertension blood pressure thresholds, risk factors such as heredity, smoking habits, alcohol or caffeine consumption, a high-salt diet, clinical symptoms, the impact of hypertension on organs, and preventive and control measures through a healthy diet, physical activity, smoking cessation, and hypertension treatment.

The behavioral questionnaire covers aspects of lifestyle and daily habits related to hypertension risk, including physical activity or exercise, diet, consumption of risky foods and drinks, rest and sleep patterns, screen time, and smoking or vaping habits. Questions in this questionnaire assess the frequency of daily exercise and activity, fasting and breakfast habits, consumption of foods high in fat, salt, fried foods, fast food, and caffeinated beverages, fruit and vegetable consumption, duration of device use, sleep quality, and exposure to cigarettes or vaping.

The classification of hypertension in this study refers to the Decree of the Minister of Health of the Republic of Indonesia Number HK.01.07/MENKES/ 4634/2021 concerning National Guidelines for Medical Services for the Management of Adult Hypertension. This study categorized blood pressure into normal (120–129/80–84 mmHg), high normal or prehypertension (130–139/85–89 mmHg), stage 1 hypertension (140–159/90–99 mmHg), and stage 2 hypertension (160–179/100–109

mmHg). In this study's analysis, the researchers combined the high normal category into the hypertension group. The researchers measured the respondents' blood pressure using an Omron digital tensiometer.

Knowledge and behavior scores were categorized based on the average (mean) of the respondents' total scores. Respondents with scores below the mean were categorized as poor, while respondents with scores equal to or greater than the mean were categorized as good.

This study has received ethical approval from the Medical Research Ethics Committee of the Banjarmasin Ministry of Health Polytechnic, under license number 268/KEPK-PKB/2025.

RESULTS AND DISCUSSION

This section presents the research results based on univariate and bivariate analyses. Table 1 illustrates the distribution of respondent characteristics and research variables, Table 2 shows a cross-tabulation between independent variables and hypertension status, and Table 3 presents the results of the Chi-Square test to analyze the relationship between research variables.

Table 1. Univariate Analysis of Study Variables (n = 99)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	19	19.2
	Female	80	80.8
Blood Group (ABO)	O	38	38.4
	A	25	25.3
	B	32	32.3
	AB	4	4.0
Hypertension Status	Normal	67	67.7
	Hypertension	32	32.3
Knowledge Level	Good	69	69.7
	Poor	30	30.3
Behavior Level	Good	58	58.6
	Poor	41	41.4

Based on the respondent characteristics table, the total number of respondents in this study was 99 people. Based on gender, the majority of respondents were female, amounting to 80 people (80.8%), while male respondents amounted to 19 people (19.2%). Based on ABO blood type, blood type O was the most common blood type of respondents, namely 38 people (38.4%). Furthermore, blood type B was owned by 32 respondents (32.3%), blood type A by 25 respondents (25.3%), while blood type AB was the blood type with the least number, namely 4 respondents (4.0%). Based on hypertension status, most respondents had normal blood pressure, namely 67 people (67.7%), while respondents who had hypertension numbered 32 people (32.3%). In terms of knowledge level, the majority of respondents had a good level of knowledge, namely 69 people (69.7%), while 30 respondents (30.3%) had a poor level of knowledge. Based on the level of behavior, the majority of respondents showed good behavior, as many as 58 people (58.6%), while 41 respondents (41.4%) had poor behavior.

Table 2. Relationship between Demographic/Behavioral Factors and Hypertension Status

Variable	Category	Normal n (%)	Hypertension n (%)	Total n (%)
Gender	Male	14 (14.1%)	5 (5.1%)	19 (19.2%)
	Female	53 (53.5%)	27 (27.3%)	80 (80.8%)
Blood Group (ABO)	O	27 (27.3%)	11 (11.1%)	38 (38.4%)
	A	16 (16.2%)	9 (9.1%)	25 (25.3%)
	B	21 (21.2%)	11 (11.1%)	32 (32.3%)
	AB	3 (3.0%)	1 (1.0%)	4 (4.0%)
Knowledge Level	Good	51 (51.5%)	18 (18.2%)	69 (69.7%)
	Poor	16 (16.2%)	14 (14.1%)	30 (30.3%)
Behavior	Good	42 (42.4%)	16 (16.2%)	58 (58.6%)
	Poor	25 (25.3%)	16 (16.2%)	41 (41.4%)
Total		67 (67.7%)	32 (32.3%)	99 (100%)

Based on Table 2, the number of respondents in this study was 99. Most respondents had normal blood pressure (67.7%), while 32 respondents (32.3%) had hypertension. Based on gender, the majority of respondents were female (80.8%). Of these, 53 (53.5%) had normal blood pressure, and 27 (27.3%) had hypertension. Meanwhile, there were 19 male respondents (19.2%), consisting of 14 (14.1%) with normal blood pressure and 5 (5.1%) with hypertension.

In terms of ABO blood type, blood type O was the most common, with 38 respondents (38.4%). Of these, 27 (27.3%) had normal blood pressure, and 11 (11.1%) had hypertension. Furthermore, blood type B accounted for 32 respondents (32.3%), consisting of 21 individuals (21.2%) with normal blood pressure and 11 individuals (11.1%) with hypertension. Blood type A accounted for 25 respondents (25.3%), with 16 individuals (16.2%) having normal blood pressure and 9 individuals (9.1%) with hypertension. Blood type AB was the least numerous, with 4 respondents (4.0%), consisting of 3 individuals (3.0%) with normal blood pressure and 1 individual (1.0%) with hypertension.

Based on knowledge level, the majority of respondents had a good level of knowledge, namely 69 individuals (69.7%). Of these, 51 individuals (51.5%) had normal blood pressure, and 18 individuals (18.2%) had hypertension. Meanwhile, 30 respondents (30.3%) had poor knowledge, consisting of 16 individuals (16.2%) with normal blood pressure and 14 individuals (14.1%) with hypertension.

Based on behavioral levels, the majority of respondents had good behavior, namely 58 people (58.6%). Of these, 42 people (42.4%) had normal blood pressure, and 16 people (16.2%) had hypertension. Meanwhile, respondents with poor behavior numbered 41 people (41.4%), consisting of 25 people (25.3%) with normal blood pressure and 16 people (16.2%) with hypertension.

Table 3. Summary of Chi-Square Test between Independent Variables and Hypertension Status (n = 99)

Variable	χ^2 Value	df	p-value	Interpretation
Gender	0.388	1	0.533	Not significant
Blood Group (ABO)	0.512	3	0.916	Not significant
Knowledge Level	4.048	1	0.044	Significant
Behavior Level	1.437	1	0.231	Not significant

Based on the Chi-Square test results in Table 3, an analysis was conducted to determine the relationship between the independent variables—gender, ABO blood type, knowledge level, and behavior level—and hypertension status in the 99 respondents.

The analysis showed no significant relationship between gender and hypertension status, with a χ^2 value of 0.388 and a p-value of 0.533 ($p > 0.05$). These results indicate that the incidence of hypertension in male and female respondents did not differ significantly.

For the ABO blood type variable, the test also showed no significant relationship with hypertension status, with a χ^2 value of 0.512 and a p-value of 0.916 ($p > 0.05$). These results indicate that ABO blood type was not significantly associated with hypertension incidence in the study respondents.

Unlike the previous variables, knowledge level was significantly associated with hypertension status, with a χ^2 value of 4.048 and a p-value of 0.044 ($p < 0.05$). These results indicate that respondents' knowledge level was significantly associated with hypertension status, suggesting that knowledge could be a factor associated with hypertension incidence.

Meanwhile, behavioral level was not significantly associated with hypertension status, with a χ^2 value of 1.437 and a p-value of 0.231 ($p > 0.05$). These results indicate that differences in respondents' behavioral levels were not significantly associated with hypertension status in this study.

Based on Table 1, of the 99 respondents, the majority were female (80.8%), had normal blood pressure (67.7%), a good level of knowledge (69.7%), and good behavior (58.6%). This indicates that the respondents in this study generally had a relatively good health profile and health literacy.

Based on Table 2, female respondents dominated this study, at 80.8%. Of these, 53 (53.5%) had normal blood pressure, and 27 (27.3%) had hypertension. Meanwhile, of the 19 male respondents, 5 (5.1%) had hypertension. However, the Chi-Square test results in Table 3 indicate that gender was not significantly associated with hypertension status ($p = 0.533$). This finding differs from the study by An J. et al. A study involving 355,324 young adults aged 18–39 found that men had a significantly higher risk of being on the highest blood pressure trajectory compared to women (aOR = 13.38; 95% CI: 12.80–13.99). In addition to male gender, older age, obesity, overweight, smoking, prediabetes, diabetes, and high LDL levels were also associated with the highest blood pressure trajectory in young adults (An J. et al., 2024). This difference in results is likely due to differences in sample characteristics, with this study predominantly involving female respondents and having a relatively small sample size compared to the study by An J. et al. (2024).

Based on hypertension status in Table 1, the majority of respondents had normal blood pressure (67.7%), while 32.3% of respondents had hypertension. The incidence of hypertension in young adults aligns with findings that hypertension in young people can be influenced by lifestyle factors, such as unhealthy diet, lack of physical activity, and an increased risk of overweight and obesity (Poznyak AV. et al, 2022). Furthermore, research suggests that heredity and family patterns can also contribute to high blood pressure (Poznyak AV. et al, 2022). These findings indicate that hypertension is influenced not only by behavioral factors but also by biological factors.

Regarding ABO blood type (Table 1), blood type O was the most common blood type, accounting for 38.4%, followed by blood type B (32.3%), A (25.3%), and AB (4.0%). However, based on the results of the Chi-Square test (Table 3), there was no

significant association between ABO blood type and hypertension status (p = 0.916). These results align with research showing no significant association between the ABO blood type system and the incidence of hypertension (Tabatabaie AH & Ali-Madadi M. 2012). Although several other studies have reported a predisposition for certain blood types, such as blood type B or A, to hypertension (Sadiq H et al., 2017; Altaf B et al., 2019), the findings of this study further support the belief that blood type is not a major determinant of hypertension in young adults.

In terms of knowledge (Table 1), the majority of respondents had a good level of knowledge (69.7%). This finding aligns with findings that implementing health education and community health service programs can increase awareness and knowledge regarding hypertension (Tian, M.M. et al., 2015). Furthermore, the chi-square test (Table 3) shows a significant association between knowledge level and hypertension status (p = 0.044). This finding shows that knowledge is an important factor related to the occurrence of hypertension in the respondents of this study, although not all knowledge always leads to consistent behavioral changes (Gonçalves, C et al, 2016).

Regarding the behavioral variable (Table 1), most respondents had good behavior (58.6%). However, statistical test results (Table 3) showed no significant relationship between behavior and hypertension status (p = 0.231). This finding can be explained by the fact that health behavior is influenced not only by knowledge but also by broader environmental and social factors (Wang, C. et al, 2016), so behavioral changes do not always directly impact hypertension status.

From a broader perspective, blood pressure is influenced by various biological, environmental, and social factors (Loucks EB. et al, 2011; Allen NB et al, 2021), including risk factors such as obesity, age, gender, and lifestyle (Krist, A. H. et al, 2021). This is relevant to the results of this study, which show that respondents were predominantly female (80.8%) in Table 1. Furthermore, in Table 2, the distribution of hypertension between men (5.1%) and women (27.3%) does not show a significant proportional difference. The chi-square test results (Table 3) also indicate that gender was not significantly associated with hypertension status (p = 0.533). This finding reinforces the notion that in young adults on campus, gender is not a standalone factor in determining hypertension incidence but rather part of a more complex multifactorial interaction.

Furthermore, metabolic risk factors such as obesity, prediabetes, and dyslipidemia also play a role in the development of hypertension from a young age (Allen NB et al., 2021). Therefore, early detection is necessary in college students and young adults, as in this study, to support hypertension prevention efforts from a young age.

This study has several limitations. First, the cross-sectional design cannot explain the causal relationship between the independent variables and hypertension status. Second, the relatively small sample size from a single institution limits the generalizability of the results to a broader population of young adults. Third, the researchers obtained some data through self-reported questionnaires, potentially introducing information bias and response bias. Fourth, this study did not include several other risk factors, such as body mass index, family history, stress levels, and metabolic status, which could potentially influence the incidence of hypertension.

CONCLUSION

This study shows that knowledge level is significantly associated with hypertension status in the young adult community on campus. In contrast, ABO blood

type, gender, and behavior were not significantly associated with hypertension status. These results suggest that in addition to knowledge level, there are other unanalyzed factors that may contribute to hypertension status in young adults. Therefore, educational institutions need to improve health education and regular blood pressure screenings as an effort to detect and prevent hypertension from a young age.

CONFLICT OF INTEREST

The researcher has no conflict of interest in this research.

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