



RISK FACTORS FOR CARDIOVASCULAR DISEASE AMONG GENERATION Z

Rini Ernawati^{1*}, Yuliani Winarti², Mukripah Damaiyanti³

¹Diploma III Nursing Program, Universitas Muhammadiyah Kalimantan Timur, Jl Ir. H. Juanda No.15, Sidodadi, Samarinda Ulu, Samarinda, Kalimantan Timur 75124, Indonesia

²Public Health Program, Universitas Muhammadiyah Kalimantan Timur, Jl Ir. H. Juanda No.15, Sidodadi, Samarinda Ulu, Samarinda, Kalimantan Timur 75124, Indonesia

³Nursing Science Program, Universitas Muhammadiyah Kalimantan Timur, Jl Ir. H. Juanda No.15, Sidodadi, Samarinda Ulu, Samarinda, Kalimantan Timur 75124, Indonesia

*re850@umkt.ac.id

ABSTRACT

Cardiovascular Disease (CVD) epidemiologically shows a changing trend that influences. Currently, the incidence of risk factors and cases of heart attacks and strokes is increasing in the productive age population, including adolescents to young adults. The purpose of this study was to determine the risk factors for cardiovascular disease in generation Z. This research method uses descriptive correlation with a cross-sectional approach. The study population was 90 students in their 3rd and 5th semesters. The instruments were questionnaires that had been tested for validity and reliability, and measuring tools for weight, height, sphygmomanometer (blood pressure measuring device), cholesterol and blood sugar measuring devices. The results showed that dietary factors obtained a p value = 0.002, physical activity obtained a p value = 0.00 and sleep patterns with a p value = 0.000, this indicates that dietary patterns, physical activity and sleep patterns are at risk for cardiovascular disease, while screen time and smoking do not pose a risk of cardiovascular disease with a p value > 0.05. Prevention of heart disease in Generation Z depends on the synergy between active movement to combat a sedentary lifestyle, nutritional choices to suppress systemic inflammation, and adequate sleep to regulate stress hormones

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INTRODUCTION

Cardiovascular disease (CVD) is a term that encompasses a group of disorders affecting the heart and blood vessels, ranging from the most common and well-known conditions such as coronary heart disease (CHD) and stroke, to other conditions such as heart failure, coronary artery disease, and acute coronary syndrome (Nafiul Faqih, 2021). Data on cardiovascular disease (stroke) for those aged over 15, based on the 2018 Riskesdas survey, stands at 10.9% of the total population, whilst in East Kalimantan it reaches 14.7%. Data on hypertension in Indonesia stands at 8.4%, and in East Kalimantan at 10.2%. This situation indicates that East Kalimantan has a significant number of residents suffering from cardiovascular disease, and this figure is set to rise each year. (Kementerian Kesehatan Republik Indonesia, 2018). Historically, CVD has often been perceived as a disease that exclusively affects the elderly population. The process of atherosclerosis the build-up of fatty plaques on the walls of the arteries which becomes. The underlying cause of the majority of cases of coronary heart disease and stroke, this is a degenerative process that takes decades to manifest clinically. Currently, this paradigm is beginning to shift dramatically. Epidemiological evidence from recent years indicates an alarming trend of rising incidence of risk factors and cardiovascular events among adolescents and young adults (Hernawan, 2023).

A study conducted on a group of 17 adolescents, five of whom had a history of heart disease, showed that an unhealthy diet, lack of physical activity, smoking habits, and emotional stress are factors experienced on a daily basis by this adolescent group (Hinga et al., 2025). This study indicates that lifestyle, physical activity, smoking, and psychological factors significantly influence

health status, particularly increasing the risk of cardiovascular disease. This demographic shift in risk signals a fundamental change in the aetiology of disease, which is no longer driven solely by ageing, but also by environmental exposure and behaviours unique to the younger generation.

Generation Z is defined as individuals born between 1996 and 2010, and they are currently in a crucial transitional phase as they enter working age.(Kristyowati, 2021) . This identifies and mitigates CVD risk factors in this age group, as interventions carried out at this stage can serve as primary prevention measures and have the potential to yield significant long-term health benefits. By preventing or delaying the onset of risk factors such as hypertension, obesity, and dyslipidaemia, the future burden of disease can be significantly reduced, both for individuals and for the national healthcare system as a whole.

Research shows that adolescents' knowledge of risk factors for heart disease is associated with unhealthy eating patterns ($p = 0.000$) . Research shows that the social environment also influences Gen Z to use vapes. (). Generation Z has a strong preference for sugary drinks; a study by Anggadireja states that 7% of students are highly dependent on energy drinks, whilst 70% report consuming energy drinks once a day (Tanoto, 2024). Physical activity is a crucial factor, as it impacts health. Generation Z are, on average, still in education, so their activities are largely centred on school. Research indicates that students engaging in light physical activity are at risk of hypertension, with a p -value of 0.000 (Kasyifa et al., 2018) . Low levels of physical activity are associated with the incidence of obesity, with a p -value of 0.021 (Budiana, 2024). The most common factor among Generation Z is their inability to put down their devices, both day and night, which disrupts sleep patterns. Research on 18-year-old students at PSIK Malang showed that 84.7% were severely addicted to the internet and 57.6% suffered from poor sleep patterns. (Scott et al., 2025) .

The issue at the University of East Kalimantan is the occurrence of two sudden deaths in the last two years (2024 and 2025). Based on a preliminary random survey of 10 UMKT students in September 2025, out of the 10 examined, data showed that 6 had cholesterol levels ranging from 205 mg/dL to 267 mg/dL, and 5 students had blood pressure > 140 mmHg, ranging from 140/100 to 170/100 mmHg, whilst 4 students had a 2-hour postprandial blood glucose level > 165 mg/dL. This situation is deeply concerning as it poses a high risk of developing cardiovascular disease. Consequently, this issue warrants thorough investigation to prevent cardiovascular disease among Generation Z. The aim of this study was to analyze the factors that influence the risk of cardiovascular disease among Generation Z at Muhammadiyah University of East Kalimantan.

METHOD

This study used a descriptive correlational method with a cross-sectional approach. The study population consisted of 90 students from the Faculty of Public Health and Economics, Business, and Politics at the Muhammadiyah University of East Kalimantan, selected from the third and fifth semesters. Sampling was carried out using a purposive sampling technique. The instrument was a questionnaire containing questions about diet, sleep patterns, physical activity, smoking/vaping, screen time that had been tested for validity with Pearson product moment and reliability with Cronbach's Alpha. The observation method was carried out using a scale to measure weight and height, a sphygmomanometer (blood pressure measuring device), a cholesterol and blood sugar measuring device, this tool was used to check the results of biomarker tests, namely total cholesterol levels, random blood glucose, blood pressure, and BMI. Secondary data was obtained from the Academic Administration Section of the Muhammadiyah University of East Kalimantan to obtain data related to the population of the two faculties studied, which totaled 1,102 people. The data obtained in this study were processed using statistical software. Univariate analysis was used to describe the frequency distribution of the variables studied; For bivariate analysis, researchers used the chi-square test with a significance level of $p < 0.05$. This conclusion was based on the analysis

results, where a p value < 0.05 indicated that lifestyle factors among Generation Z were associated with an increased risk of cardiovascular disease.

RESULT

Table 1
Risk Factors for Cardiovascular Disease in Generation Z

Variable	Category	f	%
Grave pattern	Good	19	21.1
	Poor	71	78.8
Physical activity	Light	41	45.6
	Moderate	49	54.4
Smoking/vaping	Yes	22	24.4
	No	68	75.5
Sleep Patterns	Fair	36	40
	Insufficient	54	60
Screen time	Moderate	12	13.3
	Weight	78	86.7
Risk of Cardiovascular Disease	Low Risk	35	38.9
	Moderate risk	55	61.1

Table 1, the majority of Generation Z respondents exhibit high-risk behaviors, dominated by unhealthy eating habits (78.8%), heavy screen time (86.7%), low physical activity (45.6%), and insufficient sleep (60%). Consequently, 61.1% of the group falls into the moderate cardiovascular risk category.

Tabel 3
Analysis of factors associated with the risk of in Generation Z

Risk of Cardiovascular Disease							
Variable	n		Moderate		Total	P-value	
	f	%	f	%	f	%	
Burial pattern							
healthy	18	94.7	1	5.3	19	100	0.002
unhealthy	27	38.0	44	62.0	71	100	OR 16.00
Physical activity							
Light	33	94.3	2	5.7	35	100	0.000
Moderate	8	14.5	47	85.5	55	100	OR 6.482
Smoking/Vaping							
No	28	26.4	40	41.6	68	100	0.064
Yes	7	8.6	15	13.4	22	100	OR 1.500
Sleep Patterns							
good	30	85.7	6	10.9	36	100	0.000
Poor	5	14.3	49	89.1	54	100	OR 7.857
Moderate Screen							
Time	4	4.7	8	7.3	12	100	0.076
heavy	31	30.3	47	47.7	78	100	OR 1.036

Table 2 the bivariate analysis reveals that dietary patterns, physical activity, and sleep quality are significantly associated with cardiovascular disease (CVD) risk among Generation Z at Muhammadiyah University of East Kalimantan. An unhealthy diet emerged as the most critical factor, with an Odds Ratio (OR) of 16.000, indicating a 16-fold increased risk compared to those with healthy eating habits. Similarly, poor sleep patterns and light physical activity showed strong statistical significance ($p = 0.000$), increasing the likelihood of moderate CVD risk by 7.857 and 6.482 times, respectively. In contrast, smoking/vaping habits and screen time duration did not show a statistically significant association with cardiovascular risk in this study. Although high screen time yielded an OR of 1.036, its p-value ($p = 0.076$) suggests that the correlation is not significant. Likewise, with a p-value of 0.064, smoking and vaping were not identified as significant risk factors for CVD within this specific respondent group, suggesting that other lifestyle factors currently play a more decisive role in their cardiovascular health.

DISCUSSION

The Relationship Between Dietary Patterns and Cardiovascular Disease Risk in Generation Z

The research findings indicate that dietary patterns are correlated with the risk of cardiovascular disease in Generation Z, with a p-value of 0.002. The study states that heart disease is one of the leading causes of death worldwide and is becoming increasingly common among younger age groups. Various risk factors such as lifestyle, poor diet, drug use, lack of physical activity, smoking, and alcohol consumption contribute to the development of comorbid conditions such as hypertension, hypercholesterolemia, obesity, and diabetes, which increase the risk of heart disease. Another study indicates that Generation Z has the lowest fruit consumption at just 4% and vegetable consumption at 8.4%. Gen Z teenagers are more influenced in their daily lives by peers (63.2%), taste (60.6%), and price (10.5%) than by nutritional value. Gen Z prefers eating out at restaurants (40.3%), often eats late (88.3%), consumes more soft drinks (59.2%) and snacks (51.6%) (Alqahtani et al., 2025).

A diet high in saturated fat, sodium and calories from fast food has a negative impact on heart health in adolescents; excessive consumption of fast food can increase the risk of obesity, hypertension and cardiovascular disease. A diet high in trans fats, sodium and added sugars poses a risk of heart disease as these foods damage the vascular system. Excessive salt intake draws fluid into the bloodstream, thereby raising blood pressure, whilst excess sugar triggers insulin spikes that cause chronic inflammation and elevated triglycerides. If this habit is combined with the consumption of meat and fried foods, 'bad' cholesterol (LDL) will accumulate and form plaques that narrow the arteries, potentially leading to atherosclerosis. This risk becomes more severe if intake of fibre from fruit, whole grains, and vegetables is low; this fibre acts as a natural cleanser of fat in the body. A lack of fibre and micronutrients leaves the body defenceless against oxidative stress, thereby accelerating heart damage. This high-calorie yet nutritionally poor diet leads to metabolic instability, ultimately significantly increasing the risk of heart attacks and strokes, even from a young age. Research findings indicate a significant association between carbohydrate consumption and coronary heart disease, with a p-value of 0.04 (Marlinda, Dafriani, 2020). This is supported by Pashar's research, which found that dietary patterns are associated with coronary heart disease ($p = 0.029$), a history of hypertension ($p = 0.002$), and a history of dyslipidaemia ($p = 0.000$). (Pashar & Wendikbo, 2024). In Indonesia, adolescents aged over 15 years have a prevalence of abnormal cholesterol levels of 68.6%; this is attributed to frequent consumption of high-fat foods such as fried foods and cholesterol-rich foods. Bivariate test results indicate that consumption of fried foods is associated with an increased risk of hypercholesterolemia ($p = 0.026$) (Yuningrum, rahmuniyati, 2022).

The relationship between screen time and the risk of cardiovascular disease in Generation Z

The study results indicate that screen time is not associated with the risk of cardiovascular disease in Generation Z ($p = 0.078$). The study states that screen time is associated with obesity, has a fairly weak association with metabolic syndrome, and there is no association between screen time and cardiovascular risk factors. Screen time is considered a trigger for heart disease, but medically the relationship is indirect, as staring at a screen does not biologically impair cardiovascular function; the risk arises if screen time takes up time that could be spent exercising and affects associated behaviours such as diet and snacking. Screen time has not been proven to be a significant cause of coronary heart disease risk. Research indicates that screen time is associated with the risk of metabolic syndrome in adolescents ($p = 0.017$). These findings suggest that dietary patterns and sedentary behaviour play a significant role in increasing the risk of metabolic syndrome in adolescents; therefore, the promotion of a healthy lifestyle and the adoption of healthy dietary habits are necessary to prevent the onset of metabolic syndrome among adolescents (Septiana Vannessa Putri & Dwi Sarbini, 2025).

Another study states that the results indicate that physical activity ($p = 0.038$), dietary patterns ($p = 0.029$), sleep patterns ($p = 0.04$), screen time ($p = 0.04$), and stress ($p = 0.04$), and genetics ($p = 0.04$) are associated with the incidence of obesity in adolescents (Anriyani et al., 2024) in addition to mechanical effects, sleep deprivation caused by device use also triggers hormonal imbalances that increase systemic inflammation and insulin resistance. This condition is often accompanied by impulsive eating patterns at night, which worsen blood lipid profiles, thereby accelerating the process of arterial hardening. Thus, the combination of uncontrolled screen time and poor sleep patterns creates a metabolic environment highly susceptible to the risk of future heart attacks and strokes. Research findings reveal that Generation Z's excessive scrolling on gadgets is a form of stress coping mechanism or task avoidance, yet this has a negative impact on Gen Z's health (Christantio et al., 2025). A sedentary lifestyle among adolescents leads them to frequently consume fast food, fried foods, meatballs and other ready-to-eat foods, which are high in energy and fat; adolescents prefer to spend time in front of screens whilst snacking rather than engaging in physical activities such as sport. (Islami et al., 2023).

The relationship between sleep patterns and the risk of cardiovascular disease in Generation Z

Research findings indicate that sleep patterns are correlated with the risk of cardiovascular disease, with a p -value of 0.000. Insufficient and irregular sleep patterns are becoming an increasingly common health issue among the younger population, particularly Generation Z. Sleep duration of less than 6 hours or more than 9 hours per night is closely associated with an increased risk of cardiovascular disease, including hypertension, obesity, dyslipidaemia, and insulin resistance; furthermore, poor sleep quality is also linked to increased systemic inflammation, which contributes to cardiovascular risk. Research findings indicate that sleep patterns influence the development of hypertension with a p -value of 0.000 and an odds ratio (OR) of 9.022; the OR indicates that respondents with good sleep patterns have a 9.022 times greater risk of not developing hypertension compared to those with poor sleep patterns (Martini et al., 2018).

Quality sleep is an active biological process that is vital for the recovery and maintenance of the entire body system. Whilst we sleep, the body performs vital functions such as tissue repair, the clearance of toxins from the brain, and the resetting of metabolic and hormonal systems. A regular sleep pattern of 7–9 hours for adults plays a direct role in maintaining blood vessel elasticity and stabilising blood pressure, thereby reducing the risk of heart disease, stroke and metabolic disorders such as type 2 diabetes, and improving overall health. This study found a statistically significant p -value ($p < 0.05$), indicating that adolescent health is influenced by time management and sleep quality. (Saputra et al., 2023). The study results indicate that regular exercise, a diet low in fat and high in fibre, and sufficient sleep duration significantly ($p < 0.05$) reduce the risk of heart disease; conversely, unhealthy lifestyle habits such as junk food consumption, lack of physical activity, and insufficient sleep contribute to the risk of heart disease. Sleep disorders have systemic effects that play a role in the development of coronary heart disease, hypertension, coronary artery disease, heart failure, and arrhythmia. (Jaspan et al., 2024).

Chronic sleep deprivation triggers hyperactivity of the sympathetic nervous system, causing the brain to perceive the body's condition as a state of stress or threat. This disturbance stimulates the excessive release of the hormone e.g., cortisol, epinephrine and norepinephrine, causing blood vessels to remain constricted throughout the night; consequently, peripheral blood pressure rises and forces the heart to work at high intensity without sufficient recovery time. In addition to raising blood pressure, these hormones also trigger systemic inflammation and oxidative stress in the endothelial lining of blood vessels, which can lead to plaque formation and increase the risk of sudden heart attacks, particularly in younger individuals. (Solehati et al., 2024).

The relationship between physical activity and the risk of cardiovascular disease in Generation Z

Research findings indicate that physical activity is significantly associated with the risk of cardiovascular disease in Generation Z, with a p-value of 0.000. Cardiovascular disease is a major health issue both globally and in Indonesia. Forty per cent of deaths worldwide are caused by heart disease, and in Indonesia, the number of heart disease patients increases every year. There are many contributing factors, one of which is a lack of physical activity; a related study indicates a significant association between physical activity (p-value = 0.005) and smoking behaviour (p-value = 0.047) with cardiovascular endurance in the village of Pandan Wangi. Supported by research indicating that regular exercise, a diet low in fat and high in fibre, and sufficient sleep duration are significantly associated with reducing the risk of heart disease. (Nugraha & Sartika, 2025)

Physical activity enables the heart to pump blood more effectively with a lighter workload; exercise stimulates the release of nitric oxide, which keeps arterial walls flexible, thereby preventing micro-damage to the endothelial lining—which is typically the starting point for fat accumulation. Physical activity improves lipid metabolism by increasing levels of “good” cholesterol (HDL), which removes bad cholesterol from the blood vessels for excretion; this process is accompanied by increased insulin sensitivity and a reduction in systemic inflammation, thereby preventing plaque in the blood vessels. Research indicates that the higher the level of physical activity, the shorter the duration of the disease, whilst patients with low activity levels are likely to suffer from the disease for a longer duration. (Janah, 2026). Physical activity significantly influences health across various age groups. Other research indicates that physical activity has a significant association with the incidence of coronary heart disease in individuals over 15 years of age in Indonesia, with a p-value of 0.00. (Further research supports the existence of a link between physical activity and total cholesterol, with a correlation between physical activity and the risk of cardiovascular disease (p=0.030, OR 3.1). (Kertapati & Palembang, 2020). Generation Z teenagers who are accustomed to a sedentary lifestyle must make lifestyle changes. Regular physical activity has been shown to reduce cortisol levels caused by stress. Setting aside 15–30 minutes, three times a week, for physical activity or exercise can maintain fitness and prevent the risk of metabolic diseases and circulatory disorders at a young age.

The relationship between smoking/vaping and the risk of cardiovascular disease in Generation Z

Research findings indicate that smoking/vaping is not associated with the risk of cardiovascular disease, with a p-value of 0.064. A related study shows that there is no association between smoking habits and hypertension in adolescents aged 15–19 years in the Dayen Peken Sub-District, with a p-value of 0.213. The nicotine content in cigarettes significantly affects blood pressure through various mechanisms, ranging from accelerating the formation of atherosclerotic plaque to stimulating the release of the epinephrine and norepinephrine hormone. Exposure to carbon monoxide (CO) triggers a compensatory increase in red blood cells, which places an additional burden on the heart. At the cellular level, smoking increases levels of C-reactive protein and systemic inflammatory agents, which ultimately trigger endothelial dysfunction, vascular tissue damage, and arterial wall stiffness—the primary causes of elevated blood pressure. (Rahmatika Aufa Fitri, 2021). Another study noted that smoking habits among students at SMK I Padang were not associated with systolic blood pressure, with a p-value of 0.078. (Farabi et al., 2017). Another study demonstrated that there is a correlation between BMI (p = 0.000) and physical activity (p = 0.47) with hypertension in adolescents, but not with gender (p = 0.281), family history (p = 0.792), sodium intake (p = 0.178), smoking (p = 0.698), stress (p = 0.345) and parental income (p = 0.945) are not associated with hypertension in adolescents (eny pemilu, 2022).

Cardiovascular disease is a condition with a relatively long development process; consequently, the effects of smoking are not yet apparent in Generation Z, whose average age is 20 years. The effects will become evident after 10–20 years of exposure, meaning that many studies examining the

correlation between smoking and cardiovascular disease in adolescence show no association. Exposure to toxic substances from cigarettes or vapes poses a serious threat to the development of the cardiovascular system in adolescents who are still growing. Nicotine causes an increase in heart rate and blood pressure, whilst carbon monoxide reduces oxygen supply to the entire body; these conditions impair concentration and lead to damage to blood vessel walls, which can be the precursor to coronary heart disease in the future. Therefore, smoking must be avoided from an early age. Smoking has a significant impact on health, particularly on cholesterol levels, as cigarettes contain nicotine which can trigger the release of catecholamines, cortisol and growth hormones. The release of these hormones activates adenylyl cyclase in adipose tissue, thereby increasing lipolysis and releasing free fatty acids into the plasma, which are subsequently metabolised in the liver.(Pudjiastuty et al., 2025)

CONCLUSION

The results of the analysis indicate that cardiovascular disease risk factors, including diet, sleep patterns and physical activity, are strongly associated with cardiovascular disease risk, whilst screen time and smoking/vaping are not associated with cardiovascular risk among Generation Z at the University of Muhammadiyah East Kalimantan.

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