

Strengthening the Role of Families in Healthy Lifestyle Changes as a Preventive Effort for Heart Disease Patients in the Working Area of the Kalumpang Community Health Center, Ternate City

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Abstract.

Heart disease is a high-risk cardiovascular disease that occurs due to narrowing or blockage of the coronary arteries by plaque, so that blood flow to the heart is disrupted and can cause chest pain, heart attacks, and sudden death. This study aims to strengthen the role of families in encouraging healthy lifestyle changes as an effort to prevent coronary heart disease in the work area of the Kalumpang Community Health Center. Research Methods: This study used an observational analytical design with a cross-sectional approach to analyze factors related to strengthening the role of families in healthy lifestyle changes as an effort to prevent coronary heart disease in the work area of the Community Health Center. The study population included all heart disease sufferers recorded in the register book at the Kalumpang Community Health Center during 2025. The sampling technique used was total sampling, so that the entire population was used as a research sample. Results: The physical activity variable has an Odds Ratio (OR) value of 12,600, which means that individuals who do not do physical activity have a chance of about 12.6 times greater. Dietary patterns have a significant relationship with the incidence of heart disease, indicated by p value = 0.014 and OR = 4.148, which means that individuals with poor diet have a chance of about 4.1 times greater. Smoking habits have a significant relationship with efforts to prevent heart disease, with p value = 0.018 and OR = 3.838. This means that individuals who have a smoking habit are at risk of about 3.8 times greater. Compliance has a very significant relationship with efforts to prevent heart disease, with p value = 0.000 and OR = 13.964. Family attitudes have a very significant relationship with efforts to prevent heart disease, indicated by p value = 0.000 and OR = 13.444. Conclusion: This study shows that strengthening the role of the family is very important in encouraging healthy lifestyle changes as an effort to prevent heart disease in the working area of the Kalumpang Community Health Center, Ternate City. Compliance, attitude, physical activity, and knowledge are the main factors, while unhealthy behavior and lack of family support increase the risk. Therefore, family-based interventions are needed through education at the Kalumpang Community Health Center, accompanied by counseling, mentoring, policy support, cross-sector collaboration, and increased outreach for heart disease prevention.

Keywords: *The Role of the Family; Prevention Efforts and Heart Disease Sufferers.*

I. INTRODUCTION

Heart disease is one of the most common and high-risk cardiovascular diseases, characterized by narrowing or blockage of the coronary arteries due to plaque buildup, disrupting blood flow to the heart. This condition can cause chest pain, heart attacks, and even sudden death [1]; [2]. This disease is triggered by various risk factors such as hypertension, diabetes, high cholesterol, and smoking [3]; [4]. Its impact not only affects physical health but also creates a significant social and economic burden due to high treatment costs [5]. Therefore, strengthening the role of families in encouraging healthy lifestyle changes is crucial in preventing heart disease.

In recent years, cases of coronary heart disease in Indonesia have increased significantly. Based on Basic Health Research (Riskesdas) data, this disease ranks seventh among non-communicable diseases, with a steadily increasing prevalence [6]. In some regions, such as South Sulawesi, the prevalence reaches 1.46% [6]. Globally, a WHO report indicates that cardiovascular disease, including coronary heart disease, causes

approximately 9.4 million deaths annually and is expected to continue to rise [2]. This situation emphasizes the importance of strengthening the role of families in encouraging healthy lifestyle changes as an effort to prevent heart disease.

Understanding the risk factors for coronary heart disease (CHD) is crucial because it is key to its prevention and control. Factors such as unhealthy diet, lack of physical activity, and stress play a significant role in the high incidence of CHD [5]; [4]. Furthermore, smoking and alcohol consumption exacerbate the condition [7]. Therefore, public education is essential to reduce the prevalence of CHD in Indonesia.

Coronary heart disease is one of the leading causes of death in Indonesia, so understanding its risk factors is crucial. Smoking is a major factor because it can damage blood vessels and increase bad cholesterol (LDL) and lower good cholesterol (HDL), with the risk of heart attack 2–4 times higher in smokers ([8]; [9]; [10]). Hypertension also plays a significant role because it can damage arteries and increase the heart's workload. A certain increase in blood pressure can even double the risk of heart attack [11] ; [12] ; [13].

Furthermore, high cholesterol causes plaque buildup in the arteries, which can lead to blockages and heart attacks, particularly due to a diet high in saturated fat [11]; [9]. Diabetes also increases the risk of coronary heart disease (CHD) because it affects blood vessels and the body's metabolism. Therefore, prevention through a healthy lifestyle, regular checkups, and strengthening family involvement is crucial to reducing the incidence of CHD.

This study aims to encourage strengthening the role of families in healthy lifestyle changes as an effort to prevent coronary heart disease (CHD) in the Kalumpang Community Health Center (Puskesmas) work area. This is based on the understanding that the family is the smallest unit in society that plays a crucial role in shaping the health behaviors of its members, such as diet, physical activity, smoking habits, and compliance with health check-ups. With active family involvement, CHD prevention efforts can be carried out more effectively. This study focuses on several main aspects. First, identifying the level of family knowledge and attitudes towards CHD risk factors, such as hypertension, diabetes, high cholesterol, and unhealthy lifestyles. Second, analyzing the role of families in supporting behavior changes, for example by providing healthy food, reminding people about physical activity, and reducing smoking and alcohol consumption. Third, assessing the relationship between strengthening the family role and healthy lifestyle changes in at-risk family members.

Furthermore, this study also aimed to determine the extent to which family-based interventions can increase awareness and practice of healthy living in the community. Researchers assumed that the stronger the family's role in providing emotional support, information, and supervision, the greater the likelihood of individuals adopting a healthy lifestyle and reducing their risk of coronary heart disease.

II. METHODS

This study used an observational analytical design with a cross-sectional approach to analyze factors related to strengthening the family's role in healthy lifestyle changes as an effort to prevent coronary heart disease in the Community Health Center (Puskesmas) work area. The study population included all heart disease sufferers recorded in the register at the Kalumpang Community Health Center during 2025. The sampling technique used was total sampling, so the entire population was used as the research sample. This study was conducted from January to March 2026.

The research data consisted of primary and secondary data. Primary data were obtained through a structured questionnaire designed to measure dietary patterns, physical activity, smoking habits, adherence to health checks, and family knowledge and attitudes. All variables were analyzed in relation to strengthening the family's role in healthy lifestyle changes as a preventative measure for heart disease sufferers in the Kalumpang Community Health Center, Ternate City. Univariate analysis was performed to clearly and systematically describe the frequency distribution and characteristics of each variable.

Univariate analysis was used to describe the characteristics and frequency distribution of respondents based on the variables of age, education, occupation, marital status, religion, level of knowledge, physical activity, smoking habits, adherence to health checks, and heart disease status descriptively without looking at

the relationship between variables. The results of this analysis show the proportion of each category in each variable, for example the most dominant age group, the highest level of education, the most common type of work, and the majority of respondents' marital status and religion. In addition, this analysis also provides an overview of respondents' level of knowledge, physical activity patterns, smoking habits, and level of adherence to health checks, as well as the distribution of respondents who do or do not suffer from heart disease, which can be seen in Table 1 below:

Table 1. Characteristics and Frequency Distribution of Respondents Age, Education, Occupation, Marital Status, Religion, Level of Knowledge, Physical Activity, Smoking Habits, Compliance with Health Check-ups and Heart Disease Sufferers.

Variables	Frequency	Percent (%)
Age		
39-50	18	19.6
51-60	36	39.1
≥ 61	38	41.3
Gender		
Man	22	23.9
Woman	70	76.1
Education		
Elementary School	6	6.5
Junior High School	47	51.1
Senior High School	2	2.2
Bachelor	37	40.2
Work		
Government employees	6	6.5
Housewife (IRT)	62	67.4
Retired	6	6.5
Private employees	1	1.1
Self-employed	17	18.5
Religion		
Islam	87	94.6
Christian	3	3.3
Catholic	2	2.2
Level of Knowledge		
Good	23	25.0
Not enough	69	75.0
Physical Activity		
Activity	24	26.1
Inactive	68	73.9
Dietary habit		
Good	67	72.8
Not good	25	27.2
Smoking Habit		
Smoke	63	68.5
Do not smoke	29	31.5
Compliance		
Obedient	69	75.0
Not obey	23	25.0
Family Attitude		
Good	72	78.3
Not good	20	21.7
Heart Disease Sufferers		
Suffer	75	81.5
No Suffering	17	18.5

Based on Table 1, the results of the univariate analysis show that the distribution characteristics of respondents are dominated by the highest age group ≥ 61 at 41.3% and the lowest age group 39-50 at 19.6%. Based on gender, the majority of respondents were female (76.1%) compared to male (23.9%). The educational level was dominated by junior high school graduates at 51.1%, while the lowest proportion was 2.2%. From the occupational aspect, the majority of respondents were housewives (IRT) at 67.4%, and the fewest worked as private employees (1.1%). Based on religion, the majority of respondents were Muslim

(94.6%) and the fewest were Catholic (2.2%). The level of knowledge of respondents was mostly classified as poor (75.0%), compared to those with good knowledge (25.0%). Respondents' physical activity was dominated by the inactive category (73.9%), while those who were active were 26.1%. Respondents' eating patterns were mostly classified as good (72.8%), compared to those who were poor (27.2%). Smoking habits showed that the majority of respondents smoked (68.5%), compared to non-smokers (31.5%). The level of compliance with health check-ups was dominated by compliant respondents (75.0%), while non-compliant respondents were 25.0%. Furthermore, the majority of family attitudes were considered good (78.3%), compared to less good (21.7%). Finally, the majority of respondents had heart disease (81.5%), while those who did not suffer from it were 18.5%.

III. RESULT AND DISCUSSION

Table 2 Analysis of the Relationship between Level of Knowledge, Physical Activity, Diet, Compliance with Health Check-ups, Family Attitudes, Smoking Habits

Variables	Heart Disease Sufferers				P	OR (95% CI)
	Suffer		No Suffering			
	n	%	n	%		
Level of Knowledge						
Good	12	52.2%	11	47.8%	0.000	9.625
Not enough	63	91.3%	6	8.7%		2.985-31.034
Physical Activity						
Doing activities	63	92.6%	5	7.4%	0.000	12.600
Inactive	12	50.0%	12	50,0%		3.749-42.348
Dietary habit						
Good	16	64.0%	25	100.0%	0.014	4.148
Not good	59	88.1%	8	11.9%		1.380-12475
Smoking Habit						
Smoke	58	87.9%	8	12.1%	0.018	3.838
Do not smoke	17	65.4	9	34.6%		1.284-11474
Compliance						
Obedient	64	92.8%	5	7.2%	0.000	13.964
Not obey	11	47.8%	12	52.2%		4.107-47.477
Family Attitude						
Good	66	91.7%	6	8.3%	0.000	13.444
Not good	9	45.0	11	55.0		3.992-45.280

Based on Table 2, the results of the bivariate analysis show that all variables studied have a statistically significant relationship with the role of the family in encouraging healthy lifestyle changes as a preventive effort in heart disease sufferers. The level of knowledge is proven to have a significant relationship ($p = 0.000$) with an OR value of 9.625, which indicates that families with low knowledge have almost 10 times greater odds of not optimally supporting healthy lifestyle changes compared to families with good knowledge, although the range of confidence intervals shows variation in risk estimates. Furthermore, physical activity also shows a relationship ($p = 0.000$; OR = 12.600), indicating that low physical activity substantially increases the risk of not achieving effective prevention efforts. Dietary variables have a significant relationship ($p = 0.014$; OR = 4.148), which shows that unhealthy consumption habits contribute to an increased risk of failure in prevention. Smoking habits also play a significant role ($p = 0.018$; OR = 3.838), reflecting that smoking behavior is an important risk factor in prevention efforts in heart disease sufferers. Furthermore, adherence showed a significant association with highly adherent ($p = 0.000$; OR = 13.964), indicating that low adherence significantly increases the likelihood of suboptimal prevention efforts. Finally, family attitudes were also significantly associated ($p = 0.000$; OR = 13.444), confirming that less

supportive attitudes can hinder the implementation of a healthy lifestyle. Overall, these findings confirm that cognitive, behavioral, and affective factors within the family have a determinant contribution to the success of heart disease prevention interventions, with varying but consistently statistically significant associations.

A sample of 92 coronary heart disease patients was obtained from data from the Kalumpang Community Health Center in Ternate City. Case determination at the community health center level is generally carried out through a combination of clinical examinations and basic supporting tests. The process begins with a history taking to identify typical symptoms such as radiating chest pain, shortness of breath, fatigue, and a history of risk factors (hypertension, diabetes mellitus, dyslipidemia, and smoking). This is followed by a physical examination, including blood pressure and pulse measurement, and an evaluation of the patient's general condition. Supporting tests available at the community health center typically include simple laboratory tests such as total cholesterol and blood sugar levels, as well as an electrocardiogram (ECG) to detect rhythm disturbances or signs of myocardial ischemia. If the test results strongly suggest coronary heart disease, the patient will be referred to a more advanced health facility for confirmatory testing such as a treadmill test or coronary angiography. Thus, the diagnosis at the community health center is screening and initial, which is then confirmed through a referral system.

Preventing coronary heart disease is crucial for reducing incidence and mortality. Lifestyle changes, particularly smoking cessation, are key because smoking is a risk factor that damages blood vessels and increases LDL cholesterol levels [14]; [15]. Quitting this habit can significantly reduce the risk of heart disease and improve overall heart health, so smoking cessation programs need to be continuously strengthened and expanded [7].

Heart disease sufferers are predominantly in the age group ≥ 60 at 41.3%. This is in line with the research of [16] which found that there is a significant relationship between age and the incidence of coronary heart disease in CHD sufferers, more experienced by the age group ≥ 45 years (96.5%) and more than half are men (55.4%). The risk of CHD tends to be experienced by men aged ≥ 55 years and in women aged ≥ 45 years if the onset of menopause is normal. Women have a lower chance of developing CHD before menopause when compared to men. However, with increasing age and decreasing estrogen hormone levels after menopause, the risk of heart disease will also increase in women [17].

In this study, the proportion of heart disease sufferers based on gender showed a female dominance of 76.1%. However, the analysis results showed no statistically significant relationship between gender and the incidence of coronary heart disease, which is in line with several previous studies, namely the study of [16] which also did not find a significant association between the two variables. This finding indicates that gender is not the main determinant in the incidence of coronary heart disease, but is more influenced by other factors such as lifestyle, diet, physical activity, smoking habits, and comorbid conditions from the studies of [18] and [19]. Practically, these results provide important benefits in planning health interventions, where prevention and health promotion efforts do not need to be strictly differentiated by gender, but rather focused on controlling modifiable risk factors. Thus, behavioral and family-based approaches become more relevant in reducing the incidence of coronary heart disease in the community.

The level of knowledge shows that the Odds Ratio (OR) value of 9.625 in the role of families with low knowledge has a chance of approximately 9.6 times greater to not make healthy lifestyle changes as a preventive effort in heart disease sufferers compared to those with good knowledge. This finding confirms that the level of knowledge is a very strong determinant factor in influencing health behavior, because adequate knowledge will increase understanding of risk factors. Conversely, low knowledge tends to lead to a lack of awareness and motivation in implementing a healthy lifestyle, thereby increasing the risk of developing or worsening coronary heart disease. Therefore, health education-based interventions that involve strengthening the role of families are very important to increase knowledge and encourage sustainable behavior changes in efforts to prevent heart disease. This study is in line with [20] that the increase in the number of coronary heart disease (CHD) sufferers is closely related to the low public knowledge about risk factors and prevention efforts. Lack of understanding about healthy eating patterns, the dangers of a sedentary lifestyle, and the impact of smoking and consuming foods high in fat/salt causes many individuals

to tend to adopt habits that worsen the risk of CHD. In this case, health education plays a crucial role in changing people's behavior.

The results of the study showed that the physical activity variable had an Odds Ratio (OR) value of 12.600, which means that individuals who do not engage in physical activity have approximately 12.6 times greater chance of not adopting a healthy lifestyle as a preventive measure for heart disease sufferers compared to those who are physically active. This finding confirms that physical activity is a very strong protective factor in maintaining cardiovascular health, because regular physical activity can improve heart function, improve blood circulation, lower blood pressure, and control cholesterol levels and body weight. Conversely, lack of physical activity will increase the risk of fat accumulation in blood vessels that contribute to coronary heart disease. These results are also in line with research by [20] which states that individuals with low levels of physical activity have a higher risk of experiencing cardiovascular disorders and tend to have less than optimal preventive behaviors. Therefore, increasing physical activity through family and community-based interventions is an important strategy in encouraging healthy lifestyle changes and reducing the risk of heart disease.

A sedentary lifestyle is one factor that can increase the risk of coronary heart disease. Regular exercise at moderate to vigorous intensity has been shown to reduce the risk of cardiovascular disease. Regular physical exercise helps regulate cholesterol levels, control diabetes and excess weight, and can even normalize blood pressure in some individuals [21]. However, irregular or sudden exercise can trigger angina attacks in people with coronary heart disease. This chest pain occurs due to a lack of oxygen supply to the myocardial cells due to impaired blood flow through narrowed coronary arteries (atherosclerosis) [22].

The analysis results showed that dietary patterns have a significant relationship with the incidence of heart disease, indicated by a p value = 0.014 and OR = 4.148, which means that individuals with poor dietary patterns have approximately 4.1 times greater chance of not adopting a healthy lifestyle as a preventative measure compared to those with a good diet. In terms of proportion, respondents with poor dietary patterns who suffered from heart disease were 88.1%, higher than those with a good diet at 64.0%, thus indicating that dietary quality plays an important role in determining cardiovascular health status. This finding is in line with research by [23] and [24] which stated that lifestyle changes significantly influence eating habits, where consumption of foods high in fat, cholesterol, and low in fiber can cause plaque buildup on artery walls which leads to narrowing or blockage of the coronary arteries. This condition will impede blood flow to the heart and increase the risk of coronary heart disease. In this context, the role of the family is very important as an agent of change in forming healthy eating habits, such as regulating the type of food, frequency of consumption, and encouraging the selection of balanced nutritious foods, so that efforts to prevent heart disease can be carried out optimally.

Based on a review of various studies, many people, especially teenagers and college students, tend to consume foods high in saturated fat, salt, and sugar, but low in fiber. This habit reflects an unbalanced diet influenced by a fast-paced lifestyle, including the consumption of processed or fast food. Fast food generally does not meet balanced nutritional standards because it is high in calories, fat, protein, and salt, but low in fiber. This consumption pattern is strongly suspected of contributing to the rise in coronary heart disease cases. Excessive fat intake can cause health problems, including clogged arteries. Consuming too many high-calorie foods, especially those containing saturated or trans fats, can accelerate the formation of atherosclerosis. This condition ultimately leads to high blood pressure [25].

The analysis results show that smoking habits have a significant relationship with efforts to prevent heart disease, with a p value = 0.018 and OR = 3.838. This means that individuals who have a smoking habit are at approximately 3.8 times greater risk of not implementing healthy lifestyle changes compared to non-smokers. In terms of proportion, respondents with smoking habits who suffer from heart disease reached 87.9%, which indicates that smoking behavior is a fairly strong risk factor in worsening heart health conditions. In the context of the role of the family, smoking habits can be influenced by the family environment, where a lack of support, supervision, and education from family members can make it difficult for individuals to stop the habit. Therefore, the family has a strategic role in encouraging behavioral changes

through education, motivation, and creating a supportive environment for smoking cessation as part of efforts to prevent heart disease.

These findings align with studies by [26] and [27], which state that smoking is a major risk factor for coronary heart disease, which is actually preventable. Approximately 10% of CHD cases are associated with smoking, with the risk in smokers approximately 25% higher than in non-smokers. Pathophysiologically, the nicotine content in cigarettes can damage the endothelial lining of blood vessels through the release of catecholamines that trigger vasoconstriction and increase blood pressure, as well as accelerate the blood clotting process. Furthermore, carbon monoxide (CO) in cigarette smoke reduces the ability of hemoglobin to bind oxygen, thereby reducing oxygen supply to tissues, including the heart muscle, and accelerating the development of atherosclerosis. This cumulative effect is exacerbated by the dose effect phenomenon, where the longer and earlier a person smokes, the higher the risk of cardiovascular complications. Therefore, family- and community-based smoking cessation interventions are crucial for effectively reducing the incidence of heart disease.

The analysis results show that compliance has a very significant relationship with heart disease prevention efforts, with a p value = 0.000 and OR = 13.964. This indicates that individuals or families who are not compliant have a risk of almost 14 times greater to be unsuccessful in implementing healthy lifestyle changes compared to those who are compliant. In terms of proportion, compliant respondents showed a very high figure of 92.8%, compared to 47.8% of non-compliant respondents, thus confirming that compliance with health recommendations. In this context, the role of the family is very important as the main support system that can increase compliance through supervision, motivation, and strengthening healthy living behaviors in daily life.

These findings align with various studies at the primary care level, such as community health centers, which show that patient compliance is closely linked to successful coronary heart disease prevention. Good compliance, both with therapy and lifestyle changes, has been shown to reduce risk factors such as hypertension, dyslipidemia, and obesity, which are key determinants of heart disease (Ministry of Health of the Republic of Indonesia[28]. Furthermore, other studies have confirmed that family support plays a significant role in improving patient compliance, particularly in the management of chronic diseases in primary health care facilities [29]. Therefore, family-based interventions focused on improving compliance are an effective strategy in reducing the incidence and complications of heart disease.

The analysis results show that family attitudes have a highly significant relationship with heart disease prevention efforts, as indicated by a p-value of 0.000 and an OR of 13.444. This indicates that families with less supportive attitudes have a 13-fold greater risk of suboptimally encouraging healthy lifestyle changes compared to families with positive attitudes. Family attitudes reflect psychological readiness and acceptance of healthy lifestyle behaviors. A positive attitude will encourage the formation of a supportive and conducive environment for sufferers in carrying out prevention efforts, while negative attitudes tend to be obstacles to changing health behaviors. Thus, family attitudes play a role as a reinforcing factor that is very important in determining the success of heart disease prevention interventions.

These findings align with the theory and research proposed by [30], which states that a person's attitude is strongly influenced by others they consider important, such as family members. Individuals tend to adopt attitudes that align with their social environment, primarily to maintain harmony and avoid conflict. In the context of coronary heart disease, this means that if the family demonstrates a supportive attitude towards a healthy lifestyle, the sufferer will be more motivated to consistently follow that behavior. Conversely, a less caring or unsupportive family attitude can reduce the sufferer's motivation to take preventative measures. Therefore, health interventions that involve the family as agents of change are crucial for fostering sustainable positive attitudes in efforts to reduce the risk of heart disease.

IV. CONCLUSION

The conclusion of this study shows that strengthening the role of the family plays a very important role in encouraging healthy lifestyle changes as a preventive measure for heart disease sufferers in the working area of the Kalumpang Community Health Center in Ternate City. All variables studied, namely the

level of knowledge, physical activity, diet, smoking habits, compliance, and family attitudes, were shown to have a significant relationship with prevention efforts. The variables of compliance, attitude, physical activity, and knowledge showed a high strength of association, indicating that behavioral factors and family support are the main determinants in the success of healthy lifestyle changes. Low knowledge, lack of physical activity, unhealthy diet, smoking habits, low compliance, and less supportive family attitudes contribute to the increased risk of coronary heart disease. Thus, the family plays a very strategic role as an agent of change in shaping, motivating, and maintaining healthy lifestyle behaviors in heart disease sufferers.

Suggestions based on the results of this study include the need to strengthen family-based interventions through integrated health education programs at the community health center level, with a focus on increasing knowledge, fostering positive attitudes, and increasing adherence to medical recommendations. Health workers are expected to develop promotive and preventive strategies, such as routine outreach, family counseling, and behavioral change assistance that includes increased physical activity, improved diet, and smoking cessation. Furthermore, cross-sector collaboration and policy support are needed to create a conducive environment for the adoption of a healthy lifestyle in the community. Future research is recommended to examine other factors that may influence family roles and utilize more robust research designs to examine causal relationships in greater depth.

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REFERENCES

- [1] I. (2022). Ivan, "Smartphone-Based Screening: Midkine, Adiponectin, Apolipoprotein C-1, Kidney Injury Molecule-1 Detection Tool as Biomarkers of Coronary Artery Obstruction.," *Yars. Med. J.*, vol. 29, no. 3, pp. 112–119, 2022, [Online]. Available: <https://doi.org/10.33476/jky.v29i3.1415>
- [2] S. R. J. I. Alham, "Coronary Heart Disease Diagnosis System Using Website-Based C4.5 Algorithm (Case Study: Dr. Soedarso Pontianak Regional Hospital). Lightning," vol. 14, no. 2, pp. 214–222, 2021.
- [3] Testiana., *Hypertension, Diabetes, and Cholesterol as Risk Factors for Heart Disease.*
- [4] L. Susanti, D. Y., & Latriyanti, "Overview Of Risk Factors For Coronary Heart Disease Patients In The Heart Polyclinic Of The Dr. Mintoarjo Naval Hospital. *Mitra Kesehatan Journal,*" *Heal. Partn. J.*, vol. 2, no. 2, pp. 65–71, 2020, [Online]. Available: <https://doi.org/10.47522/jmk.v2i2.33>
- [5] G. Riary, A. F., & Testiana, "Application of Data Mining for Coronary Heart Disease Classification Using the Naive Bayes Algorithm. MDP-Sc," vol. 2, no. 1, pp. 297–305, 2023, [Online]. Available: <https://doi.org/10.35957/mdp-sc.v2i1.4388>
- [6] N. A. Usri, "Characteristics of Risk Factors for Coronary Heart Disease Patients at Ibnu Sina Hospital Makassar in 2020," *51 Fakumi Med. J. Med. Student Journal*, vol. 2, no. 9, pp. 619–629, 2022, [Online]. Available: <https://doi.org/10.33096/fmj.v2i9.117>
- [7] R. Rahmawati, "Literature Review Study: Overview of Healthy Lifestyle Patterns in Preventing Recurrence in Coronary Heart Disease Patients.," *Siliwangi Heal.*, vol. 1(1), no. 1, pp. 192–205, 2021.
- [8] B. Santosa, W. N., & Baharuddin, "Coronary Heart Disease and Antioxidants. Keluwih," *J. Heal. Med.*, vol. 1, no. 2, pp. 98–103, 2020, [Online]. Available: <https://doi.org/10.24123/kesdok.v1i2.2566>
- [9] I. A. Sholihah, "Counseling on the Effect of Diet on Cholesterol Levels in the Body.," *Educ. J. Community Serv. Educ.*, vol. 2, no. 2, pp. 82–87, 2022, [Online]. Available: <https://doi.org/10.32585/educate.v2i2.2890>
- [10] S. Laksono, "Carotid Artery Stenosis," *Ibn Sina J. Med. Heal. - Fac. Med. Islam. Univ. North Sumatra*, vol. 22, no. 2, pp. 176–188, 2023, [Online]. Available: <https://doi.org/10.30743/ibnusina.v22i2.527>
- [11] K. Iman, B. N., Rafikasitha, R., & Kemalasar, "Design and Implementation of Early Detection Tools for Coronary Heart Disease.," *J. Electr. Eng.*, vol. 18, no. 4, 2022, [Online]. Available: <https://doi.org/10.17529/jre.v18i4.27240>
- [12] N. A. Nurahman, "Combination of Back Acupressure Therapy with Wet Cupping on Reducing Lipid Profile and Blood Pressure in Hypertensive Patients with Hypercholesterolemia.," *Indones. Nurse*, vol. 6, no. 3, pp. 1129–1139, 2023, [Online]. Available: <https://doi.org/10.32584/jpi.v6i3.1689>
- [13] M. C. Untoro, "Application of K-Means Clustering on Imbalance Dataset of Heart Disease Symptoms.," *Ilk. J.*

- Comput. Sci. Appl. Informatics*, vol. 5, no. 1, pp. 1–7, 2023, [Online]. Available: <https://doi.org/10.28926/ilkomnika.v5i1.455>
- [14] R. Rahmawati, “Literature Review Study: Overview of Healthy Lifestyle Patterns in Preventing Recurrence in Coronary Heart Disease Patients.,” *Siliwangi Heal. Journal*, vol. 1, no. 1, pp. 192–205, 2021, [Online]. Available: <https://doi.org/10.34011/jks.v1i1.491>
- [15] S. D. Sawu, “Dominant Risk Factors for Acute Coronary Heart Disease in Hospitalized Patients. Literate Syntax,” *Indones. Sci. Journal*, vol. 7, no. 1, pp. 465, 2022, [Online]. Available: <https://doi.org/10.36418/syntax-literate.v7i1.5784>
- [16] A. B. Johanis, I. J., Hinga, I. A. T., & Sir, “Risk Factors of Hypertension, Smoking and Age on the Incidence of Coronary Heart Disease in Patients at Prof. Dr. W. Z. Johannes Kupang Regional Hospital,” *Public Heal. Media*, vol. 2, no. 1, pp. 33–40, 2020.
- [17] Yuliani F, Oenzil F, Iryani D., “The Relationship of Various Risk Factors to the Incidence of Coronary Heart Disease in Type 2 Diabetes Mellitus Patients.,” *Andalas Heal. J. [Internet].*, vol. 3, no. 1, 2014.
- [18] A. M. Farahdika A, “Risk Factors Associated with Coronary Heart Disease in Middle Adulthood (41-60 Years) (Case Study at Semarang City Regional General Hospital).,” *Unnes J Public Heal [Internet].*, vol. 4, no. 2, pp. 117–23, 2015, [Online]. Available: <https://journal.unnes.ac.id/sju/index.php/ujph/article/view/518813>.
- [19] Rulandani R, Wijayanegara H, Hikmawati D., “The Relationship between Age, Gender, Blood Pressure and Dyslipidemia with Coronary Heart Disease. In: Proceedings of Medical Education [Internet]. Bandung:,” pp. 225–31, 2015, [Online]. Available: <http://repository.unisba.ac.id:8080/xmlui/handle/123456789/26123>
- [20] D. S. Irfan, S. N., Arini D. R., Windi, A. Dinda, P. S. Nailla, “Systematic Review: The Influence of Lifestyle and Public Knowledge on the Risk of Coronary Heart Disease,” *J. Public Health (Bangkok).*, vol. 4, no. 2, p. Akses: Rabu, 06 Mei 2026., 2025.
- [21] N. Saraswati, D., & Lina, “Risk factors for heart disease in the community at the integrated development post (Posbindu) at Cibeureum Community Health Center. Journal of Health & Science: Gorontalo,” *J. Heal. Sci. Community*, vol. 4, no. 1, pp. 1–7, 2020.
- [22] A. I. Lestari, S. D., Wahyuningsih, I. S., & Amal, “Description of physical activity and comfort levels of patients with coronary heart disease.,” *Sultan Agung Sci. J.*, vol. 2, no. 1, pp. 575–582, 2023.
- [23] H. Hanifah, W., Oktavia, W. S., & Nisa, “Lifestyle Factors and Coronary Heart Disease: A Systematic Review in Adults in Indonesia. Nutrition and Food Research,” *J. Nutr. Food Res.*, vol. 44(1), pp. 45–58, 2021.
- [24] V. Marlinda, R., Dafriani, P., & Irman, “The Relationship Between Diet and Physical Activity with Coronary Heart Disease.,” *Coron. Hear. Dis. J. Med. Sci. Heal.*, vol. 11, no. 2, pp. 2533–257, 2020.
- [25] L. Aisya, R. W., & Dharmawati, “The relationship between fast food consumption habits and the incidence of coronary heart disease in outpatients at Dr. Moewardi Regional Hospital.,” *Indones. Med. J.*, vol. 2, no. 2, pp. 21–28, 2021.
- [26] S. Leutualy, V., Siauta, M., Madiuw, D., Tasijawa, F. A., Lilipory, M., Tubalawony, S. L., & Embuai, “Risk Factors Associated with Recurrent Attacks in Coronary Heart Disease Patients; Literature Review.,” (*Journal Sci. Technol.*, vol. 3, no. 1, pp. 68–79, 2022.
- [27] F. E. S. Tampubolon, L. F., Ginting, A., & Turnip, “Overview of Factors Influencing the Incidence of Coronary Heart Disease (CHD) at the Integrated Heart Center (PJT).,” *Permas Sci. J. Kendal Heal. Coll. Sci. Journal*, vol. 13, no. 3, pp. 1043–1052, 2023.
- [28] World Health Organization (WHO)., “Cardiovascular Diseases (CVDs) Prevention Guidelines.,” 2021.
- [29] S. Notoatmodjo, “Health Promotion and Health Behavior. Jakarta: Rineka Cipta.,” 2018.
- [30] A. Wawan, “Theory and Measurement of Human Attitudes and Behavior. Yogyakarta: Nuha Medika.,” 2020.