

Original Research Report

KNOWLEDGE ON THE RISK OF THE ISCHEMIC HEART DISEASE ESTIMATION BY WHO CHARTS IN CEMPAKA BARU, INDONESIA

Hasna Luthfiah Fitriani,^{ID} Karina Ajeng DA Ridwan^{ID}
 Faculty of Medicine, Universitas Yarsi, Jakarta, Indonesia

ABSTRACT

In 2018, Indonesia became the country with the second-highest number of deaths and disabilities (DALYs) due to ischemic heart disease. Based on Riskesdas data in 2018, Jakarta is one of the provinces with a high percentage (1.9%) of ischemic heart disease. Risk factors for ischemic heart disease that are not treated quickly will increase the severity of ischemic heart disease in the future. Therefore, this study was to provide education regarding the assessment of risk estimation for ischemic heart disease with WHO/ISH charts among participants in Cempaka Baru sub-district. This study used pre-test and post-test questionnaires. After the seminars, the interview and examination results were carried out as well as calculating the estimated risk of ischemic heart disease using the WHO chart. These charts were divided into low risk (<10%), moderate (10-20%), and severe (>20%). The evaluation was conducted by comparing the pre-test and post-test results, which indicated that the knowledge level increased significantly from the Paired T-Test with a p-value = 0.000 (p<0.05). The significant estimation of high risk of ischemic heart disease for high blood pressure was 72.7% (p=0.023) and total cholesterol level was 66.7% (p=0.049). The increasing knowledge of the stratification risk of ischemic heart disease with the WHO chart was expected to reduce the risk of ischemic heart disease in the future.

Keywords: Ischemic heart diseases; knowledge; screening; WHO charts; cardiovascular disease

Correspondence: Hasna Luthfiah Fitriani, Faculty of Medicine, Universitas Yarsi, Jakarta, Indonesia. Email: hasna160297@gmail.com

How to cite: Fitriani, H. L., & DA Ridwan, K. A. (2022). Knowledge on The Risk of The Ischemic Heart Disease Estimation by WHO Charts in Cempaka Baru, Indonesia. *Folia Medica Indonesiana*, 58(3), 215–221. <https://doi.org/10.20473/fmi.v58i3.33683>

pISSN:2355-8393 • eISSN: 2599-056x • doi: 10.20473/fmi.v58i3.33683 • Fol Med Indones. 2022;58:215-221
 • Submitted 29 April 2021 • Received 25 Jul 2022 • Accepted 18 Aug 2022 • Published 5 Sep 2022
 • Open access under CC-BY-NC-SA license • Available at <https://e-journal.unair.ac.id/FMI/>

Hii j iii j tu

1. The risk estimation of ischemic heart disease.
2. High blood pressure and cholesterol levels affect Ischemic heart disease.

INTRODUCTION

Globally, cardiovascular disease is the leading cause of death worldwide. One of them is ischemic heart disease (IHD) which is caused by the narrowing of the coronary arteries. The narrowing occurs due to the formation of atherosclerotic plaques in the lumen of blood vessels, resulting in an imbalance in the flow of nutrients and oxygen to the myocardium (Shahjehan & Bhutta 2022). In 2018, Indonesia became the country with the second-highest number of deaths and disabilities (DALYs) due to ischemic heart disease (Uli et al. 2020). Data from the Ministry of Health in 2018 showed that three provinces in Indonesia had a high prevalence of heart disease: North Kalimantan (2.2%), Central Sulawesi (2%), and Jakarta (1.9%). This is also supported by the area of residence, the urban population suffers more from heart disease with a prevalence of 1.6% compared to the rural population which is only 1.3% (Ministry of Health 2018). Even though IHD treatment in Indonesia has developed, the prevalence of IHD in Indonesia's working-age population is still relatively high for the young and the old at 1.45% (1.3% in men and 1.6% in women),

equivalent to almost 2.0 million people (865,855 men and 1.08 million women) aged between 15 and 55 years (Uli et al. 2020).

The recent lifestyle of the Indonesians is still classified as unhealthy and increases the risk factors for IHD (Suryati & Suyitno 2020), therefore a nationally representative health survey showed that the prevalence of diagnosed stroke among people aged 15 years and above increased by 56% (from 0.7 to 1.1%) during 2013–2018. The prevalence of hypertension among people aged >18 years also increased by 32% (from 26 to 34%), and that of obesity increased by 47% (from 15 to 22%) from 2013 to 2018 (Adisasmito et al. 2020). Also, the lifestyle of urban communities plays a role in increasing cases of IHD (i.e., hypertension, high cholesterol levels, smoking, diabetes, overweight/obesity, lack of physical activity, and unhealthy food patterns). In addition, factors that cannot be controlled are age (getting older increases the risk of IHD), gender (males have a greater prevalence of IHD incidence), family history of the disease, and ethnicity/race (Hajar 2017). This condition will increase mortality and morbidity in Indonesia.

Based on information from the representative participants, the people in Cempaka Baru sub-district do not yet fully understand the risk factors and prevention of IHD. This is illustrated by the fact that there are still many people who consume processed foods, high calories and fat, and lack exercise, which are trigger factors for the occurrence of IHD in the future. For this reason, it is important to increase the knowledge of allies or the community to be able to recognize the risk of IHD from the aspect of age, gender, smoking habits, increased blood pressure, total cholesterol, and a history of diabetes.

The risk for IHD can be detected simply through early detection with WHO/ISH cardiovascular risk prediction charts, which are the simplest and most helpful tools in identifying someone at high risk of cardiovascular disease and motivating them to change their lifestyle, administer antihypertensives, cholesterol/lipid-lowering drugs and aspirin if needed. In addition, the results of this tool can determine what percentage of an individual's risk of ischemic heart disease in the next 10 years, so individuals can prevent these events earlier. However, if the findings are severe, allies and the community can quickly consult with health workers at the nearest health facilities or hospitals. This study aimed to provide education regarding the assessment of risk estimation for ischemic heart disease with WHO/ISH charts among participants in Cempaka Baru sub-district.

MATERIALS AND METHODS

This study used a one-group pre-test and post-test design, namely an initial test (pre-test) before being given education and a final test (post-test) after being given education on IHD risk factors. The population was the representatives of Cempaka Baru sub-district community by using a purposive sampling technique with inclusion and exclusion criteria. The inclusion criteria were the residents of Cempaka Baru sub-district, Central Jakarta, Indonesia, who became representative participants in the area. Meanwhile, the exclusion criteria included non-citizens of Cempaka Baru sub-district, Central Jakarta, Indonesia, and not representative participants in that area. The collection of participants was done using online sounding to the representative participants of the Cempaka Baru sub-district to get residents included in the inclusion criteria. Due to the Covid-19 pandemic, we had limited the number of participants to only 30 participants.

The participants were asked to fill out a pre-test that had been provided by the organizing committee 10 minutes before the speaker explained the learning materials, by including identity in the form of the name, age, gender, and residential address. The pre-test contained 10 questions. The deadline for filling out the pre-test was before the activity started. The symposium

activity consisted of conveying learning materials by the speaker on the ischemic heart disease risk factor estimation knowledge using WHO/ISH prediction charts.

During the presentation, participants were also taught how to use the WHO chart and an example case was given to use as a screening exercise. In addition, participants were also given a small guidebook, so participants could see the steps for assessing IHD risk with the WHO chart. After the symposium was finished, participants were required to fill out a post-test that will be given by the organizing committee. After that, the event was continued by conducting a screening examination for ischemic heart disease using the WHO chart.

The examination consisted of interviewing participant history, smoking status (all active smokers or smoking cessation <1 year), past medical history, physical activity (physical activity <600 MET minutes/weeks), followed by examination of blood pressure, current blood glucose levels, and total blood cholesterol using a simple blood check. After obtaining the results of the examination, the estimated risk of ischemic heart disease for individuals using the WHO chart is divided into low risk (<10%), moderate risk (10-20%), and severe risk (>20%). This examination and calculation of the estimated risk of IHD is a form of application from the previous symposium.

The data that had been obtained is then processed computerized using Microsoft Excel and SPSS 23 version software. The data from the seminar activities will be analyzed to see the frequency distribution of the characteristics of the participants, which is carried out using a non-parametric numerical test. The results of the pre-test and post-test were also analyzed to see if there was an increase in participants' knowledge about early detection of ischemic heart disease with the WHO chart after providing education.

On the results of the examination of IHD risk factors, a Chi-Square test was performed to find the relationship of risk factors (age, gender, smoking status, past medical history, physical activity, blood pressure, current blood glucose, and total blood cholesterol) to the risk of IHD. Besides, the odds ratio was calculated with a 95% confidence interval.

RESULTS

Characteristics of participants

The symposium was attended by representative participants in the Cempaka Baru sub-district, Central Jakarta, Indonesia. Cempaka sub-district is only 1.2 km

from Universitas Yarsi and has become a frequent target area for health education activities. The Covid-19 pandemic has limited the number of symposium participants so that 30 participants are set to attend the symposium.

The participants consisted of various ages with the most participants in old adults or >50 years (67%). Participants were divided into 3 groups, namely young adults (aged 15-30 years) as many as 1 person (3%), middle-aged adults (aged 31-50 years) as many as 9 people (30%) and older adults (age >50 years) as many as 20 people (67%). Most of the participants were female namely 23 people (77%) and 7 male (23%).

Table 1. Characteristics of participants

Characteristics	Frequency	Percentage (%)	Std. Deviation
Gender			
Male	7	23	± 11.31
Female	23	77	
Age			
Young Adults (15 – 30 years old)	1	3	± 9.53
Middle-aged Adults (31 – 50 years old)	9	30	
Old Adults (>50 years old)	20	67	

Knowledge

After the pre-test and post-test data were obtained, the data were processed using Microsoft Excel and the SPSS.23 version software. Based on the results of the normality test, it was found that the significance value was 0.170 which showed $p > 0.05$, then the data distribution was normal. Then because the data distribution is normal, it is continued with Paired T-Test on pre-test and post-test data and the results showed that there was a significant difference if the p-value < 0.05 .

Table 2. The differences in mean, median, and modus in pre-test & post-test

	Pre-test	Post-test	p-value
Mean	81.67	89.67	
Median	85	90	
Mode	90	100	0.00
Minimum	50	50	
Maximum	100	100	

Table 3. The comparison of knowledge scores in pre-test and post-test

	Frequency	Percentage (%)
Post-test < Pre-test score	1	3
Post-test > Pre-test score	18	60
Post-test = Pre-test score	11	37
Total	30	100

After the symposium, there was a significant increase in participants' knowledge (Table 3). There was an increase in the value of the mode (the majority value of the participants) from the pre-test, which was 90 to 100 in the post-test. Then, there was an increase in the average score of the participants from 81.67 in the pre-test to 89.67 in the post-test ($p = 0.00$). Based on Table 3 the results of the post-test scores increased from the pre-test scores for 18 participants (60%), and there were also participants whose post-test scores did not change from the pre-test scores which were 11 participants (37%). There was also one participant who experienced a decrease in their post-test scores compared to their pre-test scores (3%).

Estimation of ischemic heart diseases with WHO/ISH risk prediction chart

After the symposium, the participant's interview and measurement of metabolic parameters were carried out, namely, age, gender, smoking status, past medical history, physical activity, blood pressure, current blood glucose, and total blood cholesterol. It was found that the high risk (high risk: $>20\%$) for ischemic heart disease was found in women (90.9%), aged over 50 years (90.9%), with less physical activity (72.7%), history of diabetes (27.3%) and hypertension (27.3%). In addition, the results of the examination showed that a high risk of IHD (high risk: $>20\%$) was found in systolic blood pressure 140/90 in 8 people (72.7%) and total cholesterol ≥ 200 mg/dL in 10 people (90.9%). In contrast, a low risk of IHD (low risk $<10\%$) was found in blood glucose <200 mg/dL in 10 people (90.9%), systolic blood pressure $<140/90$ mmHg in 9 people (81.8%) and total cholesterol <200 mg/dL as many as 6 people (54.5%).



Table 4. Distribution of variables with category of ischemic heart disease risk level

No.	Variable	Low risk n=11 N (%)	Moderate risk n=8 N (%)	High risk n=11 N (%)	Total n=30 N (%)
1	Gender				
	Male	4 (36.4%)	2 (25%)	1 (9.1%)	7 (23.3%)
	Female	7 (63.6%)	6 (75%)	10 (90.9%)	23 (76.7%)
2	Age				
	< 50	6 (54.5%)	2 (25%)	1 (9.1%)	9 (30%)
	≥ 50	5 (45.5%)	6 (75%)	10 (90.9%)	21 (70%)
3	Smoker				
	Yes	4 (36.4%)	2 (25%)	1 (9.1%)	7 (23.3%)
	No	7 (63.6%)	6 (75%)	10 (90.9%)	23 (76.7%)
4	Physical activity				
	Sufficient	1 (9.1%)	1 (12.5%)	3 (27.3%)	5 (16.7%)
	Insufficient	10 (90.9%)	7 (87.5%)	8 (72.7%)	25 (83.3%)
5	Medical history				
	None	8 (72.7%)	3 (37.5%)	3 (27.3%)	14 (46.7%)
	Diabetes	1 (9.1%)	1 (12.5%)	3 (27.3%)	5 (16.7%)
	Hypertension	1 (9.1%)	2 (25%)	3 (27.3%)	6 (20%)
	Diabetes and hypertension	0	0	2 (18.2%)	2 (6.7%)
	Heart failure and hypertension	0	1 (12.5%)	0	1 (3.3%)
	Cancer	1 (9.1%)	0	0	1 (3.3%)
	Osteoarthritis	0	1 (12.5%)	0	1 (3.3%)
6	Systolic blood pressure				
	< 140/90	9 (81.8%)	5 (62.5%)	3 (27.3%)	17 (56.7%)
	≥ 140/90	2 (18.2%)	3 (37.5%)	8 (72.7%)	13 (43.3%)
7	Blood glucose				
	< 200 mg/dL	10 (90.9%)	7 (87.5%)	7 (63.6%)	24 (80%)
	≥ 200 mg/dL	1 (9.1%)	1 (12.5%)	4 (36.4%)	6 (20%)
8	Total cholesterol				
	< 200 mg/dL	6 (54.5%)	3 (37.5%)	1 (9.1%)	10 (33.3%)
	≥ 200 mg/dL	5 (45.5%)	5 (62.5%)	10 (90.9%)	20 (66.7%)

*Low risk: <10%, moderate risk: 10% - 20%, high risk: >20%

Table 5. Ischemic heart disease risk variable with risk levels < 20% and > 20%

No.	Variables	IHD risk <20% n= 19 N (%)	IHD risk >20% n= 11 N (%)	Total	p-value	OR (95% CI)
1	Systolic blood pressure					
	< 140/90	14 (73.7%)	3 (27.3%)	17 (56.7%)	0.023	7.467 (1.4 - 39.836)
	≥ 140/90	5 (26.3%)	8 (72.7%)	13 (43.3%)		
2	Total cholesterol					
	< 200 mg/dL	9 (47.4%)	1 (9.1%)	10 (33.3%)	0.049	9 (0.954 - 84.899)
	≥ 200 mg/dL	10 (52.6%)	10 (90.9%)	20 (66.7%)		
3	Age					
	< 50	8 (42.1%)	1 (9.1%)	9 (30%)	0.1	7.273 (0.768 - 68.887)
	≥ 50	11 (57.9%)	10 (90.0%)	17 (70%)		
4	Gender					
	Male	6 (31.6%)	1 (9.1%)	7 (23.3%)	0.215	4.615 (0.476 - 44.757)
	Female	13 (68.4%)	10 (90.9%)	23 (76.7%)		
5	Smoker					
	No	13 (68.4%)	10 (90.9%)	23 (76.7%)	0.215	0.217 (0.022 - 2.101)
	Yes	6 (31.6%)	1 (9.1%)	7 (23.3%)		
6	Physical activity					
	Sufficient	2 (10.5%)	3 (27.3%)	5 (16.7%)	0.327	0.314 (0.043 - 2.265)
	Insufficient	17 (89.5%)	8 (72.7%)	25 (83.3%)		
7	Blood glucose					
	< 200 mg/dL	17 (89.5%)	7 (63.6%)	24 (80%)	0.156	4.857 (0.718 - 32.867)
	≥ 200 mg/dL	2 (10.5%)	4 (36.4%)	6 (20%)		

Based on Table 5, the systolic blood pressure variable had a significant relationship with the risk of developing an IHD of 0.023 with a p-value <0.05. The

OR (odds ratio) value was 7,467, which meant that people with a blood pressure of 140/90 were at risk of developing ischemic heart disease by 7.47 times,



compared to people who have systolic blood pressure <140/90. The confidence interval (95% CI) showed a value of 1.4-39.836 which the lowest risk of IHD was 1.4 times and the highest was 39.8 times. There was also a significant relationship between the variable total cholesterol and the risk of developing IHD, with a significance value of 0.049. Then, the odds ratio showed that people who had total cholesterol \geq 200 mg/dL were at risk of developing IHD by 9 times when compared to people who have total cholesterol < 200 mg/dL. The confidence interval (CI 95%) of 0.954-84,899, showed that the lowest risk opportunity was 0.95 times and the highest was 84.90 times. In addition, the variables of age, sex, smoking status, physical activity, and blood sugar levels did not have a significant relationship with the risk of coronary heart disease.

DISCUSSION

The results of the analysis of knowledge on the estimation of ischemic heart disease with the WHO chart by considering the results of the pre-test and post-test showed the majority of post-test results were increasing and it could be interpreted that the provision of knowledge in this symposium could significantly increase participants' knowledge. As a result of the knowledge of the risk factors for ischemic heart disease, people are becoming aware of their health and taking various disease prevention measures. Knowledge has a relationship with the severity of ischemic heart disease. It is stated in some literature that a low level of education has a higher prevalence of risk behaviors (smoking, obesity, lack of physical activity, unhealthy eating patterns, etc.), more likely to have a poor polluted environment, lack of medical information awareness of the impact of lifestyle behaviors, poor adherence/wrong medication, ignorance of medical examinations), and have a higher prevalence of depression (Dégano et al. 2017, Khaing et al. 2020). In addition, good knowledge will increase good body responses such as an increase in HDL due to individual awareness of the importance of exercise and increased medical care (Hamad et al. 2019).

According to 2014 WHO/ISH risk prediction charts guidelines, it is stated that the use of this guide greatly facilitates people in an area that has limited health facilities and can estimate the percentage of IHD in the next 10 years, so the public can find out the appropriate forms of prevention and management. In addition, according to the AHA/ACC guidelines, it is recommended to calculate the estimated risk of IHD in the next 10 years, by assessing several risk factors, such as age, gender, blood pressure, blood glucose

levels, cholesterol, and smoking status, and disease history. Some people who do not have previous heart disease are advised to calculate the estimated IHD risk every 4-6 years and for individuals aged 20-59 years with low risk, the outcomes (<7.5%) are assessed for 30 years or for life (Hajar 2017). The accomplishment of the participants was known based on the comparison between the knowledge test scores before and after the provision of material and also from the activeness of participants in asking and answering questions related to the material presented. This is supported by Tiksnadi et al. (2018) who stated that the basis for the formation of health representatives was a special community group that actively participates in health development.

On the results of the examination of the risk of IHD, it was found that more women had a higher risk (90.9%) than men. This is also influenced by the unequal number of participants between men and women. However, according to research by (Gheisari et al. 2020), there was a high prevalence of IHD risk in American women aged between 20-70 years. Contributing factors (i.e., hypertension, increased cholesterol levels, smoking, overweight, and lack of physical activity) were the most common problems in the female population. Hormonal factors, particularly decreasing estrogen levels in menopause conditions can increase the risk of heart disease. Increasing age will increase the risk of IHD and the highest incidence is in the age group 45 years. According to research by Mora et al. (2021), the incidence of IHD was 10-fold higher at the age of 75 years compared to the age of 55 years. Getting older causes a greater incidence of plaque that is stuck to the wall and caused disruption of blood flow through it (Gheisari et al. 2020). Novriyanti et al. (2014) conducted a study on the effect of long hypertension on IHD at the Cardiology Polyclinic of Dr. Mohammad Hoesin Palembang Hospital and resulted that most IHD cases occurred in the 45-64-year age group (75.0%).

Based on WHO data, low physical activity was recorded as a cause of diabetes by 27% and 30% of ischemic heart disease (Cleven et al. 2020). In their study, two of 11 studies reported an increased risk of diabetes incidence (179 and 145%, respectively) for participants who engaged in minimal leisure-time physical activity compared with the highly active group. Patients with diabetes had a 10% greater risk of IHD, 53% of myocardial infarction, and 58% of stroke. This is corresponding to the results of research showing an increase in the occurrence of IHD due to a person's low physical activity. In contrast, physical activity that is carried out regularly produces beneficial results in the form of prevention and therapy of IHD (Chomistek et al. 2016). This is corresponding with the

results of a 1-year multifactorial intervention study that included 3 hours of exercise per week which induced a 3.1% regression in coronary stenosis which was associated with a reduction in the incidence of cardiovascular disease (Winzer et al. 2018). In addition, one effective way is to reduce and control glucose levels in the blood so that it can protect the microvasculature from damage that will cause IHD (Einarson et al. 2018). Research by Suryati and Suyitno (2020) states that diabetes and hypertension are two risk factors for ischemic heart disease with a very strong relationship with the occurrence of myocardial infarction. Increasing systolic blood pressure by 20 mm Hg and diastolic blood pressure by 10 mm Hg more, has a 2-fold higher risk of CVD (Fuchs & Whelton 2020). A literature states that treatment of hypertension significantly reduces the risk of cardiovascular disease and death in various patient populations (Suryati & Suyitno 2020). According to (Ettihad et al. 2016), a 10 mm Hg reduction in systolic blood pressure reduced the risk of major cardiovascular disease events by 20%, ischemic heart disease by 17%, stroke by 27%, heart failure by 28%, and all-cause mortality by 13%.

A study conducted by Jeong et al. (2018) showed that increased cholesterol levels were associated with a higher risk of IHD compared to the group with low cholesterol. In addition, higher total cholesterol levels were associated with 11% higher mortality from CVD (95% CI, 4%-18%), 16% for IHD (4%-31%), and 19% for AMI (5% -36%) especially in the elderly (Kwon et al. 2019). LDL is one of the blood cholesterols associated with plaque formation in coronary arteries, in one study stated that the risk of IHD with LDL-cholesterol >190 mg/dL is more dangerous than LDL-cholesterol <130 mg/dL (Ueda et al. 2018). One of the reasons is that dyslipidemia is one of the factors that can accelerate atherosclerotic changes in blood vessels. In contrast, it has been demonstrated that the benefit of reducing serum cholesterol for IHD risk is related to age, i.e., a 10% reduction in serum cholesterol results in a 50% reduction in CHD risk at age 40, 40% at age 50, 30% at age 60, and 20 years. 20% at the age of 70 years. There are two risk factors that have a significant relationship with the development of IHD, namely hypertension, and hypercholesterolemia. These two risk factors form a circle of problems that can lead to other risk factors developed.

A recent study reported that among individuals with high blood pressure almost 60% cause type 2 diabetes. In addition, dyslipidemia causes endothelial damage resulting in loss of vasomotor activity, which can lead to hypertension (Ajabnoor et al. 2021). As an effective preventive measure, it is possible to control risk factors quickly and precisely, such as lowering total

cholesterol (24%), systolic blood pressure (20%), smoking (12%), and lack of physical activity (5%) to reduce mortality from IHD by half (Sanchis-Gomar et al. 2016).

Strength and limitation

Based on several explanations and the results that have been described previously, our research still has some limitations. Estimates were collected from the limited number of participants due to the Covid-19 pandemic which made it impossible to collect many participants, as well as the results of the pre-test, post-test, and examination results which are a sequence of the symposium have a high level of heterogeneity both in terms of the level of education, income, environment and some disruptive factors during the event which we cannot strictly monitor. This research still needs further review, both in terms of the number of respondents and the variables studied to be able to estimate IHD estimates with risk factors that are more specific and comprehensive and reduce biased results.

CONCLUSION

The results of the assessment illustrate that the knowledge of participants after being given education in the form of a symposium, shows an increase in knowledge with significant results, with a p-value = 0.00 (p <0.05). Increased knowledge in the community has a positive impact on the prevention of IHD in the future. However, in old-age, females, the results of blood pressure and cholesterol examinations which are a sequence of the symposium, there is a significant increase in the high risk for the occurrence of IHD. Rising several risk factors for IHD are due to the majority of people living in densely populated urban areas accompanied by an unhealthy lifestyle.

Aenpqy ngf i go gpv

We would like to thank residents of Cempaka Baru sub/ district, Central Jakarta and Faculty of Medicine, Universitas [arsi, Jakarta, Indonesia

Conflict of interest

None0

Funding disclosure

Pone0

Author contribution

HLK was conceptualization, data collection, analysis data, and revise the manuscript. KADER was grammatical checks, methods design, and final validation

REFERENCES

- Adisasmito W, Amir V, Atin A, et al (2020). Geographic and socioeconomic disparity in cardiovascular risk factors in Indonesia: Analysis of the basic health research 2018. *BMC Public Health* 20, 1–13.
- Ajabnoor G, Bahijri S, Alamoudi A, et al (2021). The association between hypertension and other cardiovascular risk factors among nondiabetic Saudis adults—A cross sectional stud. *PLoS One* 16, 1–15.
- Chomistek A, Cook N, Rimm E, et al (2016). Physical activity and incident cardiovascular disease in women: Is the relation modified by level of global cardiovascular risk? *J. Am. Heart Assoc.* 7, 1–15.
- Cleven L, Krell-Roesch J, Nigg C, et al (2020). The association between physical activity with incident obesity, coronary heart disease, diabetes and hypertension in adults: A systematic review of longitudinal studies published after 2012. *BMC Public Health* 20, 1–15.
- Dégano I, Marrugat J, Grau M, et al (2017). The association between education and cardiovascular disease incidence is mediated by hypertension, diabetes, and body mass index. *Sci. Rep.* 7, 1–8.
- Einarson T, Acs A, Ludwig C, et al (2018). Prevalence of cardiovascular disease in type 2 diabetes: A systematic literature review of scientific evidence from across the world in 2007–2017. *Cardiovasc. Diabetol.* 17, 1–19.
- Ettehad D, Emdin C, Kiran A, et al (2016). Blood pressure lowering for prevention of cardiovascular disease and death: A systematic review and meta-analysis. *Lancet* 387, 957–967.
- Fuchs F, Whelton P (2020). High blood pressure and cardiovascular disease. *Hypertension* 75, 285–292.
- Gheisari F, Emami M, Shahraki H, et al (2020). The role of gender in the importance of risk factors for coronary artery disease. *Cardiol. Res. Pract.* 2020, 1–6.
- Hajar R (2017). Risk factors for coronary artery disease: Historical perspectives. *Hear. Views* 18, 109–114.
- Hamad R, Nguyen T, Bhattacharya J, et al (2019). Educational attainment and cardiovascular disease in the United States: A quasi-experimental instrumental variables analysis. *PLoS Med.* 16, 1–19.
- Ministry of Health (2018). *Profil kesehatan Indonesia 2017*. Jakarta.
- Jeong S-M, Choi S, Kim K, et al (2018). Effect of change in total cholesterol levels on cardiovascular disease among young adults. *J. Am. Heart Assoc.* 7, 1–17.
- Khaing W, Vallibhakara S, Attia J, et al (2020). Effects of education and income on cardiovascular outcomes: A systematic review and meta-analysis. *Eur. J. Prev. Cardiol.* 24, 1032–1042.
- Kwon D, Yi J-J, Ohrr H, et al (2019). Total cholesterol and mortality from ischemic heart disease and overall cardiovascular disease in Korean adults. *Med.* 98, 1–9.
- Mora S, Moorthy M, Li C, et al (2021). Association of lipid, inflammatory, and metabolic biomarkers with age at onset for incident coronary heart disease in women. *JAMA Cardiol.* 6, 437–447.
- Novriyanti I, Usnizar F, Irwan I (2014). Pengaruh lama hipertensi terhadap penyakit jantung koroner di Poliklinik Kardiologi RSUP. Dr. Mohammad Hoesin Palembang 2012. *J. Kedokt. dan Kesehat.* 1, 55–60.
- Sanchis-Gomar F, Perez-Quilis C, Leischik R, et al (2016). Epidemiology of coronary heart disease and acute coronary syndrome. *Ann. Transl. Med.* 4, 1–12.
- Shahjehan R, Bhutta B (2022). Coronary artery disease Available from <https://www.ncbi.nlm.nih.gov/books/NBK564304/>. Accessed on December 16, 2021.
- Suryati T, Suyitno S (2020). Prevalence and risk factors of the ischemic heart diseases in Indonesia: A data analysis of Indonesia basic health research (RISKESDAS) 2013. *Public Heal. Indones.* 6, 138–144.
- Tiksnadi B, Afrianti R, Wahyudi K, et al (2018). Pembinaan pengetahuan, sikap dan perilaku kader kesehatan Kecamatan Jatinangor mengenai faktor risiko penyakit jantung koroner. *J. Pengabd. Kpd. Masy.* 02, 1–6.
- Ueda P, Gulatin P, Danaei G (2018). Long-term moderately elevated LDL-cholesterol and blood pressure and risk of coronary heart disease. *PLoS One* 13, 1–12.
- Uli R, Satyana R, Zomer E, et al (2020). Health and productivity burden of coronary heart disease in the working Indonesian population using life-table modeling. *BMJ Open* 10, 1–9.
- Winzer E, Woitek F, Linke A (2018). Physical activity in the prevention and treatment of coronary artery disease. *J. Am. Heart Assoc.* 7, 1–15.