ORIGINAL ARTICLE

Risk Factors for Coronary Heart Disease in Productive Age Group in Indonesia

Arwan Setyo Nugroho[1,4], Erni Astutik[1,2], Tika Dwi Tama[3]

[1] Department of Epidemiology, Biostatistics, Population Studies, and Health Promotion, Faculty of Public Health, Universitas Airlangga, Surabaya 60115, Indonesia
[2] Research Group for Health and Well-being of Women and Children, Faculty of Public Health, Universitas Airlangga, Indonesia
[3] Department of Public Health, Faculty of Sports Science, Universitas Negeri Malang, Malang 65145, East Java, Indonesia
[4] Batang District Health Office, Central Java Province, Indonesia

ABSTRACT

Introduction: Heart attack and stroke are two diseases causing four out of five patients with cardiovascular disease to experience early death at the age of below 70 years old. Coronary heart disease is caused by two factors, namely modifiable factors and non-modifiable factors. This study aimed to determine factors related to coronary heart disease in the productive age groups in Indonesia. **Methods:** This study used data from the Indonesia Family Life Survey (IFLS) 5. The total sample in this study was 24,199 with productive age (15-59 years old). The data were analyzed using multiple logistic regressions to analyze the risk factors for coronary heart disease. **Results:** This study found that coronary heart disease prevalence was 1.30%. Most of the respondents in this study were females (52.30%), had a normal body mass index (40.75%), had moderate physical activities (39.33%), had no smoking habit (64.59%), and consumed no fast-food (88.34%). The result showed that older age (AOR =1.06 95%CI=1.05-1.07), female (AOR =1.93, 95%CI=1.32-2.83), vigorous physical activity (AOR = 0.72, 95%CI=0.53-0.96), and fast-food consumption (AOR =1.68, 95%CI=1.22-2.31) had higher odds to experience coronary heart disease. **Conclusion:** Older age, female, vigorous physical activities, fast-food consumption were the risk factors of coronary heart disease at a productive age in Indonesia.

Keywords: IFLS, Coronary Heart Disease, Productive age, Risk factors

Corresponding Author:
Erni Astutik, M.Epid
Email: erniastutik@fkm.unair.ac.id
Tel: +6231-5920948

INTRODUCTION

Around 17.9 million fatalities annually in the world were caused by cardiovascular disease that was a group of heart and blood vessel disorders, including rheumatic heart disease, cerebrovascular disease, coronary heart disease, and other conditions. Cardiovascular disease was at the first rank for the disease that causes mortality in the world. Heart attack and stroke were the cause for 4 out of 5 fatalities in patients with cardiovascular disease. Those might cause early death in people at the age of below 70 years old. Those cases reached one-third of the total fatalities caused by cardiovascular disease (1).

Based on the result from the Basic Health Research in 2013, the prevalence of CHD based on the physician's diagnosis or symptoms was 1.5%, while based on the physician's diagnosis was 0.5% (2). Coronary heart disease caused an increased rate of disability-adjusted life years (DALYs) from 85 million (DALYs) in 1990 to 150 million in 2020. It led to a massive disability so that the world might lose productivity (3).

Based on the profile of the non-infectious disease in 2016, it was found out that, in Indonesia, CHD frequently happened to people at the age group of above or equal to 60 years old and the age group of 35-59 years with 2,228 cases and 1,934 cases respectively(4). Meanwhile, the patient with CHD in the hospital inpatient care facility were mostly people at the age group of 45-64 years old with 29,074 cases in total, and people at the age group of above or equal to 65 years with 14,733 cases in total (5).

Young people (<45 years) had the potential to experience symptoms of obstructive coronary atherothrombosis lesions or commonly called premature coronary heart disease (6). Coronary heart disease generally occured in old age, but at a young age it was the beginning of the process of coronary heart disease. The occurrence of coronary heart disease at old and young age was different, this was due to differences in prognosis, clinical profile and risk factors (7). In addition, CHD was

associated with decreased productivity of the working age population (8).

The potential for impaired life productivity as well as increased use of health care throughout life was the impact of coronary heart disease at a young age so this was an important health problem to address (9). In addition, coronary heart disease at a young age also had an impact on the patient's financial condition and the sufferer's family and also had an impact on the sufferer's psychological (10).

Several studies found that the prevalence of coronary heart disease at a young age had increased significantly (11). Young people had a lifestyle that is at risk of causing coronary heart disease, namely alcohol consumption, smoking habits and sleep duration (12). Several studies had shown that smoking was the most common risk factor for coronary heart disease at a young age, this was because the prevalence of smoking at a young age was greater than that in old age (13).

There were modifiable factors and non-modifiable factors that could cause of CHD. The modifiable factors included lacking physical activities, overweight, and obesity, stress, excessive consumption of alcohol, unhealthy dietary program, smoking, dyslipidemia, hypertension, and diabetes mellitus. Meanwhile, the non-modifiable factors were ethnicity, gender, and age (14). Many studies had investigated the risk factors of CHD in Indonesia; however, the most frequently investigated variables were the elderly group and all age groups. Only a few studies in Indonesia investigated the dominant factors of CHD at a productive age; therefore, the researcher was interested in investigating factors related to CHD at a productive age in Indonesia utilizing data from the Indonesia Family Life Survey (IFLS) 5 The IFLS was a longitudinal and sustainable survey of socioeconomic and health status that collected data about individuals, families, households, and the communities, including the health and educational facilities they used (15).

MATERIALS AND METHODS

This study used the data take from the Indonesia Family Life Survey (IFLS) 5. In this study, we only analyzed the IFLS 5. IFLS 5 was conducted at the end of 2014 to the beginning of 2015. The sample of this study was 24,199 respondents aged 15-59 years old who were successfully interviewed and had the completed data on all variables studied. We excluded data the respondents from analysis due to incomplete information. The IFLS sample used represents 83% of the Indonesian population living in 13 of Indonesia's 26 provinces. Samples were selected randomly from the sample frame used in the 1993 SUSENAS (15). This study had already obtained the informed consent from all respondents and been reviewed by the Research And Development (RAND)

through the Institutional Review Boards (IRBs) from the U.S. and Universitas Gadjah Mada from Indonesia (16).

CHD status was measured by interviewing the respondents related to the condition of coronary heart disease they suffered according to the diagnosis by the doctors, paramedics, nurses, or midwives. The respondents could answer yes or no. Age was determined from the respondent's age report at the time of the interview, while sex consisted of two categories, namely female and male.

In this study, body mass index was collected from the measurement of body weight (kg) divided by the respondent's squared height (m2). The EB1003-Camry scale and Seca 213 Portable Stadiometer Height were used to measure the respondent's body weight and height. This measurement was performed by the officers that had been trained to do the physical measurements during the training.

In the body mass index data, the researcher divided them into four categories, namely underweight, normal, overweight, and obesity. The respondents were categorized as underweight if their body mass index was below 18.5 kg/m2, categorized as normal if their body mass index was 18.5-22.9 kg/m2, categorized as overweight if their body mass index was 23-24.9 kg/m2, and categorized as obesity if their body mass index was above or equal to 25 kg/m2 (17–19).The smoking habit was collected by asking "Do you have a habit to chew tobaccos, to smoke tobacco using pipes, to smoke the self-rolled tobacco leaves, or to smoke cigarettes/cheroots?". In the smoking habit data, the researcher divided them into two categories, namely smoking and not smoking.

The physical activities data were collected by asking respondents about their physical activities during the last 7 days. This variable was divided into three categories based on scoring measurement of the International Physical Activity Questionnaire (IPAQ), namely light physical activity, moderate physical activity, and vigorous physical activity. The score of below 600 was categorized as light physical activity, the score of around 600-2900 was categorized as moderate physical activity, and the score of equal to 3000 or above 3000 was categorized as vigorous physical activity (20). The fast-food consumption data were collected by asking respondents about their history of consuming fast food (KFC, burger, etc) during the last week. Respondents were categorized into consuming fast-food and not consuming fast-food.

Descriptive analysis was used to describe each of studied variables. The data were analyzed using multiple logistic regressions assisted by STATA 14 software. Covariate variables that had a relationship with coronary heart disease status with p-value of <0.25 were included in

the initial multivariable analysis to allow for a possibility that insignificant covariates in the unavailable analysis might become significant when adjusted by other variables.

RESULTS

As many as 24,199 respondents fulfilled the criteria to be analyzed. Most of the respondents in this study were females (52.30%), had a normal body mass index (40.75%), had moderate physical activities (39.33%), had no smoking habit (64.59%), and consumed no fast-food (88.34%) (Table I).

This study found that CHD prevalence was 1.30%. The prevalence of CHD was higher in females (1.60%) than males (0.98%). Compared with other BMI categories, the proportion of CHD was higher in obese respondents (1.84%). More respondents were light physical activities (1.47%), had no smoking habit (1.38%), and consumed fast-food (1.67%) suffered from CHD. Table 2 showed that every 1 year increase in age, the risk of coronary heart disease would increase by 1.06 times after controlling for other variables (AOR=1.06; 95%CI=1.05-1.07; p-value<0.001). The female respondents had 93% higher odds of experiencing coronary heart disease than the males after controlling for other variables (AOR=1.93; 95%CI=1.32-2.83; p-value=0.001). The respondents with vigorous physical activities had 28% lower risk of experiencing coronary heart disease than respondents with the light physical activities after controlling for other variables

(AOR= 0.72; 95%CI=0.53-0.96; p-value=0.027). The respondents with a habit of consuming fast food had 68% higher odds of experiencing coronary heart disease than the respondents with no habit of consuming fast food after controlling for other variables (AOR=1.68, 95%; CI=1.22-2.31; p-value=0.001) (Table II).

Table I: Distribution of respondents according to age, sex, body mass index, physical activity, smoking habit and fast-food consumption in Indonesia

Variables	Frequency or Mean±SD (n=24,199)	(%)
Age	34.31 ± 11.83	
Sex		
Male	11544	47.70
Female	12655	52.30
BMI		
Normal	9861	40.75
Underweight	2874	11.88
Overweight	3733	15.43
Obesity	7731	31.95
Physical activity		
Light	5923	24.48
Moderate	9518	39.33
Vigorous	8758	36.19
Smoking habit		
Yes	8570	35.41
No	15629	64.59
Fast-food consumption		
Yes	2822	11.66
No	21377	88.34
Cardiovascular disease		
Yes	315	1.30
No	23884	98.70

Table II: The relationship between age, sex, body mass index, physical activity, smoking habit and fast-food consumption with the incidence of coronary heart disease in Indonesia

Variables	CHD				Bivariate analysis OR (95%CI)	Multivariate analysis AOR (95%CI)	p-value
	Yes	%	No	%			
Age					1.06 (1.05-1.07)**	1.06 (1.05-1.07)**	<0.001
Sex							
Male	113	0.98	11431	99.02	Ref	Ref	
Female	202	1.60	12453	98.40	1.64 (1.30-2.07)**	1.93 (1.32-2.83)**	0.001
BMI							
Normal	99	1.00	9762	99.00	Ref	Ref	
Underweight	28	0.97	2846	99.03	0.97 (0.64-1.48)	1.21 (0.79-1.85)	0.380
Overweight	46	1.23	3687	98.77	1.23 (0.87-1.75)	0.98 (0.67-1.40)	0.928
Obesity	142	1.84	7589	98.16	1.85 (1.42-2.39)**	1.28 (0.98-1.68)	0.068
Physical activity							
Light	87	1.47	5836	98.53	Ref	Ref	
Moderate	128	1.34	9390	98.66	0.91 (0.70-1.20)	0.83 (0.63-1.09)	0.183
Vigorous	100	1.14	8658	98.86	0.77 (0.58-1.03)	0.72 (0.53-0.96)*	0.027
Smoking habit							
Yes	99	1.16	8471	98.84	0.83 (0.66-1.06)	1.38 (0.93-2.05)	0.109
No	216	1.38	15413	98.62	Ref	Ref	
Fast-food consumption							
Yes	47	1.67	2775	98.33	1.33 (0.98-1.82)	1.68(1.22-2.31)**	0.001
No	268	1.25	21109	98.75	Ref	Ref	

* Significantly associated at p-value < 0.05, ** Significantly associated at p-value ≤ 0.001

DISCUSSION

The result showed older age, female, vigorous physical activities, and fast-food consumption were significantly associated with coronary heart disease after controlling for other variables.

Coronary heart disease is caused by many factors so it was known as a multifactorial disease. This disease was caused by genetic factors and different environmental responses (21). Age significantly influenced the occurrence of coronary heart disease. The older person, the risk of having various diseases including coronary heart disease, was also higher (22). Sex led to coronary heart disease due to the hormonal difference owned by females and males (23). Physical activity was also the predictor of coronary heart disease. People who often did physical activities were more protected from the risk of coronary heart disease (24). Fast-food consumption was correlated with an increased risk of getting coronary heart disease. People who consumed fast food in large quantities might have a risk of several chronic diseases, including coronary heart disease (25).

In this study, it was found that age had 1.06 times higher risk as the factor causing coronary heart disease. This finding was in line with a study conducted by Otaki et al., (2013), stating that age had 1.05 times higher risk as a factor causing coronary heart disease (26). A study conducted by Popa et al., (2020) also stated that age had 1.063 times higher risk as a factor causing coronary heart disease (27).

The increased risk of coronary heart disease was associated with increased age. It happened since the organ function decreased as the people got older. Decreasing body organ function caused a person to be more susceptible to get several diseases, such as coronary heart disease (28). In elders, the signs and symptoms of coronary heart disease were often identified. As people get older, the total cholesterol levels get higher. A person with an excessive fat level in the blood may suffer from coronary heart disease and the increased blood level due to the cholesterol accumulation in blood vessel walls (29). Older adults above the age of 40 had higher prevalence of coronary heart disease than young adults. Young adults had a lower total of symptomatic coronary heart disease and myocardial infarction. The study showed that the total coronary heart disease cases in young adults were lower than that of the patients at the age of 40 years old, namely around 3% (30).

Several factors caused coronary heart disease in young adults, namely coronary segments with non-significant stenosis and a non-classified plaque showing a positive remodeling. Coronary heart disease in young adults was also caused by blood coagulation from other places that spread to normal arteries (5%), congenital disorders of coronary arteries (4%), the failure in the blood coagulation system causing an increased risk of the formation of a blood clot (5%). The other 6% of the factors of coronary heart disease in young adults were the misuse of cocaine, amphetamine, and other drugs, chest trauma, stiffness or coronary artery inflammation, and radiotherapy for chest trauma (31). A study conducted by Sinha and Bhardwaj (2016) stated that there was a significant relationship between people at the age of above 45 years old with the coronary heart incident (p-value=<0.001)(32). The retrospective cohort study conducted by Xia et al., (2018) also stated that there was a significant relationship between age and the coronary heart incident (p-value=<0.001) (33).

In this study, it was found that women had a risk of 1.93 times higher to experience coronary heart disease than the men did. The study conducted by Pradono and Werdhasari (2018) in Indonesia also reported a similar finding. The risk of CHD in women was almost two times greater than in men (34). However, this finding was different from a study conducted in Southern Iranian by Tabei et al (2014) and in Turkey by Akboga et al. (2016). Those studies stated that men had a higher risk of CHD than women (21,35). A possible explanation for the different findings with other studies is the difference in the diagnostic tools used in determining CHD. CHD in Indonesian studies was determined based on a self-report of a previous diagnosis by medical personnel and the results of an ECG test, while studies conducted in other countries used angiographic results to determine CHD status. ECG examination in women has lower sensitivity and specificity than other diagnostic tools (36). Overdiagnosis might occur because there is no gender-specific criteria for ECG interpretation (37), although women have a higher heart rate with longer QT intervals than men. Misdiagnosis by ECG examination may occur in younger groups of women because endogenous estrogen levels can cause ECG changes mimic ischemia (38)

Diabetes was a factor that can explain the risk differences of presenting CHD between women and men (39,40). Previous meta-analysis study found that women with diabetes had a 50% greater risk of CHD than men (39). Women tend to have a lower glycemic control than men as a result of inadequate diabetes management that was received (41). This condition triggered a disturbance in the vascular system that increased the risk of CHD (39).

Differences in cholesterol levels between women and men might also explain this finding. Reduced high-density lipoprotein cholesterol (HDL) and high total cholesterol levels had a greater effect on increasing the risk of CHD in women (42). Since menopause, the cholesterol levels in women tend to be higher than men (37,43). It elevated the risk of developing CHD in women (37). Hypertension, dietary pattern, psychosocial factors, and other women-specific factors, such as pregnancy

complication, were also associated with the different risk of CHD between women and men (42–44).

People having vigorous physical activities had odds of 0.72 times higher as a protective factor against coronary heart disease. This finding was in line with a study conducted by Tanasecu et al., (2002), stating that vigorous physical activities had odds of 0.83 times higher as a protective factor against coronary heart disease (45). The study conducted by Steward et al., (2017) stated that moderate and vigorous physical activities might play a role as the protective factors against coronary heart disease compared to the light physical activities (HR= 0.75 95%; CI 0.65-0.87; HR= 0.70; 95%CI 0.60-0.82) (46).

Physical activities strongly associated with the decline of coronary heart disease incidence because physical activities might control the risk factors of coronary heart disease, namely obesity, hypertension, and diabetes. Physical activities may influence thrombosis, the decline of systemic inflammation, the delay of the atherosclerosis process, including the improvement of endothelial dysfunction (47). People who perform physical activities in 3-5 days a week for 30 minutes regularly might increase the cholesterol levels of high-density lipoprotein (HDL) by 4 mg/dL and might decrease the cholesterol levels of low-density lipoprotein (LDL) by 10 mg/dL. The decline in LDL levels and the increase in HDL levels affected the reduced risk of coronary heart disease (48).

This study reported that people with fast food consumption habits had 1.68 times higher odds to suffer from coronary heart disease compared to people who did not have these eating habits. A study conducted by Balakrishnan et al. (2017) stated that having fast food consumption habits was a significant predictor of CHD (p-value=<0.01), both in men who lived in cities and villages (49). These findings were also supported by a study conducted by Odegaard et al. (2012). It found that people who consume fast food more than or equal to two times/week had 1.56 times higher odds to experience CHD than people who did not consume fast food (50).

Fast food can increase total cholesterol levels and LDL because it contained high sodium and fat. People who consumed fast food might cause an increase in the risk of developing non-infectious diseases, such as hypertension, cancer, diabetes, and heart disease. It would be worse if combined with an unhealthy lifestyle. Consuming fast-food in a long-term period also might cause other health problems, such as dementia and Alzheimer's. These might happen due to the content in fast-food that may cause damage in the brain area having duty for memory and a decline in the brain-derived neurotrophic factor (51).

The increased risk of mortality that was caused by

coronary heart disease and type 2 diabetes might be caused by fast food consumption that had poor in terms of nutrition (52). People who frequently consume fast food may have health problems, such as the risk of cardiovascular disease, diabetes mellitus, increased body weight, and insulin resistance (53). The study conducted by Yang et al., (2013) in 292 young patients reported that there was a significant relationship between consuming high-fat food and the mortality due to coronary heart disease (p-value=<0.000). People who consumed high-fat foods had 1.35 times higher risk causing death due to coronary heart disease than the people who did not consume high-fat foods (54).

The limitation of this secondary data analysis is related to data availability. The primary data collected did not aim to test the hypotheses determined by the study so that some covariates were not available for analysis, such as total cholesterol levels and HDL cholesterol levels. There was no cholesterol measurement in IFLS5 (55). Omitted those important covariates can cause residual confounding.

CONCLUSION

Older age, female, vigorous physical activities, fast-food consumption were the risk factors of coronary heart disease at a productive age in Indonesia.. Therefore, it is important to provide education about the importance of a healthy lifestyle such as doing physical activity and consuming healthy foods to prevent coronary heart disease, especially in the older age group and women. In addition, Integrated Development Post (POSBINDU) activities can be optimized to carry out early detection of risk factors and monitoring of non-communicable diseases such as coronary heart disease.

REFERENCES

1. World Health Organization. Cardiovascular Diseases. World Health Organization. 2020.
2. Kementerian Kesehatan Republik Indonesia. Riset Kesehatan Dasar. Kementerian Kesehatan Republik Indonesia; 2013. 87–90 p.
3. Setyaji DY, Prabandari YS, Gunawan IMA. Aktivitas fisik dengan penyakit jantung koroner di Indonesia. J Gizi Klin Indones. 2018;14(3):115–21.
4. Kementerian Kesehatan R of I. Profil Penyakit Tidak Menular Tahun 2016.
5. Kementerian Kesehatan Republik Indonesia. Profil Penyakit Tidak Menular Tahun 2016. Jakarta: Kementerian Kesehatan Republik Indonesia; 2016. 30–32 p.
6. Collet JP, Zeitouni M, Procopi N, Hulot JS,

Silvain J, Kerneis M, et al. Long-Term Evolution of Premature Coronary Artery Disease. J Am Coll Cardiol. 2019;74(15):1868–78.

7. Arumugam C, Chokkalingam M, Ganesh N, Nayar PG, Ahamed A, K NAS. Original article : A study of pattern of coronary artery disease in young south Indian population. Indoan J Bassic Applie Med Res. 2016;5(3):216–24.

8. Uli RE, Satyana RPU, Zomer E, Magliano D, Liew D, Ademi Z. Health and productivity burden of coronary heart disease in the working Indonesian population using life-table modelling. BMJ Open. 2020;10(9):e039221.

9. Vikulova DN, Grubisic M, Zhao Y, Lynch K, Humphries KH, Pimstone SN, et al. Premature Atherosclerotic Cardiovascular Disease: Trends in Incidence, Risk Factors, and Sex-Related Differences, 2000 to 2016. J Am Heart Assoc. 2019;8(14):1–12.

10. Egred M, Viswanathan G, Davis GK. Myocardial infarction in young adults. Postgrad Med J. 2005;81(962):741–5.

11. Shemirani H, Separham KH. The relative impact of smoking or Hypertension on severity of premature coronary artery disease. Iran Red Crescent Med J IRCMJ. 2007;9(4):177–81.

12. Krittanawong C, Kumar A, Wang Z, Narasimhan B, Mahtta D, Jneid H, et al. Coronary artery disease in the young in the US population-based cohort. Am J Cardiovasc Dis. 2020;10(3):189–94.

13. Tolstrup JS, Hvidtfeldt UA, Flachs EM, Spiegelman D, Heitmann BL, BΔlter K, et al. Smoking and risk of coronary heart disease in younger, middle-aged, and older adults. Am J Public Health. 2014;104(1):96–102.

14. Kementerian Kesehatan Republik Indonesia. Faktor Risiko Penyakit Jantung Koroner (PJK). Kementerian Kesehatan Republik Indonesia. 2020.

15. Strauss J, Witoelar F, Sikoki B. The fifth wave of the Indonesia family life survey: overview and field report. Vol. 1. RAND Santa Monica, CA; 2016.

16. RAND. Working Paper The Fifth Wave of the Indonesia Family Life Survey: Overview and Field Report. RAND. 2016.

17. Lim JU, Lee JH, Kim JS, Hwang Y Il, Kim T-H, Lim SY, et al. Comparison of World Health Organization and Asia-Pacific body mass index classifications in COPD patients. Int J Chron Obstruct Pulmon Dis [Internet]. 2017 Aug 21;12:2465–75. Available from: https://pubmed.ncbi.nlm.nih.gov/28860741

18. Weir CB, Jan A. BMI classification percentile and cut off points. 2019; Available from: https://www.ncbi.nlm.nih.gov/books/NBK541070/

19. Kementerian Kesehatan R of I. Epidemi Obesitas [Internet]. Available from: http://p2ptm.kemkes.go.id/uploads/N2VaaXIxZGZwWFpEL1VlRFdQQ3ZRZz09/2018/02/FactSheet_Obesitas_Kit_Informasi_Obesitas.pdf

20. Forde C. Scoring the International Physical Activity Questionnaire (IPAQ) Exercise Prescription for the Prevention and Treatment of Disease. 2005.

21. Tabei SMB, Senemar S, Saffari B, Ahmadi Z, Haqparast S. Non-modifiable Factors of Coronary Artery Stenosis in Late Onset Patients with Coronary Artery Disease in Southern Iranian Population. J Cardiovasc Thorac Res. 2014;6(1):51–5.

22. Zahrawardani D, Herlambang KS, Anggraheny HD. Analisis Faktor Risiko Kejadian Penyakit Jantung Koroner di RSUP Dr Kariadi Semarang. J Kedokt Muhammadiyah. 2013;1(3):13–20.

23. Garcia M, Mulvagh SL, Merz CNB, Buring JE, Manson JAE. Cardiovascular disease in women: Clinical perspectives. Circ Res. 2016;118(8):1273–93.

24. Al-Zoughool M, Al-Ahmari H, Khan A. Patterns of physical activity and the risk of coronary heart disease: A pilot study. Int J Environ Res Public Health. 2018;15(4):1–13.

25. Azadbakht L, Esmaillzadeh A. Fast foods and risk of chronic diseases. J Res Med Sci. 2008;13(1):1–2.

26. Otaki Y, Gransar H, Berman DS, Cheng VY, Dey D, Lin FY, et al. Impact of family history of coronary artery disease in young individuals (from the CONFIRM registry). Am J Cardiol. 2013;111(8):1081–6.

27. Popa LE, Petresc B, Catana C, Moldovanu CG, Feier DS, Lebovici A, et al. Association between cardiovascular risk factors and coronary artery disease assessed using CAD-RADS classification: A cross-sectional study in Romanian population. BMJ Open. 2020;10(1):1–7.

28. Suherwin. Hubungan Usia, Jenis Kelamin dan Riwayat Penyakit Dengan Kejadian Penyakit Jantung Koroner di Instalasi Gawat Darurat Rumah Sakit TK II dr. AK. Gani Palembang Tahun 2016. Aisyiyah Med. 2018;1(1):89–97.

29. Ghani L, Susilawati MD, Novriani H. Faktor Risiko Dominan Penyakit Jantung Koroner di Indonesia. Bul Penelit Kesehat. 2016;44(3):153–64.

30. Alkhawam H, Zaiem F, Sogomonian R, El-Hunjul M, Al-Kateb M, Bakhsh MU, et al. Coronary artery disease in young adults. Am J Med Sci. 2015;350(6):479–83.

31. Aggarwal A, Srivastava S, Velmurugan M. Newer perspectives of coronary artery disease in young. World J Cardiol. 2016;8(12):728.

32. Sinha U, Sumit Dutt Bhardwaj. Prevalence of Coronary Artery Disease and Its Association with Various Risk Factors in Rural Area of Nagpur. Natl J Community Med. 2016;7(8):703–7.

33. Xia TL, Huang FY, Li YM, Chai H, Huang BT, Ou YWX, et al. The impact of age on the implementation of evidence-based medications in patients with coronary artery disease and its prognostic significance: A retrospective cohort study. BMC Public Health. 2018;18(1):1–10.

34. Pradono J, Werdhasari A. Faktor Determinan

Penyakit Jantung Koroner pada Kelompok Umur 25-65 tahun di Kota Bogor, Data Kohor 2011-2012. Bul Penelit Kesehat. 2018;46(1):23–34.

35. Akboga MK, Canpolat U, Yayla C, Ozcan F, Ozeke O, Topaloglu S, et al. Association of Platelet to Lymphocyte Ratio with Inflammation and Severity of Coronary Atherosclerosis in Patients with Stable Coronary Artery Disease. Angiology. 2016;67(1):89–95.

36. Zeljković I, Pintarić H, Vrsalović M, Kruljac I. Effectiveness of cardiogoniometry compared with exercise-ECG test in diagnosing stable coronary artery disease in women. QJM An Int J Med. 2017;110(2):89–95.

37. Maas AHEM, Appelman YEA. Gender differences in coronary heart disease. Netherlands Hear J. 2010;18(12):598–603.

38. Members TF, Montalescot G, Sechtem U, Achenbach S, Andreotti F, Arden C, et al. 2013 ESC guidelines on the management of stable coronary artery disease: the Task Force on the management of stable coronary artery disease of the European Society of Cardiology. Eur Heart J. 2013;34(38):2949–3003.

39. Wang Y, O'Neil A, Jiao Y, Wang L, Huang J, Lan Y, et al. Sex differences in the association between diabetes and risk of cardiovascular disease, cancer, and all-cause and cause-specific mortality: a systematic review and meta-analysis of 5,162,654 participants. BMC Med. 2019;17(1):1–18.

40. Woodward M. Cardiovascular disease and the female disadvantage. Int J Environ Res Public Health. 2019;16(7):1165.

41. Ohkuma T, Komorita Y, Peters SAE, Woodward M. Diabetes as a risk factor for heart failure in women and men: a systematic review and meta-analysis of 47 cohorts including 12 million individuals. Diabetologia. 2019;62(9):1550–60.

42. Gao Z, Chen Z, Sun A, Deng X. Gender differences in cardiovascular disease. Med Nov Technol Devices. 2019;4:100025.

43. Najafi M, Sheikhvatan M. Gender differences in coronary artery disease: correlational study on dietary pattern and known cardiovascular risk factors. Int Cardiovasc Res J. 2013;7(4):124.

44. Galiuto L, Locorotondo G. Gender differences in cardiovascular disease. J Integr Cardiol. 2015;1(1):20–2.

45. Tanasescu M, Leitzmann MF, Rimm EB, Willett WC, Stampfer MJ, Hu FB. Exercise type and intensity in relation to coronary heart disease in men. J Am Med Assoc. 2002;288(16):1994–2000.

46. Stewart RAH, Held C, Hadziosmanovic N, Armstrong PW, Cannon CP, Granger CB, et al. Physical Activity and Mortality in Patients With Stable Coronary Heart Disease. J Am Coll Cardiol. 2017;70(14):1689–700.

47. Cheng SJ, Yu HK, Chen YC, Chen CY, Lien WC, Yang PY, et al. Physical activity and risk of cardiovascular disease among older adults. Int J Gerontol. 2013;7(3):133–6.

48. Sesso HD, Paffenbarger RS, Lee IM. Physical activity and coronary heart disease in men: The Harvard Alumni Health Study. Circulation. 2000;102(9):975–80.

49. Balakrishnan G, Sree A, Bangera S, Dutt A, Thalenjeri P, Balasubramaniyam K. Lifestyle risk factors for coronary artery disease among young male patients of urban and rural Dakshina Kannada - A cross-sectional study. Natl J Physiol Pharm Pharmacol. 2017;8(3):300–4.

50. Odegaard AO, Koh WP, Yuan JM, Gross MD, Pereira MA. Western-style fast food intake and cardiometabolic risk in an Eastern country. Circulation. 2012;126(2):182–8.

51. Alsabieh M, Alqahtani M, Altamimi A, Albasha A, Alsulaiman A, Alkhamshi A, et al. Fast food consumption and its associations with heart rate, blood pressure, cognitive function and quality of life. Pilot study. Heliyon. 2019;5(5).

52. Van Horn L, McCoin M, Kris-Etherton PM, Burke F, Carson JAS, Champagne CM, et al. The Evidence for Dietary Prevention and Treatment of Cardiovascular Disease. J Am Diet Assoc. 2008;108(2):287–331.

53. Pereira MA, Kartashov AI, Ebbeling CB, Van Horn L, Slattery ML, Jacobs PDR, et al. Fast-food habits, weight gain, and insulin resistance (the CARDIA study): 15-year prospective analysis. Lancet. 2005;365(9453):36–42.

54. Yang WX, Yang Z, Wu YJ, Qiao S Bin, Yang YJ, Chen JL. Factors associated with coronary artery disease in young population (Age40): Analysis with 217 cases. Chinese Med Sci J. 2014;29(1):38–42.

55. RAND. IFLS Data Updates, Data Notes, Tips, and FAQs [Internet]. Available from: https://www.rand.org/well-being/social-and-behavioral-policy/data/FLS/IFLS/datanotes.html