Prevalence and Modifiable Risk Factors of Cardiovascular Disease in Myanmar: A Case Study of Yangon General Hospital

The 5th RIN Online Workshop Series 30 October 2025

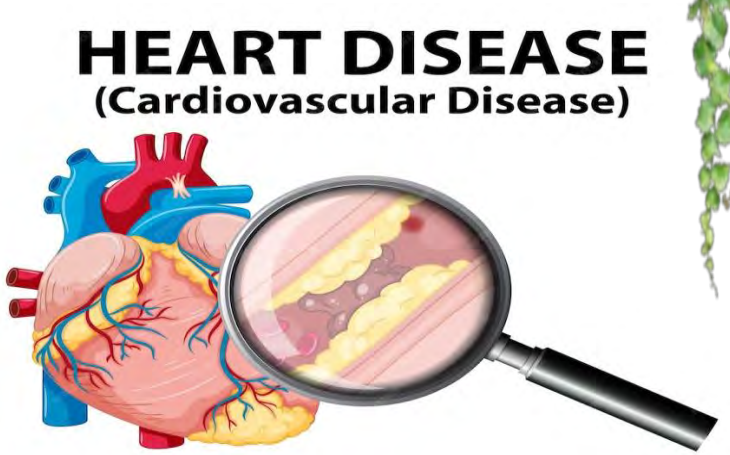
Presented by

Dr. Hlaing Hlaing Moe
Professor (Head)
Department of Applied Statistics
Yangon University of Economics

CONTENTS

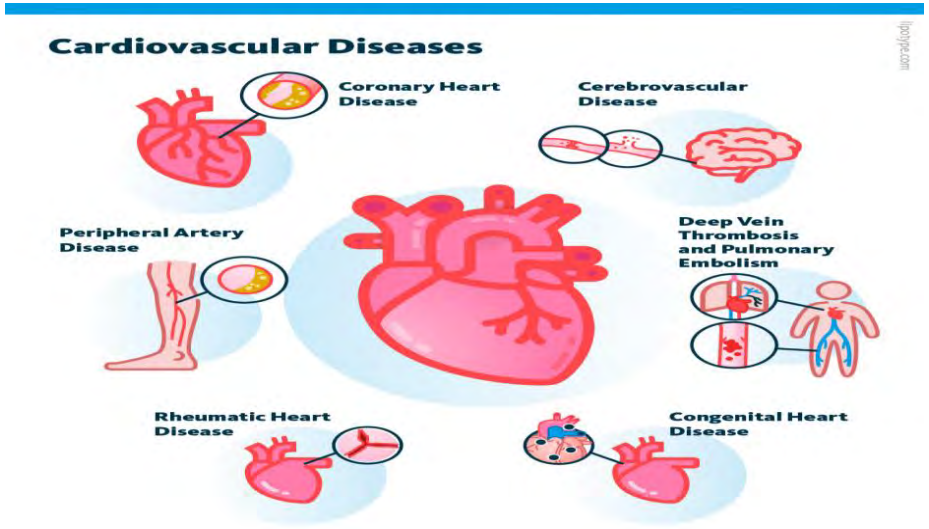
Introduction

- Cardiovascular diseases (CVDs), known as heart diseases, represent a broad group of disorders that affect the heart and blood vessels, including coronary artery disease (CAD), cerebrovascular disease, rheumatic heart disease, and other vascular conditions (WHO, 2021). Among these, CAD also referred to as ischemic heart disease.
- It is the most prevalent and significant in terms of both morbidity and mortality.
- CVDs are the leading cause of death globally, responsible for an estimated 17.9 million deaths annually, accounting for approximately 32% of all global deaths.
- Of these, nearly 85% result from heart attacks and strokes, emphasizing the critical need for preventive action and targeted public health strategies (WHO, 2021).



Introduction

- Importantly, more than three-quarters of cardiovascular deaths occur in low- and middle-income countries, including those in Southeast Asia (WHO, 2021).
- This global disparity highlights the need for contextualized research into risk factors and interventions suitable for resource-constrained healthcare systems.
- Therefore, the identifying and addressing the underlying causes of heart disease is essential to the design of effective prevention, diagnosis, and treatment strategies that improve health outcomes at both individual and population levels.



Problem Statement

- Heart disease is encompassing several cardiovascular conditions, most notably those involving the narrowing or blockage of blood vessels, which can result in myocardial infarction (heart attack), angina (chest pain), or stroke.
- Other forms of heart disease include abnormalities affecting cardiac muscle function, valve integrity, and electrical conduction systems.
- CAD is caused by atherosclerosis, a progressive accumulation of lipid-rich plaques composed of cholesterol, cellular debris, calcium, and fibrin within the arterial walls supplying the myocardium with oxygenated blood (Libby et al., 2019).
- Specific types of heart disease include CAD, heart failure, arrhythmias (abnormal heart rhythms), valvular heart disease, congenital heart defects, and cardiomyopathies (Hall & Hall, 2021).

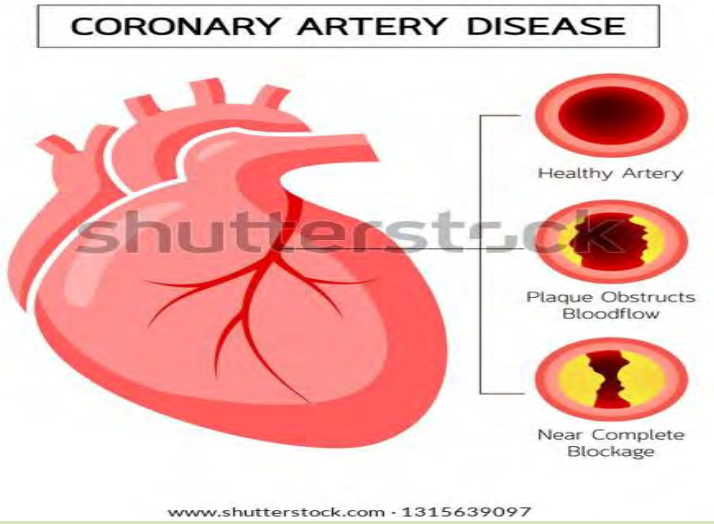
Problem Statement

- Risk factors for heart disease are classified into non-modifiable and modifiable categories.
- Modifiable risk factors are conditions and behaviors that individuals and populations can influence through lifestyle modifications, pharmacological treatment, and policy interventions.
- Hypertension is one of the most prevalent modifiable risks factors and contributes significantly to left ventricular hypertrophy, endothelial damage, and accelerated atherosclerosis.
- Diabetes mellitus is another critical modifiable risk factor, increasing CAD risk by two- to four-fold due to its promotion of endothelial dysfunction, systemic inflammation, and dyslipidemia (Haffner et al., 1998).
- Tobacco use contributes to cardiovascular risk by inducing endothelial injury, promoting thrombogenesis, and impairing oxygen delivery.

Problem Statement

- Obesity, particularly abdominal or central obesity, is associated with insulin resistance, dyslipidemia, and hypertension, all of which are strongly linked to CAD risk (Després, 2012).
- Physical inactivity further exacerbates these conditions, while regular moderate-intensity exercise (≥150 minutes per week) has been shown to significantly reduce cardiovascular risk by enhancing endothelial function and improving metabolic profiles (Li & Siegrist, 2012).
- Dietary patterns also play a significant role in modulating cardiovascular risk. Diets rich in saturated fats, trans fats, sodium, and refined sugars increase the likelihood of CAD, whereas consumption of fruits, vegetables, whole grains, nuts, and fish is protective (Estruch et al., 2013).
- Moderate alcohol consumption has been suggested to have cardioprotective effects, excessive intake is associated with hypertension, elevated triglyceride levels, and cardiomyopathy (Brien et al., 2011).

Problem Statement



- Risk factors for heart disease are classified into non-modifiable and modifiable categories.
- According to WHO data, coronary heart disease was responsible for 34,871 deaths in 2020, accounting for 9.67% of all deaths in the country.
- Based on the significant public health burden of heart disease and the increasing prevalence of its modifiable risk factors, this study is mainly emphasized to investigate the influence of the modifiable risk factors among patients diagnosed with cardiovascular disease at Yangon General Hospital.
- This study intends to provide insights for health professionals and policymakers to design targeted interventions, reduce disease burden, and improve cardiovascular outcomes in Myanmar.

Literature Review

Authors	Aims of the study	Data and Methods	Findings
Kołtuniuk and Rosińczuk (2016)	➢ to compare the prevalence of CVD risk factors between patients aged over 65 years and patients of other age groups in surgical wards.	➢ A sample of 420 patients aged 18–84 years who were hospitalized in surgical wards. ➢ Student's t-test, chi-square test, Fisher's exact test, Mann–Whitney U-test, and analysis of variance	➢ Abdominal obesity (83.3%), overweight and obesity (68%), hypertension (65.1%), hypercholesterolemia (33.3%), and low level of physical activity (29.1%) were the most common CVD risk factors among patients over 65 years old ➢ Abdominal obesity (36.2%), overweight and obesity (36.1%), and current smoking were the most common CVD risk factors among patients up to the age of 35. ➢ Distribution of the major risk factors for CVD is quite high in the adult population, especially in the age group over 65, which can result in serious problems of health and increased rates of chronic diseases, especially CVDs.

Literature Review

Authors	Aims of the study	Data and Methods	Findings
Zaw et al. (2017)	➢ to assess the burden of cardiovascular diseases (CVDs) in selected townships of Myanmar in order to inform prevention and control strategies.	➢ Utilizing a cross-sectional household survey conducted from January to Apirl 2013, the study collected data with 600 adults aged 40 years and above across four townships (Kyauk-Tan, Mawlamyaing, Pathein, and Pyay). ➢ Face-to-face interview with standard questionnaire. ➢ Descriptive Statistics	➢ Prevalence of possible heart attack, stroke and heart failure was 7.5%, 1.5% and 2.8%. ➢ The prevalence of hypertension was 51%. ➢ The findings highlight a significant public health concern and underscore the urgent need for both facility-based treatment and community-based interventions to mitigate cardiovascular risks in Myanmar.

Literature Review

Authors	Aims of the study	Data and Methods	Findings
The Global Cardiovascular Risk Consortium (2023)	➢ to examine the effect of body-mass index, systolic blood pressure, non-high-density lipoprotein cholesterol, current smoking, and diabetes on the incidence of cardiovascular disease (CVD) and all-cause mortality.	➢ Data were collected by the Hamburg Data Center. ➢ Individual-level data pooled from 112 cohort studies across 34 countries. ➢ Cox proportional hazards regression model	➢ Based on the results, these five risk factors collectively accounted for 57.2 % of the 10-year incidence of CVD among women and 52.6% among men, while contributing to 22.2% and 19.1% of all-cause mortality respectively. ➢ Those finding underscored the significant global variation in the prevalence and impact of modifiable risk factors, highlighting elevated systolic blood pressure as the leading contributor to CVD risk across all regions.

Conceptual Framework of the Study

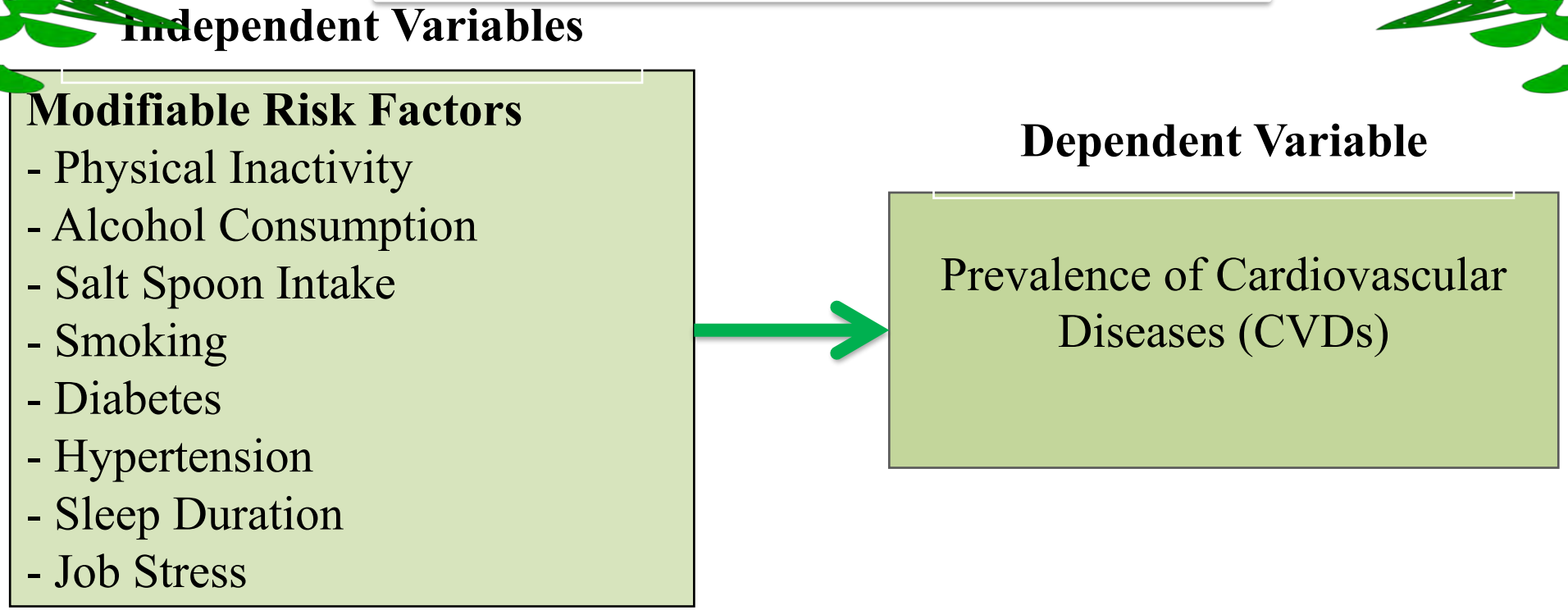


Figure (1): Conceptual Framework

Source: Own Compilation based on World Health Organization (2021)

Key Objectives

- To investigate the prevalence of cardiovascular disease and its modifiable risk factors among patients
- To analyze the relationship between the prevalence of cardiovascular disease and its modifiable risk factors among patients
- To examine the effect of modifiable risk factors on cardiovascular disease among patients

Research Methods

Study Design

- The survey design was a cross-sectional study
- The target population was patients who visited the OPD at Yangon General Hospital.
- The study population included patients aged 15 years and above.
- Worldwide in 2019, estimated incident CVD cases among individuals aged 15–39 years showed that mortality and DALYs were the highest in the age group 35–39 years (Roth et al., 2020).
- The age group of participants was limited according to the recommendation of the World Health Organization (WHO, 2020).
- Participants were selected by using systematic sampling method with every 5^{th} individual was chosen after a random starting point.
- Almost 335 patients were participated for infinite population.
- A face-to-face interview was conducted at Yangon General Hospital in April, 2025 by following permission from Medical Superintendent.

Questionnaire Design

- The questionnaire consists of the prevalence of cardiovascular disease and modifiable risk factors of cardiovascular disease .
- The questionnaire consists of both closed-ended and open-ended questions to ensure comprehensive data collection.

Sample Size Determination

- The required sample size was calculated by using the Cochran's (1977) formula.
- In this study, the prevalence of heart disease was assumed 32% based on the previous study (World Health Organization, 2021).
- Margin of error (5%) and 95% confidence level were used to meet higher precision.
- The required sample size was

$$n = \frac{Z^2 p(1-p)}{E^2} = \frac{(1.96)^2 \times 0.32 \times (1-0.68)}{(0.05)^2} = 335 \text{ patients}$$

Statistical Methods

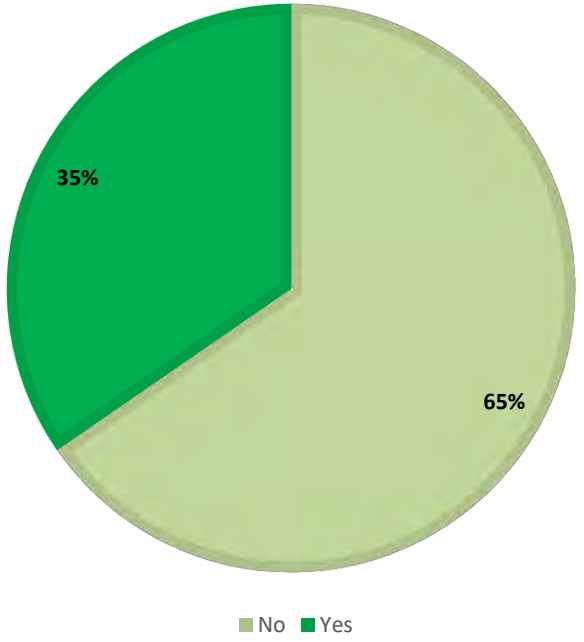
- **Descriptive Statistics**
- **Pearson Chi-squared Test**
- **Binary Logistic Regression Model**

Findings and Discussion

Table 1: Percent Distribution of Prevalence of Cardiovascular Diseases (CVDs)

Prevalence of Cardiovascular Diseases (CVDs)	Percent
No	65.4
Yes	34.6

Figure 1: Pie Chart of Prevalence of Cardiovascular Diseases (CVDs)



Findings and Discussion

Table 1: Percent Distribution of Modifiable Risk Factors of CVDs

Modifiable Risk Factors	Categorization	Percent
Physical Inactivity	No	17.9
	Yes	82.1
Alcohol Consumption	No	77.6
	Yes	22.4
Salt Spoon Intake	One Spoon	61.8
	Two Spoon	28.1
	Three Spoon	10.1
Smoking	No	77.3
	Yes	22.7

Findings and Discussion

Table 1: Percent Distribution of Modifiable Risk Factors of CVDs

Modifiable Risk Factors	Categorization	Percent
Diabetes	No	68.4
	Yes	31.6
Hypertension	No	29.9
	Yes	70.1
Sleep Duration	4-5 hours	31.6
	6-8 hours	68.4
Job Stress	No	48.1
	Yes	51.9

Findings and Discussion

Table 2: Bivariate Analysis of Modifiable Risk Factors and Prevalence of Cardiovascular Diseases (CVDs) in Myanmar

Modifiable Risk Factors		Chi-square	P-value
Physical Inactivity	Yes	10.415***	0.001
	No		
Alcohol Consumption	Yes	0.313	0.584
	No		
Salt Spoon Intake	One Spoon	30.305***	0.000
	Two Spoon		
	Three Spoon		
Smoking	Yes	1.649	0.218
	No		
Diabetes	Yes	27.648***	0.000
	No		
Hypertension	Yes	17.490***	0.000
	No		
Sleep Duration	4-5 hours	33.085***	0.000
	6-8 hours		
Job Stress	Yes	13.103***	0.000
	No		

*** ,**,* significant at 1% ,5% and 10% level.

Findings and Discussion

Table 3: Model Fitting Information for Prevalence of Cardiovascular Diseases (CVDs) in Myanmar

Model fitting criteria	χ^2 value	d.f	P-value
Omnibus Test of Model Coefficient	84.694***	9	0.000
Hosmer and Lemeshow (H-L) Test	4.956	8	0.792
-2Log Likelihood	347.527		
Cox & Snell R-square	0.223		
Nagelkerke R-square	0.308		
Overall Correct Prediction	73.4 %		

*** ,**,* significant at 1% ,5% and 10% level.

Findings and Discussion

Table 4: Parameter Estimates of Binary Logistic Regression Model for Cardiovascular Diseases (CVDs) in Myanmar

Independent variables		Coefficient	P-value	Odds Ratio
Constant		1.355***	0.002	3.877
Physical Inactivity	Yes (ref.)			
	No	-0.960**	0.017	0.383
Alcohol Consumption	Yes (ref.)			
	No	-0.130	0.752	0.878
Salt Spoon Intake	One Spoon (ref.)			
	Two Spoon	0.186	0.529	1.204
	Three Spoon	1.495***	0.002	4.458

*** ,**,* significant at 1% ,5% and 10% level.

Findings and Discussion

Table 4: Parameter Estimates of Binary Logistic Regression Model for Self-care Ability among Elderly in Myanmar

Independent variables		Coefficient	P-value	Odds Ratio
Smoking	Yes (ref.)			
	No	-0.443	0.275	0.642
Diabetes	Yes (ref.)			
	No	-0.955***	0.001	0.385
Hypertension	Yes (ref.)			
	No	-0.937***	0.004	0.392
Sleep Duration	4-5 hours (ref.)			
	6-8 hours	-0.839***	0.003	0.432
Job Stress	Yes (ref.)			
	No	-0.468*	0.83	0.626

*** ,**,* significant at 1% ,5% and 10% level.

Conclusion and Recommendation

- This study reveals a notably high prevalence of modifiable risk factors for cardiovascular diseases, including physical inactivity, hypertension, diabetes, smoking, excessive salt intake, inadequate sleep, and job-related stress.
- These findings highlight the urgent need for targeted public health interventions aimed at mitigating lifestyle-related risks that significantly contribute to the growing cardiovascular burden in Myanmar.
- Addressing these factors through well-designed prevention strategies is critical to improving population health outcomes.
- Regular physical activity, tobacco avoidance, sufficient sleep duration, and the absence of diabetes and hypertension were protective against cardiovascular diseases, whereas excessive salt intake substantially increased risk.

Conclusion and Recommendation

- Consequently, it is imperative that government and policymakers prioritize comprehensive health promotion initiatives that foster physical activity, reduce salt consumption, enhance chronic disease management, promote healthy sleep habits, and alleviate occupational stress through integrated community and primary healthcare programs.
- The findings highlight an urgent need for comprehensive public health policies that emphasize physical activity promotion, salt intake reduction, chronic disease management, sleep quality improvement, and occupational stress mitigation.
- Briefly, it is recommended that the government and policymakers adopt integrated, multi-sectoral prevention programs that combine health education, community involvement, primary care screening, and regulatory actions to effectively address the growing cardiovascular disease burden in Myanmar.

Suggestion for Further Studies

- It is necessary to clarify causal relationships, assess long-term outcomes, and evaluate the effectiveness of targeted interventions across diverse populations.

- Exploring the sociocultural and economic influences on these risk behaviors will be crucial for designing tailored and sustainable prevention strategies.

References

Ambrose, J. A., & Barua, R. S. (2004). The pathophysiology of cigarette smoking and cardiovascular disease: An update. *Journal of the American College of Cardiology, 43*(10), 1731–1737. https://doi.org/10.1016/j.jacc.2003.12.047

American Heart Association. (n.d.). *Coronary artery disease*. Retrieved Month Day, Year, from https://www.heart.org/en/health-topics/what-is-cardiovascular-disease/coronary-artery-disease

Andhuvan, G., & George, C. (2014). Knowledge of modifiable risk factors of heart disease among patients with cardiovascular risk. *Asian Journal of Pharmaceutical and Clinical Research, 7*(2), 23–25. https://journals.innovareacademics.in/index.php/ajpcr/article/view/14180

Baigent, C., Blackwell, L., Emberson, J., Holland, L. E., Reith, C., Bhala, N., Peto, R., Barnes, E. H., Keech, A., Simes, J., Collins, R., & the Cholesterol Treatment Trialists' (CTT) Collaboration. (2005). Efficacy and safety of cholesterol-lowering treatment: Prospective meta-analysis of data from 90 056 participants in 14 randomised trials of statins. *The Lancet*, *366*(9493), 1267–1278. https://doi.org/10.1016/S0140-6736(05)67394-1

Brien, S. E., Ronksley, P. E., Turner, B. J., Mukamal, K. J., & Ghali, W. A. (2011). Effect of alcohol consumption on biological markers associated with risk of coronary heart disease: Systematic review and meta-analysis of interventional studies. *BMJ, 342*, d636. https://doi.org/10.1136/bmj.d636

Cochran, W. G. (1977). *Sampling techniques* (3rd ed.). Wiley.

Després, J. P. (2012). Abdominal obesity and cardiovascular disease: Is inflammation the missing link? *Nutrition, Metabolism & Cardiovascular Diseases, 22*(3), 157–162. https://doi.org/10.1016/j.numecd.2011.09.004

References

Estruch, R., Ros, E., Salas-Salvadó, J., Covas, M.-I., Corella, D., Aros, F., Gómez-Gracia, E., Ruiz-Gutiérrez, V., Fiol, M., Lapetra, J., Lamuela-Raventós, R. M., Serra-Majem, L., Pintó, X., Basora, J., Muñoz, M. A., Sorlí, J. V., Martínez, J. A., & Martínez-González, M. A.; PREDIMED Study Investigators. (2013). Primary prevention of cardiovascular disease with a Mediterranean diet supplemented with extra-virgin olive oil or nuts. *The New England Journal of Medicine, 368*(14), 1279-1290. https://doi.org/10.1056/ NEJMoa1200303

Gordon, D. J., Probstfield, J., Garrison, R. J., Neaton, J. D., Castelli, W. P., Knoke, J. D., Jacobs, D. R., Bangdiwala, S., & Tyroler, H. A. (1989). High-density lipoprotein cholesterol and cardiovascular disease. The Framingham Heart Study. *Arteriosclerosis, Thrombosis, and Vascular Biology*, *9*(1), 1–8. https://doi.org/10.1161/01.ATV.9.1.1

Haffner, S. M., Lehto, S., Rönnemaa, T., Pyörälä, K., & Laakso, M. (1998). Mortality from coronary heart disease in subjects with type 2 diabetes and in non-diabetic subjects with and without prior myocardial infarction. *The New England Journal of Medicine, 339*(4), 229–234. https://doi.org/10.1056/NEJM199807233390404

Hall, J. E., & Hall, M. E. (2021). *Guyton and Hall textbook of medical physiology* (14th ed.). Elsevier.

Hosmer, D. W., Lemeshow, S., & Sturdivant, R. X. (2013). *Applied logistic regression* (3rd ed.). Wiley. https://doi.org/10.1002/9781118548387

Lawrence, C. W. (2015). *Modifiable risk factors for cardiovascular disease as perceived by women in Kenya* (Master's thesis). University of Vermont. https://scholarworks.uvm.edu/graddis/374

Li, J., & Siegrist, J. (2012). Physical activity and risk of cardiovascular disease — a meta-analysis of prospective cohort studies. *International Journal of Environmental Research and Public Health, 9*(2), 391-407. https://doi.org/10.3390/ijerph9020391

References

Libby, P., Buring, J., Badimon, L., Hansson, G. K., Deanfield, J., Bittencourt, M. S., … Lewis, E. F. (2019). *Atherosclerosis*. Nature Reviews Disease Primers, 5, 56. https://doi.org/10.1038/s41572-019-0106-z

Lloyd-Jones, D. M., Nam, B. H., D'Agostino, R. B., Levy, D., Murabito, J. M., Wang, T. J., Wilson, P. W. F., & O'Donnell, C. J. (2004). *Parental cardiovascular disease as a risk factor for cardiovascular disease in middle-aged adults: A prospective study of parents and offspring*. *JAMA, 291*(18), 2204–2211. https://doi.org/10.1001/jama.291.18.2204

Miller, M., Cannon, C. P., Murphy, S. A., Qin, J., Ray, K. K., Braunwald, E., & Cannon, C. P. (2011). Impact of HDL cholesterol on cardiovascular risk: Proportional or threshold effect? *Journal of the American College of Cardiology*, *58*(18), 1870–1880. https://doi.org/10.1016/j.jacc.2011.08.009

Mosca, L., Benjamin, E. J., Berra, K., Bezanson, J. L., Dolor, R. J., Lloyd-Jones, D. M., Newby, L. K., Piña, I. L., Roger, V. L., Shaw, L. J., Zhao, D., Beckie, T. M., Bushnell, C., D'Armiento, J., Kris-Etherton, P. M., Fang, J., Ganiats, T. G., Gomes, A. S., Gracia, C. R., … Wenger, N. K. (2011). *Effectiveness-based guidelines for the prevention of cardiovascular disease in women — 2011 update: A Guideline from the American Heart Association*. *Circulation, 123*(11), 1243–1262. https://doi.org/10.1161/CIR.0b013e31820faaf8Johns Hopkins University+2ResearchGate+2

Roth, G. A., Johnson, C., Abajobir, A. A. (2020). Global burden of cardiovascular diseases and risk factors, 1990 to 2019: A systematic analysis for the Global Burden of Disease Study 2019. *The Lancet, 396*(10258), 1223–1249. https://doi.org/10.1016/S0140-6736(20)30752

References

Roth, G. A., Mensah, G. A., Johnson, C. O., Addolorato, G., Ammirati, E., Baddour, L. M., ... & Murray, C. J. L. (2020). Global burden of cardiovascular diseases and risk factors, 1990–2019: update from the GBD 2019 Study. *Journal of the American College of Cardiology*, *76*(25), 2982-3021. https://doi.org/10.1016/j.jacc.2020.11.010

Rozanski, A., Blumenthal, J. A., & Kaplan, J. (1999). Impact of psychological factors on the pathogenesis of cardiovascular disease and implications for therapy. *Circulation, 99*(16), 2192-2217. https://doi.org/10.1161/01.CIR.99.16.2192

World Health Organization. (2014). *Hypertension fact sheet: Myanmar*. WHO.

World Health Organization. (2020). *WHO guidelines on physical activity and sedentary behaviour*. World Health Organization.

https://www.who.int/publications/i/item/ 9789240015128

World Health Organization. (2021). *Cardiovascular diseases (CVDs)*. https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds)

World Health Organization. (2021). *Cardiovascular diseases: Global factsheet*. WHO. https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds)

World Life Expectancy. (2022). *Myanmar: Coronary Heart Disease*. Retrieved Month Day, Year, from https://www.worldlifeexpectancy.com/myanmar-coronary-heart-disease

Zaw, K. K., Nwe, N., & Hlaing, S. S. (2017). Prevalence of cardiovascular morbidities in Myanmar. *BMC Research Notes, 10*(1), 99. https://doi.org/10.1186/s13104-017-2422-2

Thank You