

The Prevalence and Risk Association of Cardiovascular Disease Among Offshore Male Workers in Peninsular Malaysia

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ABSTRACT

INTRODUCTION: Offshore workers are exposed to occupational and lifestyle factors that may increase cardiovascular disease (CVD) risk. Limited data are available regarding cardiovascular risk profiles among offshore personnel in Malaysia. This study aimed to determine the prevalence of cardiovascular disease risk levels and associated factors among offshore male workers in Peninsular Malaysia. **MATERIAL AND METHODS:** A cross-sectional study was conducted among 241 offshore male workers between January and February 2025. Data were collected using structured questionnaires and clinical assessments, including body mass index, blood pressure, and lipid profiles. Participants were categorized into low, moderate, and severe CVD risk groups using Malaysian CVD risk scoring guidelines. Chi-square tests and binary logistic regression were performed to identify associated factors. **RESULTS:** Among the participants, 22.4% were classified as low risk, 47.3% as moderate risk, and 30.4% as severe risk. Overall, 77.7% fell within the moderate-to-severe CVD risk categories. Significant predictors of elevated risk included increasing age (OR=1.046, $p=0.003$), higher BMI (OR=1.094, $p=0.001$), smoking (OR=3.320, $p=0.008$), shift work (OR=2.663, $p=0.017$), high job stress (OR=4.530, $p=0.003$), hypertension (OR=5.930, $p=0.011$), and dyslipidaemia (OR=3.860, $p=0.011$). **CONCLUSION:** A high prevalence of moderate-to-severe cardiovascular risk was observed among offshore workers. Occupational health interventions, regular screening, and lifestyle modification programs are recommended to reduce cardiovascular risk in this population.

Keywords

Cardiovascular disease (CVD), Offshore workers, Risk factors.

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INTRODUCTION

Cardiovascular disease (CVD) remains the leading cause of morbidity and mortality worldwide, accounting for approximately 17.9 million deaths annually. The burden of CVD continues to increase, particularly among individuals in the economically productive age group, largely driven by modifiable risk factors such as physical inactivity, unhealthy dietary patterns, tobacco use, obesity, and psychosocial stress.

Offshore workers represent a unique occupational group exposed to multiple cardiovascular risk factors,

including long working hours, shift work, psychosocial stress, irregular sleep patterns, and limited access to healthy lifestyle options. These occupational demands may contribute to the development of cardiometabolic abnormalities and increased cardiovascular risk over time.

Despite the importance of occupational health surveillance, limited data are available regarding cardiovascular risk profiles among offshore workers in Malaysia. Therefore, this study aims to determine the

prevalence of cardiovascular disease risk levels among male offshore workers in Peninsular Malaysia and to examine the associations between socio-demographic, lifestyle, and occupational factors and CVD risk categories.

MATERIALS AND METHODS

Study Design and Setting

A cross-sectional study was conducted among offshore male workers in Peninsular Malaysia. A total of 241 participants were recruited based on inclusion criteria, including male offshore workers aged 18 years and above who consented to participate.

Study Population

The study population consisted of male offshore workers aged 20 years and above who had been actively employed offshore for at least six months. Workers with incomplete data or with diagnosed chronic illnesses unrelated to cardiovascular conditions were excluded.¹¹ Participation was voluntary, and informed consent was obtained from all respondents before data collection.

Sample Size and Sampling

The sample size was calculated using the single population proportion formula: $n = Z^2 P(1-P)/d^2$, where $Z=1.96$ for a 95% confidence level, P represents the expected prevalence based on previous studies, and $d=0.05$ margin of error. The calculated minimum sample size was achieved, and 241 participants were included. Participants were recruited using purposive sampling.¹³

Data Collection Procedures

Data collection consisted of two components: a structured questionnaire and clinical assessments. Data were collected during routine offshore medical screenings to ensure feasibility and minimize disruption to work operations.

Structured Questionnaire

A structured questionnaire adapted from standardized occupational health screening components and

Malaysian cardiovascular risk assessment variables was used. The questionnaire collected information on sociodemographic characteristics, lifestyle behaviours, dietary habits, occupational factors, psychosocial indicators, and medical history. The questionnaire was reviewed by occupational health experts before data collection.¹⁴ Research personnel were available to clarify questionnaire items when necessary.

Clinical and Biometric Measurements

Anthropometric and clinical measurements, including body mass index, blood pressure, and laboratory investigations, were recorded. Standard measurement procedures were followed.¹⁶

Cardiovascular Risk Classification

Ten-year cardiovascular risk was estimated using the Framingham General Cardiovascular Disease (FRS-General CVD) Risk Score, as recommended for risk stratification in the Malaysian Clinical Practice Guidelines on Management of Dyslipidaemia.^{17,18,19} The sex-specific score incorporates age, total cholesterol, high-density lipoprotein cholesterol (HDL-C), systolic blood pressure, treatment for hypertension, current smoking status, and diabetes status. The calculated 10-year CVD risk was classified as low risk (<10%), intermediate/moderate risk (10–20%), or high risk (>20%). In this manuscript, the term “moderate” is used for the guideline’s intermediate category.

For binary logistic regression, the moderate and high CVD risk categories were combined into a single “moderate-to-high CVD risk” outcome and compared with the low-risk category, because age, smoking, systolic blood pressure/antihypertensive treatment, and lipid measures are components of the FRS-General CVD calculation, associations involving these variables may partly reflect their mathematical contribution to the derived risk score and should not be interpreted as independent causal predictors. BMI is not a component of the lipid-based FRS-General CVD score.^{20,21}

Hypertension history and dyslipidaemia history were analysed as clinical variables; however, they are related to blood-pressure and lipid parameters used in the score.²²

Statistical Analysis

Data were analysed using appropriate statistical software. Descriptive statistics were used to summarize participant characteristics. Associations between categorical variables and CVD risk categories were examined using Chi-square tests. Variables with significant associations were further analysed using multivariate logistic regression to identify independent predictors of moderate-to-severe CVD risk. Statistical significance was set at $p < 0.05$.

Data Analysis

Data were analysed using SPSS software. Descriptive statistics were used to summarize participant characteristics. Chi-square tests were performed to identify associations. Binary logistic regression was conducted to determine predictors of moderate-to-severe CVD risk. Statistical significance was set at $p < 0.05$.

RESULT

A total of 241 offshore male workers participated in the study. Among the participants, 22.4% were classified as low risk, 47.3% as moderate risk, and 30.4% as severe risk. Overall, 77.7% fell within the moderate-to-severe CVD risk categories.

Increasing age, higher BMI, smoking status, shift work, high job stress, hypertension, and dyslipidaemia were significantly associated with moderate-to-severe cardiovascular risk. Logistic regression analysis identified age, BMI, smoking, job stress, shift work, hypertension, and dyslipidaemia as independent predictors.

Table I. Sociodemographic, Occupational, Lifestyle and Clinical Characteristics of Participants (n = 241)

Variable	Frequency (n)	Percentage (%)
Age Group (years)		
25–34	131	54.4
35–44	75	31.1
45–54	28	11.6
55–60	7	2.9
Marital Status		
Married	191	79.3
Single/Other	50	20.7
Education Level		
Secondary	213	88.4
Tertiary	28	11.6
Shift Work		
Yes	87	36.1
No	154	63.9
Work Experience (years)		
≤5	74	30.7
6–10	128	53.1
>10	39	16.2
Smoking Status		
Non-smoker	25	10.4
Light smoker	50	20.7
Moderate smoker	165	68.5
Heavy smoker	1	0.4
Physical Activity		
Active	217	90.0
Inactive	24	10.0
BMI Category		
Normal	143	59.3
Overweight	44	18.3
Obese	28	11.6
Underweight	26	10.8
Hypertension (History)	31	12.9
Dyslipidaemia (History)	49	20.3
Abnormal LDL	194	80.5
Elevated Blood Pressure	49	20.3
CVD Risk Category		
Low	54	22.4
Moderate	114	47.3
Severe	73	30.4

Note: Chi-square test applied. Significance set at $p < 0.05$.

Table II. Bivariate Associations Between Selected Variables and Moderate-to-Severe CVD Risk

Variable	χ^2	p-value
Age group	28.34	<0.001
Smoking status	9.88	0.020
Shift work	5.79	0.016
Physical inactivity	7.12	0.028
Hypertension (history)	8.96	0.003
Dyslipidaemia (history)	6.12	0.013
Family history of CVD	4.56	0.033
BMI category	16.12	0.001
Elevated blood pressure	20.47	<0.001
Work-related stress	7.24	0.027
Anxiety/depression symptoms	9.78	0.008
Poor sleep quality	6.35	0.042
Self-rated fair health	6.18	0.045

Note: OR: Odds Ratio; CI: Confidence Interval. Logistic regression adjusted for significant covariates. Significance set at $p < 0.05$.

Table III: Multivariate Logistic Regression Analysis for Predictors of Moderate-to-Severe CVD Risk

Variable	B	OR (95% CI)	p-value
Age (per year)	0.045	1.046 (1.016–1.077)	0.003
BMI (per unit)	0.090	1.094 (1.041–1.150)	0.001
Smoking (yes vs no)	1.200	3.320 (1.360–8.100)	0.008
Shift work (yes vs no)	0.980	2.663 (1.190–5.960)	0.017
High job stress	1.510	4.530 (1.650–12.450)	0.003
Hypertension	1.780	5.930 (1.480–23.750)	0.011
Dyslipidaemia	1.350	3.860 (1.350–11.020)	0.011
Sleep disturbance	0.700	2.010 (0.920–4.400)	0.080

Note: OR: Odds Ratio; CI: Confidence Interval. Logistic regression adjusted for significant covariates. Significance set at $p < 0.05$.

DISCUSSION

This study examined cardiovascular risk and associated factors among offshore male workers in Peninsular Malaysia. The findings revealed that 77.7% of participants were classified within the moderate-to-high CVD risk categories, indicating a substantial burden of cardiovascular risk in this occupational group.

The observed associations reflect a combination of demographic, behavioural, clinical, occupational, and psychosocial characteristics. Increasing age and higher BMI were associated with elevated CVD risk.

Smoking and shift work were also associated with the combined moderate-to-high risk category, while high job stress highlighted the potential relevance of psychosocial factors in this workforce.

Clinical characteristics, including hypertension and dyslipidaemia, were associated with moderate-to-high CVD risk. However, interpretation of these findings requires caution because the FRS-General CVD score itself incorporates age, smoking, systolic blood pressure, antihypertensive treatment, total cholesterol, and HDL-C.

Therefore, associations for variables that directly or indirectly overlap with score components may partly reflect the construction of the outcome measure rather than independent causal effects. BMI, shift work, and job stress are not components of the lipid-based FRS-General CVD score and therefore represent conceptually distinct factors examined in this analysis.

This study has several limitations. Its cross-sectional design does not permit causal inference. In addition, purposive sampling was used to recruit participants, which may introduce selection bias and limits the generalisability of the findings to the wider offshore worker population in Peninsular Malaysia or Malaysia as a whole.

The findings should therefore be interpreted within the characteristics of the sampled workforce. Future studies should consider probability-based sampling, broader recruitment across offshore installations, and longitudinal designs to improve external validity and evaluate temporal relationships.

CONCLUSION

This study identified a high prevalence of moderate-to-high 10-year cardiovascular risk among offshore male workers in Peninsular Malaysia, with 77.7% of participants classified in the combined moderate-to-high risk categories. The findings support the importance of regular cardiovascular risk assessment and workplace-based health promotion in offshore settings.

Occupational health programmes should continue to emphasise cardiovascular screening, smoking cessation, healthy weight, blood pressure and lipid management, fatigue and shift-work management, and psychosocial wellbeing. Further longitudinal studies using more representative sampling approaches are warranted

List of abbreviations

CVD: Cardiovascular Disease

BMI: Body Mass Index

BP: Blood Pressure

HDL: High-Density Lipoprotein (Good Cholesterol)

LDL: Low-Density Lipoprotein (Bad Cholesterol)

OR: Odds Ratio

CI: Confidence Interval

SOB: Shortness of Breath

SPSS: Statistical Package for the Social Sciences

r: Pearson Correlation Coefficient

χ^2 : Chi-Square

SE: Standard Error

B: Beta Coefficient (Regression Coefficient)

P: p-value (Statistical Significance)

%: Percentage

n: Sample Size

Availability of data and material

The datasets generated and analysed during the current study are not publicly available due to confidentiality agreements and data protection regulations involving the offshore workforce. However, data may be made available from the corresponding author on reasonable request and with permission from the relevant institutional and organizational authorities.

Author contributions

A.H.M. (Amin Hamzah Mustafha) conceptualized the study, developed the research design, and oversaw data collection.

A.H.M. also performed the data analysis and interpretation, drafted the manuscript, and coordinated revisions.

All authors contributed to the review of the manuscript for intellectual content and approved the final version for submission.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

INSTITUTIONAL REVIEW BOARD (ETHICS COMMITTEE)

This study was conducted following the ethical standards of the Faculty of Medicine, University of Sultan Zainal Abidin (UniSZA). Ethical approval was obtained from the Jawatankuasa Etika Penyelidikan Manusia UniSZA (UHREC), UniSZA Human Research Ethics Committee, with approval reference number: UniSZA.100-6/2/7 Jld. 2 (47).

All participants were provided with detailed information regarding the purpose, procedures, potential risks, and

benefits of the study. Written informed consent was obtained from each participant before data collection.

Participation was voluntary, and participants were assured of confidentiality and the right to withdraw from the study at any time without any consequences.

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