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Women cardiovascular awareness and health literacy among university workers: A cross-sectional study

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ABSTRACT

Introduction: Cardiovascular disease (CVD) is a major cause of female mortality worldwide. However, there is a paucity of research on women's cardiovascular awareness, with a potential lack of health literacy being a contributing factor. This study aimed to analyze the association between health literacy and cardiovascular awareness among university workers.

Methods: This cross-sectional, quantitative study recruited 288 female university employees using quota sampling method. Cardiovascular awareness was the dependent variable and was obtained using The Attitudes and Beliefs about Cardiovascular Disease (ABCD) Risk Questionnaire. Health literacy was the independent variable and was assessed using the European Health Literacy Study Questionnaire (HLS-EU-Q16). Pearson's correlation test, independent t-test, analysis of variance, and multivariate linear regression test were used for data analysis (significance level at $p < 0.05$).

Results: The mean cardiovascular awareness score was 52.74 (SD = 5.556), and the mean health literacy score was 14.32 (SD = 2.593). After controlling for potential confounding factors, health literacy remained significantly associated with women's cardiovascular awareness (B = 0.578, SE = 0.125, $\beta = 0.270$, $p < 0.001$), indicating a modest effect size. Higher health literacy was associated with greater cardiovascular awareness among female university employees.

Conclusions: Health literacy was significantly associated with awareness of CVD risk among women. Interventions that focus on improving health literacy have the potential to elevate awareness of CVD risk in this demographic.

Keywords: cardiovascular, gender equality, good health and well-being, health literacy.

Introduction

Cardiovascular disease (CVD) among women has been rising steadily and now ranks as one of the primary drivers of mortality worldwide (World Health Organization, 2025). Data spanning from 1990 to 2023 reveal that the CVD incidence in the global female population grew by roughly 28.6% over this period (Global Burden of Cardiovascular Diseases and Risks 2023 Collaborators, 2025). In Indonesia, ischemic heart disease contributes substantially to the national disease burden, with women experiencing a slightly higher prevalence of CVD than men (0.91 vs. 0.80) (Ministry of Health Republic of Indonesia, 2024). The Sustainable Development Goals broadly aim to reduce deaths attributable to non-communicable diseases, among which cardiovascular disease is a significant component (Sustainable Development Goals). This global target aligns closely with Indonesia's national health agenda, which focuses on strengthening the healthcare system and primary care services and reducing the overall impact of non-communicable diseases (NCDs) on the population (Law No.17, 2023).

CVD continues to pose a significant global health challenge; however, women's awareness of CVD risk

remains inadequate in many countries. Previous studies have demonstrated that women often underestimate their susceptibility to CVD, particularly younger women, who tend to perceive heart disease as a condition affecting only older adults (Gooding *et al.*, 2019, 2020). A study by Cushman et al. (2021) revealed a decline in cardiovascular awareness among American women from 65% in 2009 to 44% in 2019. Similarly, (Qasem Surrati, Mohammedsaeed and Shikieri, 2021) found inadequate cardiovascular awareness among female university employees. Low awareness may delay preventive actions, reduce healthcare-seeking behaviors, and contribute to poor disease outcomes (Kim *et al.*, 2022)(Wenger *et al.*, 2022).

Health literacy is a critical determinant of an individual's capacity to access, comprehend, assess, and utilize health-related information in decision-making (Brørs *et al.*, 2022). The American Heart Association has identified health literacy as an essential component for enhancing cardiovascular outcomes and supporting both primary and secondary prevention efforts (Magnani *et al.*, 2018). Sufficient health literacy levels have been linked to healthier behaviors, more effective management of chronic conditions, and better overall health outcomes (Taylor *et al.*, 2024). Conversely, limited health literacy tends to correlate with poor disease knowledge, lower preventive behaviors, and adverse cardiovascular outcomes (Liu *et al.*, 2020). Prior research has established a relationship between health literacy and awareness among patients with cardiovascular conditions (Farghadani *et al.*, 2018) (Reading *et al.*, 2017).

Although previous studies have investigated the factors associated with cardiovascular awareness, evidence regarding the relationship between health literacy and women's cardiovascular awareness in Indonesia remains limited. In particular, female university employees represent an understudied population despite their potential exposure to occupational stress, sedentary lifestyles, and cardiovascular risk factors. Understanding cardiovascular awareness and health literacy in this population may support the development of workplace-based health-promoting strategies. Therefore, this study aimed to examine the association between health literacy and cardiovascular awareness among female university employees in Indonesia.

Materials and Methods

Study design and setting

A cross-sectional investigation was conducted at a Public University in Padang, West Sumatra, Indonesia, from February to June 2024. This study was structured to examine the relationship between health literacy, treated as the independent variable, and cardiovascular awareness, treated as the dependent variable, among female university employees.

Participants

The study population comprised 1,031 female employees, including academic and administrative personnel from multiple faculties and organizational units across the university. These included staff from the Rectorate and a wide range of faculties, namely Agriculture, Law, Mathematics and Natural Sciences, Economics, Animal Husbandry, Cultural Sciences, Social and Political Sciences, Engineering, Agricultural Technology, Information Technology, Pharmacy, Medicine, Dentistry, Nursing, and Public Health. The sample was derived from this population, and 288 respondents were ultimately included in the analysis. Participants qualified for enrollment by meeting the following requirements: current female university employees, age range of 19-59 years, and voluntary consent to participate in the study. Respondents with incomplete responses were excluded from this study. This study adopted a non-probability sampling approach, specifically through the application of quota sampling as the primary technique, consistent with the framework described by (Notoatmodjo, 2012). [insert reference] Sample size determination was carried out using the Slovin formula, applying a 5% margin of error (e=0.05) against a total female employee population of N=1,031, which yielded a minimum required sample size of approximately 288 participants. The sampling approach involved allocating proportional quotas to each organizational unit, followed by the random selection of respondents from each unit in equal proportions using the same computational method. To further validate the adequacy of the sample size, a power analysis was performed with a target statistical power of 0.80, ensuring the study's capacity to detect meaningful effects. Together, these statistical approaches were applied to secure a sufficient number of participants, thereby enhancing the reliability of the findings and their applicability to a wider population of female employees.

Data Collection

The research personnel were responsible for data-gathering activities. The study objectives, questionnaire completion procedures, and privacy protocols were explained to the participants. Survey instruments were provided in person following the participants' informed agreement and consent documentation. Participants completed the questionnaires within 10-15 minutes, with researchers available for assistance when needed.

Variables and measurement

In this study, we collected demographic data from the respondents, including age, job, education, family disease history, medical history, age at menarche, contraceptive use, maternity history, and menopause history. The dependent variable was awareness of heart disease risk, and health literacy was the independent variable. The

Respondent Characteristic Sheet was applied to collate the respondents' demographic data, comprising age, job (lecturer/ administrative staff), education (high school/ diploma/ undergraduate/ master/ doctor), family disease history (diabetes mellitus/ hypertension/ heart disease/ stroke/ none), medical history (diabetes mellitus/ hypertension/ none), menarche age, contraceptive use (yes/ no), maternity history (never/ ever), and menopause history (never/ already).

The Attitudes and Beliefs about Cardiovascular Disease (ABCD) Risk Questionnaire was used to measure cardiovascular disease risk awareness (Woringer *et al.*, 2017a). The Indonesian version maintained the original 26-question format organized into four subscales: knowledge of cardiovascular disease risk and prevention (questions 1, 2, 3, 4, 5, 6, 7, and 8), risk perception of heart attack/stroke (questions 9, 10, 11, 12, 13, 14, 15, and 16), perceived benefits and intention to change behavior (questions 17, 18, 19, 20, 21, 22, and 23), and healthy eating intention (questions 24, 25, and 26). The adapted questionnaire has proven both valid and reliable for the Indonesian population, with a Cronbach's α of 0.737. Scoring employed the Likert scale, ranging 1-4 (from strongly disagree to strongly agree), with overall scores spanning 0-80. Higher scores indicate greater awareness of cardiovascular disease (Lumbantoruan, Uligraf and Tallutondok, 2024).

Health literacy was measured using the HLS-EU-Q16 from the European Health Literacy Study Project (Sørensen *et al.*, 2012). The instrument contained 16 questions across three domains (health care, disease prevention, and health promotion). This tool employs a single-parameter, dichotomous Rasch model, in which items are divided into dual classifications: "easy" (equivalent to "fairly easy" or "very easy," scored as "1") and "difficult" (equivalent to "fairly difficult" or "very difficult," scored as "0"). The score was 0 to 16. Higher scores reflect increased health literacy (Jorm, 2019). Cronbach's α = 0.849, indicating that this instrument was valid and reliable (Nasriyanto, 2018).

Data analysis

The data of the respondents' characteristics were presented in the form of central tendency for numerical data and categorical data in the form of frequency distribution. The data distribution was normal using the Kolmogorov-Smirnov normality test (p-value >0.05). Several statistical tests were employed to assess the associations between respondents' characteristics, cardiovascular awareness, and health literacy. Pearson's correlation test was applied to explore relationships involving continuous variables, such as age and age at menarche, with both awareness and health literacy scores. Independent t-tests were used to examine differences in awareness and health literacy across categorical variables, including occupation, contraceptive use, pregnancy history, and menopausal status. One-way analysis of variance (ANOVA) was applied to assess the association of education level, family medical history, and personal medical history with both outcome measures. Pearson's correlation analysis was used to evaluate the associations between outcome variables and their respective predictors, with statistical significance set at alpha <0.05. Subsequently, multivariate linear regression analysis was conducted to provide a more comprehensive examination of these relationships.

Ethical consideration

Ethical approval was obtained from the ethics review board at the Faculty of Nursing, Universitas Andalas (No.244. layaketik/KEPKFKEPUNAND). The participants provided written informed consent prior to participation. Confidentiality and anonymity were maintained throughout the study, and participants were informed of their right to withdraw from the study at any time, without consequences.

Results

Participant characteristics

The mean age of the participants was 41.98 years (SD=10.171), while the mean age at menarche was 13.33 years (SD=1.141). Most participants were administrative staff (70.5%) and held an undergraduate degree (38.3%). The majority of patients reported no family (75.7%) or personal (90.6%) medical history. Most participants did not use contraceptives (72.9), had experienced childbirth (79.5%), and had not experienced menopause (78.1%). Occupation was significantly associated with cardiovascular awareness (t=2.679, p=0.008) and health literacy (t=2.716, p=0.007). Educational level was significantly associated with health literacy (F=2.892, p=0.023) (Table 1).

Awareness and health literacy

Table 2 shows that the mean cardiovascular awareness score was 52.74 (SD = 5.556). Further analysis of the dimensions of The ABCD Risk reveals that the mean score for the knowledge about the risks and prevention of cardiovascular disease is 6.52 (SD = 1.312). The mean score for the risk perception of heart attack/stroke dimension was 16.28 (SD = 4.305), while the perceived benefits and intention to change behavior dimension had a mean score of 21.43 (SD = 2.686). The healthy eating intention dimension had a mean score of 8.50 (SD = 1.301). The average score among participants' health literacy was found to be 14.32 (SD = 2.593) and the mean score for each domain was health care 6.47 (SD = 0.998), the disease prevention 4.15 (SD = 1.291), and health promotion 3.71 (SD=0.745) respectively.

Correlation of health literacy and awareness

Table 1. Respondent characteristics and their association with cardiovascular awareness and health literacy (n=288)

Respondent characteristics	Mean±SD	Min	Max	n	%	Awareness			HL		
						Mean±SD	r/t/F	p-value	Mean±SD	r/t/F	p-value
Age	41.98±10.171	23	59			52.74±5.556	0.003	0.955[a]	14.32 ±2.593	-0.079	0.182[a]
Age of menarche	13.33±1.141	10	17			52.74±5.556	0.050	0.399[a]	14.32 ±2.593	0.051	0.392 [a]
Job							2.679	0.008[b, *]		2.716	0.007[b, *]
Lecturer				85	29.5	54.16±6.108			14.89±2.047		
Administrative staff				203	70.5	52.14±5.209			14.09±2.760		
Education							1.956	0.101[c]		2.892	0.023[c, *]
High school				36	12.5	51.64±6.298			13.39±3.315		
Diploma				35	12.2	52.14±4.486			14.17±2.443		
Undergraduate				110	38.2	52.17±5.070			14.12±2.798		
Master				88	30.6	53.75±5.847			14.86±2.063		
Doctor				19	6.6	54.47±6.552			15.16±1.537		
Family medical history							0.871	0.482[c]		0.404	0.806[c]
None				218	75.7	52.55±5.444			14.35±2.609		
Diabetes meilitus				23	8.0	51.87±7.319			14.30±2.566		
Hypertension				38	13.2	54.11±5.270			14.03±2.765		
Heart disease				7	2.4	54.00±4.000			15.14±1.464		
Stroke				2	0.7	53.00±4.243			15.50±0.707		
Medical history							0.768	0.465[c]			
None				261	90.6	52.72±5.507				0.842	0.432[c]
Diabetes meilitus				7	2.4	55.14±5.669			14.33±2.562		
Hypertension				20	6.9	52.15±6.218			15.43±0.976		
Contraceptive use							-0.825	0.410[b]	13.95±2.856	0.241	0.809[b]
No				210	72.9	52.57±5.558			14.35±2.562		
Yes				78	27.1	53.18±5.561			14.27±2.690		
Maternity history							0.076	0.940[b]		0.424	0.672[b]
Never				59	20.5	52.79±4.694			14.46±2.445		
Ever				229	79.5	52.72±5.767			14.30±2.634		
Menopause history							0.138	0.891[b]		1.816	0.073[b]
Never				225	78.1	52.76±5.405			14.51±2.332		
Already				63	21.9	52.65±6.110			13.70±3.310		

Table 3 shows a significant positive correlation between health literacy and cardiovascular awareness (r = 0.288, p < 0.001). Significant positive correlations were also observed across all health literacy domains, including healthcare (r=0.192, p=0.001), disease prevention (r=0.296, p<0.001), and health promotion (r =0.231, p<0.001).

Associated factors related to women cardiovascular awareness

Multivariate linear regression analysis demonstrated that health literacy was significantly associated with cardiovascular awareness after controlling for potential confounding variables (B=0.578, SE=0.125, β=0.270, p<0.001). The 95% confidence interval ranged from 0.333 to 0.823, indicating that higher health literacy was associated with higher cardiovascular awareness among female university employees (Table 4).

Discussions

This study examined the association between health literacy and cardiovascular disease awareness among female university employees. The findings demonstrated that health literacy was significantly associated with cardiovascular awareness, indicating that women with higher health literacy levels tended to have better cardiovascular awareness. These findings are consistent with those of previous studies that reported significant relationships between health literacy and awareness

Table 2. Cardiovascular awareness and health literacy among respondents (n=288)

Variables	Mean ± SD	Range
Total awareness	52.74 ± 5.556	0-80
Knowledge of cardiovascular disease risk and prevention	6.52 ± 1.312	0-8
Risk perception of heart attack/stroke	16.28 ± 4.305	0-32
Perceived benefits and intention to change behavior	21.43 ± 2.305	0-28
Healthy eating intention	8.50 ± 1.301	0-12
Total health literacy	14.32 ± 2.593	0-16
Healthcare domain	6.74 ± 0.998	0-7
Disease prevention domain	4.15 ± 1.29	0-5
Health promotion domain	3.71 ± 0.745	0-4

Table 3. The correlation of health literacy and cardiovascular awareness among respondents (n=288)

Variables	Awareness		
	Mean ± SD	r	p-value
Total health literacy	14,32 ± 2,593	0.288	<0.001 *
Healthcare domain	6.47 ± 0.998	0.192	0.001 *
Disease prevention domain	4.115 ± 1.291	0.296	<0.001 *
Health promotion domain	3.71 ± 0.745	0.231	<0.001 *

*Statistically significant at p<0.05. The Pearson Correlation test.

Table 4. Associated factors related to women cardiovascular awareness (n=288)

Factors	Cardiovascular awareness					
	B	SE	Beta	T	p-value	95% CI
Age	-0.014	0.052	-0.025	-0.267	0.790	-0.116 to 0.088
Job	-1.316	1.006	-0.108	-1.308	0.192	-3.288 to 0.656
Education	0.119	0.410	0.023	0.291	0.771	-0.685 to 0.923
Family medical history	0.480	0.393	0.074	1.220	0.224	-0.290 to 1.250
Medical history	-0.293	0.684	-0.028	-0.429	0.668	-1.634 to 1.048
Contraceptive use	0.689	0.797	0.055	0.865	0.388	-0.873 to 2.251
Maternity history	-0.745	0.969	-0.054	-0.768	0.443	-2.644 to 1.154
Menopause history	0.787	1.128	0.059	0.697	0.486	-1.424 to 2.998
Age of Menarche	0.226	0.279	0.046	0.812	0.417	-0.321 to 0.773
Health literacy	0.578	0.125	0.270	4.626	<0.001*	0.333 to 0.823

*Statistically significant at p<0.05. The Pearson Correlation test.

among individuals with cardiovascular conditions (Reading *et al.*, 2017) (Örsal *et al.*, 2019). Health literacy is an important determinant of an individual's ability to access, understand, and apply health information in preventive decision-making processes (Taylor *et al.*, 2024). Women with adequate health literacy may be better able to recognize cardiovascular risk factors, interpret health information, and adopt preventive behavior.

Although the participants demonstrated relatively adequate health literacy, their cardiovascular awareness scores remained moderate. This finding suggests that adequate general health literacy does not necessarily translate to optimal cardiovascular awareness. Previous studies have similarly reported low cardiovascular awareness among women, despite increasing public health campaigns (Bairey Merz *et al.*, 2017). Furthermore, research among younger Hispanic and non-Hispanic Black women also showed that the majority were unaware of cardiovascular risk factors (Cushman *et al.*, 2021). Many women continue to underestimate cardiovascular risk and may perceive CVD as a male health issue. Cardiovascular awareness significantly influences lifestyle modifications, prevention strategies, adherence to health guidance, and clinical treatment protocols (Daponte-Codina *et al.*, 2022). Awareness of CVD risk can be defined as the perceived accuracy of predictions regarding the likelihood of cardiac disease development, as well as the individual's general knowledge of heart disease and the potential measures that can be taken to reduce the likelihood of developing the illness (Woringer *et al.*, 2017b).

This study also found significant associations between occupation, health literacy, and cardiovascular awareness. Academic staff demonstrated higher awareness and health literacy scores than administrative staff, possibly due to differences in educational exposure, access to information, and health-related knowledge. Educational level was also associated with health literacy, supporting previous evidence that higher educational attainment contributes to better health literacy skills (Ayaz-Alkaya and Ozturk, 2021). Education can influence individual preferences and lifestyles by increasing the ability to collect and interpret health-related information, which consequently impacts quality of life (Sahroni, Anshari and Krianto, 2019) (Mailani *et al.*, 2024). Knowledge and education are crucial for enhancing disease awareness (Campos and Fernandes, 2020). Adequate knowledge of CVD facilitates enhanced comprehension and adherence to a healthy lifestyle. The present findings also revealed a correlation between the level of education and the extent of cardiovascular awareness among women. Therefore, it is important to increase individual knowledge of CVD, including its implications, risk factors, and symptoms, to reduce the risk of illness (Suarningsih and Suindrayasa, 2020). Among patients with cardiac disease, the ability to understand medical information and actively participate with healthcare professionals correlates with essential health behaviors and general health results. Consequently, health literacy has emerged as a key factor in effective CVD prevention, making it a critical focus for future interventions aimed at enhancing skills, improving patient-provider interactions, and optimizing healthcare services (Aaby *et al.*, 2017).

This study contributes to the limited evidence regarding women's cardiovascular awareness and health literacy in Indonesia's occupational settings. Female university employees represent an important population for workplace-based cardiovascular prevention programs because occupational stress, sedentary behavior, and unhealthy lifestyle may increase cardiovascular risk over time. This study has several limitations. The cross-sectional design limits causal interpretation, whereas quota sampling may reduce generalizability. Second, self-reported measures may introduce response bias. Future studies should consider longitudinal or intervention-based designs and include broader populations and objective clinical indicators.

Conclusion

This study found that health literacy was significantly associated with cardiovascular awareness among female university employees. Higher health literacy was associated with greater awareness of CVD risks. These findings highlight the importance of workplace-based health promotion programs focusing on improving health literacy to enhance women's awareness of cardiovascular health and support CVD prevention strategies.

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Declaration Of Generative Artificial Intelligence (AI) Use

The author(s) declare that artificial intelligen (AI) tools were used in the preparation of this manuscript. AI tools were used solely to assist translating the manuscript content between languages (e.g., from Bahasa Indonesia to English), to ensure accuracy and consistency in meaning across different language version. AI tools were used to improved the clarity, readability, and academic tone of the writing, including grammar correction, sentence restructuring, and vocabulary enhancement, without altering the substantive scientific content.

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Availability of data and materials

The data used to support the findings of this study are available from the corresponding author upon reasonable request.

Authors' contributions

MRM: Study conception and design, material preparation and data collection and final draft of the manuscript.; QA: Study conception and design, data collection and analysis.; EAM: Study conception and design and data collection.; FM: Data analysis and final draft of the manuscript.; YA: Data collection and final draft of the manuscript.; CYL: Data interpretation and critically reviewed/edited the draft of the manuscript.

Declaration of Interest

No competing interests exist.

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