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Gender Differences in the Prevalence of Cardiovascular Disease (CVD) Risks Among Working-age Population in Malaysia

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This article aims to determine the gender differences in the common CVD risk prevalence among the working-age population in Malaysia. A national survey was conducted in 2019 using a validated questionnaire and several clinical measurements. The prevalence of eight CVD risks and the prevalence of more than three CVD risks by gender were calculated via a complex sample design using IBM SPSS version 25. Females were noted to have a significantly higher prevalence of hypercholesterolemia (40.3% versus 29.0%; p<0.001), abdominal obesity (62.5% versus 39.8%; p<0.001), BMI of 25 kg/m2 and above (55.1% versus 45.9%; p<0.001) and physically inactivity (25.4% versus 18.6%; p<0.001) compared to males. In contrast, males significantly showed a higher prevalence of current smokers (45.3% versus 1.3%; p<0.001) and current drinkers (18.2 versus 7.1%; p<0.001) compared to females. For diabetes mellitus and hypertension, males and females had nearly similar prevalences and were statistically insignificant (14.4% versus 14.9%; p=0.579 and 24.2% versus 22.1%; p=0.112, respectively). The prevalence of those with more than three CVD risks was significantly higher among males compared to females (7.4% versus 4.7%; p<0.001). Gender differences were observed in the prevalence of hypercholesterolemia, abdominal obesity, BMI of 25 kg/m2 and above, physical inactivity, current tobacco smoker and current drinker among working-age population in Malaysia.

Keywords: cardiovascular diseases; working age; gender; National Health and Morbidity Survey

I. INTRODUCTION

Traditionally, males have a higher burden of cardiovascular diseases (CVD), with disability-adjusted life years (DALYs) being the highest at ages 30 to 60 years compared to women (Mensah & Fuster, 2022; O'Neil *et al.*, 2018; Roth *et al.*, 2020). Gender-specific differences in CVD incidence were first reported over 80 years ago, with a ratio of 24:1 for new cardiovascular events between males and females (Glendy *et al.*, 1937). For ischaemic heart disease (IHD), obviously, males had higher DALYs at the age of 30 years and above than females, but females aged 65 to 69 years had a nearly similar total DALYs with males aged 45 to 49 years, which shows that females also had the burden of CVD at a later age (Roth *et al.*, 2020). During the economically active years, males are prone to be affected by IHD, while females are prone to be affected by obesity and physical inactivity (Institute for Public Health, 2020; W.A Wan Ahmad (Ed), 2021). Both males and females in the economically active years, also known as the working-age population, are considered to have the best health status. However, previous studies found that the Malaysian working-age population encounters challenges with CVD risks and

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metabolic syndrome (Manaf *et al.*, 2021), with the youngest age of myocardial infarction recorded among those aged less than 30 years (W.A Wan Ahmad (Ed), 2021).

CVD is preventable because this disease is largely contributed by sedentary lifestyles and unhealthy behaviours such as smoking (O'Neil *et al.*, 2018). A previous study in Japan showed an association between heavy drinking among males and lack of regular exercise among females contributed to metabolic syndrome (Hattori *et al.*, 2017). Metabolic risk factors such as raised blood pressure, BMI of 25 kg/m2 and above, hyperglycaemia and hyperlipidaemia increase the risk of CVDs and are also associated with premature mortality (World Health Organization, 2021). Even though the prevalence of CVDs and risk factors are lower in younger people than in older people, early prevention can reduce the burden of chronic disease at older age among both genders (Lodi *et al.*, 2020). One of the Sustainable Development Goals (SDG) agenda is to reduce the probability of death from any of the four main non-communicable diseases (NCDs) (cardiovascular diseases such as heart attacks and stroke, cancers, chronic respiratory diseases, and diabetes) among those aged between 30 and 70 years by one-third in 2030 (World Health Organization, n.d.). Another target is to reduce poverty because people with poverty are at greater risk of being exposed to harmful products, such as tobacco, unhealthy dietary practices, and also have limited access to health services (NCD Countdown 2030 collaborators, 2022).

Gender differences in CVD predictors have been observed in previous studies, with males having a higher risk of CVD compared to females (Manaf *et al.*, 2021; Roth *et al.*, 2020). This trend shows that an escalating CVD complication is expected if no preventive action is taken promptly. In addition, the CVD risks may present as a cluster, such as having diabetes and hypertension or having CVD risks of smoking and obesity concurrently. The cluster of CVD risk factors was also found in previous studies (Mohd Ghazali *et al.*, 2015; W.A Wan Ahmad (Ed), 2021). Even though chronic diseases are usually detected at older age, they might start early in life due to maladaptive behaviours, which are closely related to work-life imbalance and stressful live events (Park & Kim, 2019).

There are gender differences in the prevalence of CVDs and their risk factors that need to be highlighted among the Malaysian working-age population (Ahmad *et al.*, 2020; Idris *et al.*, 2021). Understanding the gender differences in CVD risks among the working-age population can have significant implications for public health policy and interventions. The burden of CVDs among males is already known and affects the younger age (Mensah & Fuster, 2022; W.A Wan Ahmad (Ed), 2021), while lifestyle-related diseases among females are like a ticking time bomb (Alshaikh *et al.*, 2017). Globally, NCDs act as a silent pandemic that affects the working-age population due to multifactor, including individual lifestyle and work contributions such as work-related stress (O'Neil *et al.*, 2018), shift works (Yang *et al.*, 2022) and long working hours (Li *et al.*, 2020). Working-age populations are the backbone of the labour force and the economy in a country. Poor health status among this age group has potential economic and social consequences, including loss of productivity and increased healthcare costs. This study aimed to estimate the prevalence of CVD risk factors among the working-age population in Malaysia by exploring gender differences.

II. MATERIALS AND METHOD

The National Health and Morbidity Survey (NHMS) is a scheduled survey since 1986 with the main objective of finding the prevalence of NCDs and their risk factors among Malaysian population. This article utilised data from NHMS 2019, which was conducted between 14 July to 2 October 2019.

A. Study Design

NHMS 2019 used a cross-sectional study design and was conducted among nationally representative respondents in Malaysia. Malaysia's geographical areas were divided into enumeration blocks (EBs), a land area artificially created and consisting of specific boundaries by the Department of Statistics of Malaysia. Each EB may consist of 80 to 120 living quarters (LQs) with an average population of 500 to 600 people. The list of EBs in Malaysia was used as the sampling frame in this survey design.

B. Sampling Method

A two-stage stratified cluster random sampling design was used to select the EB from the urban and rural areas in all 13 states and three federal territories (FT) to ensure national representativeness. The primary sampling unit was the EBs, and the secondary sampling unit was the living quarters (LQs). Members of the selected LQ were eligible to participate in this survey. The sample size was calculated for a single proportion formula and multiplied for 16 strata (13 states and three federal territories) based on the prevalence of hypertension, diabetes, and hypercholesterolemia. A total of 5,676 LQs were obtained from 475 selected EBs in Malaysia, which accounted for 15,683 eligible respondents. The response rate at the LQ level was 91.4%, while at the individual level, the rate was 95.4%. The overall response rate in NHMS 2019 was 87.2%.

C. Study Population

This study focused on the working-age population regardless of their current working status and was originally defined as those aged 15 to 64 years (Department of Statistics Malaysia, 2020). However, the age of 18 to 64 was taken instead of 15 to 64 in this study because the parameters for CVD risks were only measured for those aged 18 and above. This group was targeted because they are within the most economically productive age range; thus, early prevention can maintain their productivity level and quality of life at a later age.

D. Data Collection

This survey used a validated questionnaire and a standard clinical procedure of point-of-care testing. The basic sociodemographic profiles included information on age, gender, place of residence, level of education, total household income and working status. Anthropometry measurements were conducted using Tanita Personal Scale HD 319 and SECA Stadiometer 213 for weight and height, respectively. Capillary blood samples were taken to measure fasting blood glucose and cholesterol using the CardioChek® PA Analyzer (Ani *et al.*, 2012). Resting blood pressure was measured using a digital blood pressure machine, the Omron Japan Model HEM-907. A group of short-term personnel were hired as the data collectors for the interview sessions while nurses conducted the clinical procedures. The data collectors attended a one-week intensive training course to learn survey objectives and fieldwork challenges such as multiple people's reactions, including rejections, wild animal threats, hot weather and poor geographical landscape. The nurses responsible for handling clinical specimens were instructed to adhere to standard procedures for clinical waste disposal and safety. A more detailed methodology for NHMS 2019 was published elsewhere (Institute for Public Health, 2020).

E. Data Management and Study Variables

Data was checked for any missing values; any outliers were double-confirmed with the relevant field data collectors. All data was kept confidential and anonymous. The socio-demographic profile assessed includes age, place of residence (strata), educational level, working status and total household income. The CVD risks measured include diabetes, hypertension, hypercholesterolemia, abdominal obesity, body mass index (BMI) of 25 kg/m² or more, physical inactivity, current tobacco smokers and current drinkers. A fasting capillary blood glucose (FBG) of 7.0 mmol/L or more (or non-fasting blood glucose of more than 11.1 mmol/L) was used to define diabetes, and total cholesterol of 5.2mmol/L or more to define hypercholesterolemia. Hypertension was defined with a resting systolic blood pressure measurement of ≥140mmHg or diastolic blood pressure of ≥90mmHg. Specific for diabetes, hypertension and hypercholesterolemia, the final variables were defined as the overall prevalence by including those who tested positive during the clinical measurement and those who answered that they were informed by the doctor that they had been diagnosed with the mentioned diseases before the survey. For both BMI and abdominal obesity, the standard WHO cut-off point was used to allow global comparison. The cut-off points were 25 kg/m2 or more for high BMI, while waist circumference (WC) cut-off points for males and females were ≥90 cm and ≥ 80 cm, respectively (World Health Organization, 2000). Local clinical practice guidelines on primary and secondary prevention of CVDs listed diabetes, hypertension and hypercholesterolemia, current tobacco smokers and BMI of 25 kg/m2 as the five important and measurable risks, referred to as multiple CVD risks (CPG Secretariat of Health Technology Assessment Unit, 2017).

These five CVD risks were considered in tabulating the results for the respondents who presented with multiple CVD risks for this study.

F. Data Analysis

IBM SPSS Statistics for Windows, Version 25.0 software was utilised in this study for data analyses. A complex sample analysis menu was used, and a weighting factor was applied for each data to adjust the non-response and multistage sampling design. Results were presented as weighted prevalence with a 95% confidence interval. Comparisons between categorical data were measured using a p-value derived from the second-order Rao-Scott adjusted chi-square statistic with p- the p-value of less than 0.05, indicating a significant difference between groups.

G. Ethical Approval and Consent to Participate

This study was registered under the National Medical Research Registration, NMRR ID–18-3085-44207. The approval for conducting this study was obtained from the Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia. Written individual consents were taken from the respondents at the beginning of the interview session. In general, the study followed the Declaration of Helsinki when conducting a research project.

III. RESULT AND DISCUSSION

There were 3,694 male respondents and 4,423 female respondents of working age (18-64 years regardless of their current working status) involved in this study. The majority of the respondents resided in urban areas (males: 63%; females: 62.5%). Both males and females also show a similar pattern for ethnicity and educational level, as shown in Table 1.

Table 1. Socio-demographic characteristics of the Malaysian working-age population (18-64 years) according to gender.

Variables	Male respondents n= 3694		Female respondents n= 4423	
	n	(%)	n	(%)
Age group (years)				
50 and above	929	25.1	1179	26.7
35-49	1240	33.6	1562	35.3
18-34	1525	41.3	1682	38.0
Strata				
rural	1365	37.0	1658	37.5
urban	2329	63.0	2765	62.5
Ethnicity				
Malays	2367	64.1	2876	65.0
Chinese	411	11.1	468	10.6
Indian	220	6.0	276	6.2
Bumiputera Sabah & Sarawak	394	10.7	520	11.8
Others	302	8.2	283	6.4
Marital status				
Married	2542	68.8	3518	79.5
Other than married	1152	31.2	905	20.5
Level of education				
Primary	667	18.1	883	20.0
Secondary	2037	55.4	2249	50.9
Tertiary	975	26.5	1288	29.1

Household income				
Bottom 40%	2291	62.7	2791	66.8
Middle 40%	1000	27.4	1049	25.1
Top 20%	360	9.9	337	8.1
Working status				
Government employee	522	14.1	523	11.8
Private employee	1806	48.9	1158	26.2
Self-employed	1050	28.4	665	15.0
Not working	316	8.6	2077	47.0

The overall prevalence of eight CVD risk factors for the working-age population is presented in Table 2. Both males and females had nearly similar prevalence of diabetes mellitus and hypertension (14.4% versus 14.9%; p=0.579 and 24.2% versus 22.1%; p=0.112). Females were noted to have a significantly higher prevalence of hypercholesterolemia (40.3% versus 29.0%; p<0.001), abdominal obesity (62.5% versus 39.8%; p<0.001), BMI of 25 kg/m2 and above (55.1% versus 45.9%; p<0.001) and physically inactivity (25.4% versus 18.6%; p<0.001) compared to males. In contrast, males significantly showed a higher prevalence of current smokers (45.3% versus 1.3%; p<0.001) and current drinkers (18.2 versus 7.1%; p<0.001) compared to females.

Table 2. Prevalence of each eight CVD risks among the Malaysian working-age population by gender.

Variables	**Male respondents**					**Female respondents**					**p-value**
	n	**%**	**95% CI**		**estimated population**	**n**	**%**	**95% CI**		**estimated population**	
			lower	**upper**				**lower**	**upper**		
Total Diabetes Mellitus	718	14.4	12.7	16.1	1,350,164	898	14.9	13.5	16.4	1,295,976	0.579
Total Hypertension	1,074	24.2	22.1	26.4	2,277,096	1,299	22.1	20.5	23.8	1,920,661	0.112
Total Hypercholesterolemia	**1,273**	**29.0**	**26.6**	**31.5**	**2,728,942**	**2,049**	**40.3**	**37.8**	**42.8**	**3,506,698**	**<0.001**
Abdominal obesity (≥ 90 cm for male & ≥ 80 cm for female)	**1,589**	**39.8**	**37.0**	**42.7**	**3,576,405**	**2,836**	**62.5**	**60.1**	**64.9**	**5,004,045**	**<0.001**
BMI ≥ 25	**1,865**	**45.9**	**43.2**	**48.7**	**4,178,235**	**2,505**	**55.1**	**52.6**	**57.6**	**4,457,787**	**<0.001**
Physically Inactive	**689**	**18.6**	**16.8**	**20.6**	**1,721,059**	**1,042**	**25.4**	**23.2**	**27.8**	**2,204,668**	**<0.001**
Current smokers	**1,666**	**45.3**	**42.3**	**48.3**	**4,242,621**	**50**	**1.3**	**0.9**	**1.9**	**113,225**	**<0.001**
Current drinkers	**472**	**18.2**	**15.4**	**21.5**	**1,717,260**	**207**	**7.1**	**5.6**	**9.1**	**622,096**	**<0.001**

The prevalence of clustering CVD risk factors is tabulated in Table 3. The prevalence of those with more than three risk factors was significantly higher among males than females (7.4% vs 4.7%; p<0.001). About 1.0% of males presented with all five risks, and 6.4% with all four risks. For females, 4.6 % presented with all four risks, while none presented with all five risks.

Table 3. Prevalence of single and multiple CVD risks among Malaysian working-age population by gender.

Variables	Male respondents					Female respondents					p-value
	n	%	95% CI		estimated population	n	%	95% CI		estimated population	
			lower	upper				lower	upper		
Number of CVD risks											
no risk	529	19.6	17.0	22.5	1,843,775	1018	29.0	26.6	31.5	2,527,581	<0.001
at least one risk	1,155	33.0	30.6	35.6	3,107,584	1356	33.3	31.1	35.6	2,902,176	
two risks	1,017	26.7	24.5	29.0	2,512,426	1025	21.4	19.5	23.3	1,859,529	
three risks	626	13.3	11.9	15.0	1,256,450	702	11.6	10.5	12.9	1,013,979	
four risks	306	6.4	5.4	7.5	600,363	321	4.6	3.9	5.5	403,885	
five risks	61	1.0	0.7	1.4	94,764	1	-	-	-	-	
more >3 risks	**367**	**7.4**	**6.3**	**8.6**	**695,127**	**322**	**4.7**	**4.0**	**5.5**	**407,012**	**<0.001**

The number of CVD risks included in the analysis is based on CPG Malaysia 2017 and available data in NHMS 2019 (Current smoker, BMI ≥ 25, diabetes mellitus, hypertension and hypercholesterolemia).

The prevalence of more than three risk factors is tabulated according to socio-demographic profiles in Table 4. The prevalence of more than three risk factors was associated with age group and marital status for both genders, whereas the older age group was noted to have a higher prevalence. However, the association was only significant among females for strata, ethnicity, level of education and working status. Malay and Indian females had a higher prevalence of more than three risk factors compared to Bumiputera Sabah and Sarawak ethnicity. Those who were self-employed and not working were noted to have a significantly higher prevalence than those who were in the government and private sector.

Table 4. Prevalence of Malaysian working-age population who have CVD risks of three or more by gender.

Variables	Male respondents				Female respondents			
	%	95% CI		p-value	%	95% CI		p-value
		lower	upper			lower	upper	
Age group (years)								
50-64	**18.6**	**15.5**	**22.2**	**<0.001**	**14.5**	**12.0**	**17.3**	**<0.001**
35-49	**9.9**	**7.7**	**12.7**		**5.4**	**4.2**	**7.0**	
18-34	**2.4**	**1.5**	**3.9**		**-**	**-**	**-**	
Strata								
Rural	6.6	5.2	8.3	0.325	**6.3**	**5.1**	**7.7**	**0.009**
Urban	7.6	6.3	9.1		**4.2**	**3.4**	**5.2**	
Ethnicity								
Malays	9.2	7.8	10.8	0.570	**6.2**	**5.2**	**7.3**	**<0.001**
Chinese	6.5	4.1	9.9		-	-	-	
Indian	7.7	4.7	12.3		**6.6**	**3.8**	**11.1**	
Bumi Sabah & Sarawak	6.0	4.0	8.9		**4.3**	**2.8**	**6.7**	
Others	-	-	-		-	-	-	
Marital Status								
Other than married	**3.5**	**2.2**	**5.3**	**<0.001**	**2.9**	**2.0**	**4.1**	**<0.001**
Married	**10.0**	**8.4**	**11.8**		**5.5**	**4.6**	**6.6**	

Level of education								
Primary	7.8	5.1	11.8	0.094	**7.6**	**5.6**	**10.1**	**0.001**
Secondary	8.4	7.1	9.9		**5.3**	**4.4**	**6.5**	
Tertiary	5.2	3.7	7.4		**2.0**	**1.3**	**3.1**	
Household income								
Bottom 40%	7.1	5.7	8.8	0.585	5.1	4.2	6.3	0.143
Middle 40%	8.3	6.4	10.6		3.8	2.7	5.3	
Top 20%	6.5	3.9	10.6		3.2	1.7	5.9	
Working Status								
Government	10.9	7.4	15.7	0.184	**4.6**	**2.7**	**7.9**	**<0.001**
Private	6.7	5.4	8.3		**2.2**	**1.4**	**3.3**	
Self-employed	8.2	6.4	10.4		**7.1**	**5.0**	**9.9**	
Not working	6.1	3.1	11.8		**5.9**	**4.9**	**7.1**	

A. Discussion

In this study, gender differences were observed in the overall prevalence of hypercholesterolemia, abdominal obesity, BMI of 25 kg/m2 and above, physical inactivity, current tobacco smokers and current drinkers. Although males traditionally have a higher risk of CVD than females, at postmenopausal age, females were found to have a similar risk as males. Moreover, females have more severe CVD complications compared to males (Lodi *et al*., 2020). In addition, a local study reported that 83% of those who underwent percutaneous coronary intervention (PCI) were male patients, and 23% of them were less than 50 years old. It was also reported in that study that females underwent PCI at the ages ranging from 60 to 70 years (W.A Wan Ahmad (Ed), 2021). Gender differences in cardiovascular diseases (CVDs) are multifaceted and have been explored across various dimensions. Firstly, epidemiological factors play a crucial role, as clinical trials historically underrepresented females, resulting in a lack of gender-specific data and potentially skewed treatment guidelines. Secondly, the pathophysiology of heart disease differs between males and females, with males more commonly exhibiting obstructive coronary artery disease at a younger age, while females may experience coronary microvascular dysfunction at a later age, highlighting the complexity of CVD development. Additionally, hormonal influences, particularly sex hormones, contribute to variations in disease risk and progression. Moreover, differences in clinical manifestations, disease progression patterns, and responses to treatment have been observed between genders, underscoring the need for tailored approaches in cardiovascular care based on an in-depth understanding of these multifaceted gender-related factors in CVDs (Mauvais-Jarvis *et al*., 2020; Saeed *et al*., 2017).

This study focused only on those who were in the economically active group, defined as those aged 18 to 64 and looked at the prevalence of single CVD risk as well as multiple CVD risks. The rationale of this study was to increase general awareness and to highlight that the most economically active age group in Malaysia cannot be assumed to be healthy and productive because the youngest age for ischaemic heart disease was documented among people under 30 years old (W.A Wan Ahmad (Ed), 2021). CVD disease, particularly myocardial infarction and stroke, may have higher fatality and long-term complications that interrupt a person's economic activity if the event occurs at a younger age. For females, the risk of fatality due to CVD events is lower, but they are currently living with unhealthy lifestyles. Males and females may come from the same family unit, which may pass on the unhealthy habit to the next generation if prevention is not taken promptly. This is due to the effect of parental behavioural modelling, family values and cultural norms. which shape the children's eating behaviour, lifestyle and coping mechanisms towards stressful live events.

This study found that nearly half of the males of the working-age population were current tobacco smokers, and more than half of the female respondents had a BMI of 25 kg/m² and above. The finding on the tobacco smoker prevalence ratio by gender is similar to a study conducted in the Korean working-age population (Jun-Pyo *et al*., 2012). A

study in India showed that females have a higher prevalence of central obesity than males, which is in line with this study finding (Prasad *et al.*, 2020). Another study conducted in Japan showed that males consistently had a higher prevalence of the common CVD risks than their female counterparts (Hattori *et al.*, 2017). The collective body of research conducted in various Asian countries suggests that gender differences in cardiovascular disease (CVD) risk may not exhibit consistent patterns across all CVDs. These findings underscore the need for precision-targeted interventions tailored to specific CVD risks, recognising the complexity and variability of gender-related factors within the realm of cardiovascular health.

In addition, individuals with multiple CVD risks were detected among both genders, which may further increase the risk of CVD (CPG Secretariat of Health Technology Assessment Unit, 2017). Tobacco smoking can be the only CVD risk for CVDs, particularly ischaemic heart disease and stroke among males, according to the local guidelines (CPG Secretariat of Health Technology Assessment Unit, 2017). However, this study was unable to identify the reasons why males have a higher prevalence of smoking. Previous studies found that smoking among males may be related to masculine ideals and culturally normalised and accepted (Kodriati *et al.*, 2018; Lim *et al.*, 2018). On the other hand, females may use maladaptive behaviour in facing stressful life events of unhealthy eating, which leads to overweight and obesity (Htut *et al.*, 2022; Järvelä-Reijonen *et al.*, 2016). Another maladaptive behaviour is harmful alcohol use, which was also found in this study and previous studies (Hattori *et al.*, 2017; Jun-Pyo *et al.*, 2012).

This study also found that females who had more than three risk factors were associated with ethnicity, strata, level of education and working status compared to males. This information brings hope that general awareness and education may help females adopt a healthy lifestyle compared to males who are closely related to masculinity theories (EK, 2015; Mollborn *et al.*, 2020; Rom Korin *et al.*, 2013). This study shows that both genders need a targeted intervention to prevent further CVD at a later age. A previous study in Europe conducted a gender approach in tackling NCDs (World Health Organization, 2019). Risk-based CVD management also had been documented by the WHO according to the specific region and gender stratification (World Health Organization, 2020). For those who are currently working, intervention should be best started at the workplace. A previous study found a low uptake in the government initiative community health screening programme, and among the identified barriers were time constraints (Kuay *et al.*, 2020). Therefore, another initiative is setting up a similar program at the workplace to ensure working people adopt a healthy lifestyle as documented in the local guideline known as Healthy Community Builds the Nation-Plus or KOSPEN Plus programme (Kuang Kuay *et al.*, 2021). In terms of females who were self-employed or housewives, the community outreach program can be conducted with targeted intervention, as mentioned in previous local studies (Ambak et al., 2018; Feisul Idzwan Mustapha *et al.*, 2020).

By understanding and addressing gender disparities in CVD risk factors within the working-age population, policymakers can develop targeted interventions and workplace policies that promote cardiovascular health and reduce the economic burden of CVD. This research can inform the design of equitable healthcare policies, insurance coverage, and workplace wellness programs, ultimately contributing to a healthier and more productive workforce while advancing social and economic equity.

1. Strength and limitations

This is a nationwide study with a large sample size that can represent the working-age population in Malaysia. This study included multiple CVD risks, from chronic diseases such as diabetes and hypertension to lifestyle factors. However, this study used a cross-sectional design, which limits the causal relationship. This study only used available data from point-of-care screening; therefore, respondents' lipid profiles were limited to total cholesterol only. This study did not measure the relationship between stressful life events to support the relationship of stressful life events and CVD.

IV. CONCLUSION

Gender differences were observed in the overall prevalence of hypercholesterolemia, abdominal obesity, BMI of 25 kg/m2 and above, physical inactivity, current tobacco smokers, and current drinkers among the working-age population in

Malaysia. Thus, gender-targeted interventions such as reducing maladaptive behaviours among males and increasing awareness of being physically active and having ideal BMIs among females are recommended. Moreover, a healthy workplace campaign in line with the government initiative wellness programme should be monitored in terms of the health outcome among the working-age population.

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