KNOWLEDGE AND PREVENTIVE PRACTICE REGARDING CARDIOVASCULAR DISEASE RISK FACTORS AMONG UNDERGRADUATE STUDENTS AT A HIGHER EDUCATION INSTITUTION IN KAJANG, SELANGOR

By

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ABSTRACT

Background and Objectives: With the rising burden of premature cardiovascular disease (CVD) mortality among the younger population in Malaysia, understanding awareness and management of CVD risk factors is vital for developing effective, targeted intervention strategies to mitigate early atherosclerotic changes. This study was conducted to study the knowledge and preventive practice regarding cardiovascular disease risk factors among undergraduate students at a higher education institution in Kajang, Selangor.

Methodology: A cross-sectional study was carried out among undergraduate students. Quota sampling method was used to recruit participants who fulfilled the inclusion criteria. The instrument was a validated English version questionnaire. Data collected were entered in SPSS Statistics 27.0 for analysis. Descriptive analysis and Chi-squared test were used. The level of statistical significant was set as p-value<0.05.

Results: A total of 244 undergraduate students participated in this study (50.80% male and 42.90% female) (55.70% science stream and 44.30% non-science stream). Slightly more than half (58.6%) of undergraduate students have good knowledge but less than half (42.2%) had good preventive practice. There was a significant association between knowledge and preventive practice regarding CVD risk factors and family history of CVD with knowledge on CVD risk factors.

Conclusion : The study showed that slightly more than half of the undergraduate students had good knowledge regarding CVD risk factors, but worryingly more than half of the undergraduates have inadequate preventive practice regarding CVD risk factors. Knowledge is associated with preventive practice and the presence family history of CVD were linked to better knowledge. Targeted educations are needed to improve understanding in turn enhance lifestyle behaviour in reducing CVD risks factors as primary prevention of premature CVD given that knowledge can be translated into better practice.

Keywords: knowledge, preventive practice, cardiovascular disease, risk factors, undergraduate students, higher education institution

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Date:

PERMISSION SHEET

It is hereby certified that CAROLYN ANG WEI SAN (ID No. 20UMB00252) completed this Research project titled 'KNOWLEDGE AND PREVENTIVE PRACTICE REGARDING CARDIOVASCULAR DISEASE RISK FACTORS AMONG UNDERGRADUATE STUDENTS AT A HIGHER EDUCATION INSTITUTION IN KAJANG, SELANGOR' under the supervision of Ms Liew Siew Fun (Supervisor) from the Department of Nursing, M. Kandiah Faculty of Medicine and Health Sciences.

I hereby give permission to the university to upload softcopy of my final year project/dissertation/thesis* in pdf format into UTAR Institutional Repository, which may be accessible to UTAR community and public.

Yours truly,

(CAROLYN ANG WEI SAN)

DECLARATION

I hereby declare that the research project is based on my original work except for quotations and citations which have been duly acknowledge. I also declare that it has not been previously or concurrently submitted for any other degree at UTAR or other institutions.

(CAROLYN ANG WEI SAN)

Date: 21/5/25

APPROVAL SHEET

This research project entitled '**KNOWLEDGE AND PREVENTIVE PRACTICE REGARDING CARDIOVASCULAR DISEASE RISK FACTORS AMONG UNDERGRADUATE STUDENTS AT A HIGHER EDUCATION INSTITUTION IN KAJANG, SELANGOR'** is prepared by CAROLYN ANG WEI SAN and submitted as partial fulfilment of the requirements for the degree of Bachelor of Nursing (Hons) at Universiti Tunku Abdul Rahman.

Approved by:

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LIST OF ABBREVIATIONS

AHA	American Heart Association
BMI	Body Mass Index
CARRF-KL	Cardiovascular Disease Risk Factors Knowledge Level
CHD	Coronary Heart Disease
CR	Composite Reliability
CVD	Cardiovascular Disease
diPFC	Dorsolateral Prefrontal Cortex
DOSM	Department of Statistics Malaysia
FAM	Faculty of Accountancy and Management
FCI	Faculty of Creative Industries
HC	Health Concept
HBM	Health Belief Model
HDL	High Density Lipoprotein
HEIs	Higher Education Institutions
HPB	Health Promoting Behaviour
HPLP-II	Health Promoting Lifestyle Profile-II
IHD	Ischaemic Heart Disease
IIUM	International Islamic University Malaysia
KAP	Knowledge, Attitude and Practice
LKC-FES	Lee Kong Chian Faculty of Engineering and Science
LDL	Low Density Lipoprotein
MK-FMHS	M. Kandiah Faculty of Medicine and Health Sciences
MOH	Ministry of Health
NCD	Non-Communicable Disease
OIT	Organismic Integration Theory
PAD	Peripheral Artery Disease
PHS	Perceived Health Status
SPSS	Statistical Package for the Social Sciences
UTAR	Universiti Tunku Abdul Rahman
vmPFC	Ventromedial Prefrontal Cortex
WHO	World Health Organisation

CHAPTER 1

INTRODUCTION

1.0 CHAPTER OVERVIEW

This chapter opens with a discussion of the background context and problem statement, then details the research objectives, questions, hypotheses, conceptual and operational definitions, and the study's significance, concluding with a summary.

1.1 BACKGROUND

Cardiovascular disease (CVD) is under the classification of non-communicable disease (NCD) and are a group of disorder of the heart and blood vessels which includes of coronary heart disease (CHD), cerebrovascular disease, peripheral artery disease (PAD) and aortic atherosclerosis (World Health Organization, 2024). The acute events of CVDs such as heart attacks, heart failure and strokes occur when fatty deposits or blood clots obstruct blood flow to the heart or brain (Budreviciute, et al., 2020; Olvera, et al., 2025).

CVD is a leading cause of morbidity and mortality worldwide, posing a significant burden on public health systems (Catak, et al., 2023; Di Cesare, et al., 2024). According to the World Health Organization (WHO), (2024) CVD particularly CHD, remains the leading cause of death worldwide, accounting for 13% of global fatalities. Since 2000, deaths from this disease have seen the most significant increase, rising by 2.7 million to reach 9.0 million in 2021. Similarly in United States (US), the American Heart Association's (AHA) 2025 statistical report, using the latest available data from 2022, confirmed that CVDs, including

heart disease and stroke, remained the leading cause of death in both 2021 and 2022, with recorded fatalities of 931,578 and 941,652, respectively (AHA, 2025; Martin, et al., 2024).

In Asian country like China, CVD also remains as the leading cause of mortality and morbidity among both urban and rural residents with two out of every five deaths are attributed to CVD in 2020 (Wang, et al., 2023). Likewise in Malaysia, according to the Department of Statistics Malaysia (DOSM) (2023), coronary heart disease persisted as the predominant cause of mortality, responsible for 16.1% of the 126,268 (61.1%) medically certified deaths in 2022. The 2024 report on causes of death in Malaysia further indicates that CHD remained the primary cause of mortality among the NCDs in 2023, contributing to 15.1% of total deaths, largely due to unhealthy lifestyle practices and poor dietary habits (DOSM, 2024). Additionally, the 2016 Global Burden of Disease Stroke Statistics Worldwide report projected that by 2040, one in four Malaysians will experience a stroke (Azzani, et al., 2024).

These alarming trends are largely driven by modifiable and non-modifiable risk factors of CVD. Non-modifiable risk factors, which cannot be modified, encompass inherent characteristics like age, genetic predisposition to CVD, sex, and racial or ethnic background (Brown, et al., 2025; Imes and Lewis, 2014). Whereas more than 90% of the risk factors for developing CVD are modifiable (Rezaianzadeh, et al., 2023; Shen, et al., 2024). These include lifestyle

behaviours such as diet, physical activity, smoking, sleep patterns, and alcohol consumption, as well as conditions like obesity, hypertension, diabetes, and hyperlipidaemia. The primary behavioural risk factors contributing to heart disease and stroke include poor dietary habits, sedentary lifestyles, tobacco consumption, and excessive alcohol use. These behaviours often lead to adverse health outcomes such as overweight and obesity, increased blood pressure, blood sugar level and blood lipids level. This indicate that managing CVD primarily relies on addressing metabolic disorders and making lifestyle modifications (Pikula, et al., 2024; Sharifi-Rad, et al., 2020; WHO, 2021).

Despite the effort to raise awareness and reduce risk of mortality, CVD remains the leading cause of mortality and disability in Malaysia, with CHD accounting for a significant percentage of deaths due to unhealthy lifestyle behaviour (Firus, et al., 2022; Khan, et al., 2020). This underscores the necessity for a comprehensive understanding of the factors influencing knowledge and preventive practices related to CVD. Such insights are essential for developing targeted public health interventions, notably in younger generations, who will critically shape the development of healthcare strategies in the years ahead.

1.2 PROBLEM STATEMENT

Although there is substantial global and local evidence highlighting the early onset of cardiovascular disease (CVD) risk, the prevalence of CVD risk factors among younger individual remains alarmingly high (Antza, et al., 2023; Forouzandeh, et al., 2024; Roth, et al., 2020; Zhang, et al., 2024). Recent data in Malaysia indicate that approximately 70% of youth aged 15–28 exhibit at least one risk factor such as physical inactivity, high low-density lipoprotein (LDL), high total cholesterol, overweight and obesity, poor dietary habits, and smoking. Furthermore, over half of university students are classified as having a moderate to high risk of developing CVD (Azzani, et al., 2024; Mohd, et al., 2022).

These trends are deeply concerning, as CVD is no longer a condition of old age and it increasingly affects younger populations and lead to increased early morbidity and mortality (Antza, et al., 2023). In Malaysia, the mean age of CVD onset is nearly 10 years lower than in high-income countries, with 24.5% of cases occurring in individuals under 50, and a rising proportion of acute coronary syndrome (ACS) cases reported in those under 40 (Azzani, et al., 2024; Wan Ahmad, 2022a; Wan Ahmad, 2024b). More critically, premature mortality due to CVD particularly ischaemic heart disease (IHD) has shown a systematic increase from 2010 to 2021 in Malaysia, positioning it as the primary driver of premature mortality in the country (Hasani, et al., 2024; Khaw, et al., 2023). This indicates a growing national burden of premature CVD-related deaths and highlights the urgency for early prevention.

Despite this, most Malaysian studies on knowledge of CVD risk factors and preventive practices have focused on older adults or patients in clinical and community settings (Abdalqader, et al., 2024; Ithnin, et al., 2021; Lee, et al., 2024; Mohammad, et al., 2018). There remains a gap in understanding the factors contributing to low awareness and poor adoption of CVD preventive measures among young adult, particularly undergraduates aged 18–26; as this group is in a critical phase for establishing lifelong health behaviours, as habits formed during this period often persist into adulthood (Al-Awwad, et al., 2021; Lim, et al., 2021; Lucini, et al., 2024; Cammalleri, et al., 2023; Turco, et al., 2018) This gap is especially concerning given the silent progression of subclinical atherosclerosis in early life, which often remains undetected until it leads to serious or fatal cardiovascular events (Arshad, et al., 2024; Devesa, et al., 2023; Pahwa and Jialal, 2025; Shahjehan, et al., 2025).

Therefore, it is essential to assess undergraduate students' knowledge and preventive practices toward CVD risk factors. Understanding the reasons behind their limited engagement with preventive behaviours is key to designing effective targeted health promotion strategies. Such insights are crucial for mitigating the long-term cardiovascular burden and reducing premature CVD incidence and mortality in Malaysia's young adult population, particularly in urbanized areas such as Kajang, Selangor (Azari, et al., 2022; Hassen, et al., 2022; Khaw, et al., 2023; Oyeyemi, et al., 2023).

1.3 RESEARCH OBJECTIVE

To determine the undergraduate students' level of knowledge and preventive practices regarding cardiovascular disease (CVD) risk factors at a higher education institution in Kajang, Selangor.

1.3.1 SPECIFIC OBJECTIVES

1. To assess the level of knowledge and preventive practices regarding CVD risk factors among undergraduate students at a higher education institution in Kajang, Selangor.
2. To identify the association between undergraduate students' knowledge regarding CVD risk factors and their preventive practices at a higher education institution in Kajang, Selangor.
3. To identify the association between sociodemographic factors (gender, body weight status, smoking status, faculty in university and family history of CVD) and undergraduate students' preventive practices regarding CVD risk factors at a higher education institution in Kajang, Selangor.
4. To identify the association between sociodemographic factors (gender, body weight status, smoking status, faculty in university and family history of CVD) and undergraduate students' knowledge regarding CVD risk factors at a higher education institution in Kajang, Selangor.

1.4 RESEARCH QUESTIONS

1. What is the level of knowledge and preventive practices regarding CVD risk factors among undergraduate students at a higher education institution in Kajang, Selangor?
2. What is the association between undergraduate students' knowledge regarding CVD risk factors and their preventive practices at a higher education institution in Kajang, Selangor?
3. What is the association between sociodemographic factors (gender, body weight status, smoking status, faculty in university and family history of CVD) and undergraduate students' preventive practices regarding CVD risk factors at a higher education institution in Kajang, Selangor?
4. What is the association between sociodemographic factors (gender, body weight status, smoking status, faculty in university and family history of CVD) and undergraduate students' knowledge regarding CVD risk factors at a higher education institution in Kajang, Selangor?

1.5 HYPOTHESIS

1.5.1 NULL HYPOTHESIS

$H_0 1$: There is no association between undergraduate students' knowledge regarding CVD risk factors and their preventive practices at a higher education institution in Kajang, Selangor.

$H_0 2$: There is no association between sociodemographic factors (gender, body weight status, smoking status, faculty in university and family history of CVD)

and undergraduate students' preventive practices regarding CVD risk factors at a higher education institution in Kajang, Selangor.

$H_0 3$: There is no association between sociodemographic factors (gender, body weight status, smoking status, faculty in university and family history of CVD) and undergraduate students' knowledge regarding CVD risk factors at a higher education institution in Kajang, Selangor.

1.5.2 ALTERNATIVE HYPOTHESIS

$H_a 1$: There is a statistically significant association between undergraduate students' knowledge regarding CVD risk factors and their preventive practices at a higher education institution in Kajang, Selangor.

$H_a 2$: There is a statistically significant association between sociodemographic factors (gender, body weight status, smoking status, faculty in university and family history of CVD) and undergraduate students' preventive practices regarding CVD risk factors at a higher education institution in Kajang, Selangor.

$H_a 3$: There is a statistically significant association between sociodemographic factors (gender, body weight status, smoking status, faculty in university and family history of CVD) and undergraduate students' knowledge regarding CVD risk factors at a higher education institution in Kajang, Selangor.

1.6 CONCEPTUAL AND OPERATIONAL DEFINITIONS

1.6.1 KNOWLEDGE

Knowledge is described as an individual's comprehension or information about a subject (Cambridge Dictionary, 2021). Knowledge in this study is defined as the understanding of CVD risk factors on the 14 items assessing various CVD risk factors, including family history, gender, physical activity, diet, hyperlipidaemia, weight, psychological and emotional health, as well as questions related to CVD prevention among the undergraduate students. Each item provided three response options: “True,” “False,” and “Don’t Know.” Respondents were instructed to select one option per item. A correct answer was awarded one point, while incorrect or “Don’t Know” responses were scored as zero. Each participant’s overall knowledge score was calculated by summing their responses to all 14 items. Using the median score as the threshold, participants were classified into two groups: those demonstrating good knowledge (scores ≥ the median) and those with inadequate knowledge (scores < the median). A higher overall score reflects greater knowledge of CVD risk factors.

1.6.2 PREVENTIVE PRACTICE

Preventive practice refers to measures implemented to minimize the risk or likelihood of adverse outcomes, including injury, harm or disease (AbdulRaheem, 2023). Preventive practice in this study was defined as lifestyle behavioural choices adapted by the undergraduate students to reduce their risk

of developing CVD. These behaviours were quantified using the 26 items that comprised of three domains: health responsibility (9 items), nutrition (9 items), and physical activity (8 items) from Health Promoting Behaviour (HPB) questionnaire adapted from Lim, et al. (2016). Each item is rated on a 4-point Likert scale: “Never” (1 point), “Sometimes” (2 points), “Often” (3 points), and “Routinely” (4 points). Total scores for each participant were calculated by summing their responses across all 26 items. A mean score was then derived, and participants were classified into two categories: those with good preventive practices (scores $\geq$ the mean) and those with inadequate preventive practices (scores $<$ the mean). A higher mean percentage indicated better preventive practice within that specific domain. Overall, a higher total score reflected better preventive practices toward CVD risk factors.

1.6.3 CARDIOVASCULAR DISEASE (CVD)

A group of disorders affecting the heart and blood vessels including coronary heart disease (CHD), cerebrovascular disease, stroke, heart attack, and heart failure, resulting from blocked or restricted blood flow due to fatty deposits or clots (WHO, 2021).

1.6.4 RISK FACTORS

Conditions or behaviours that increase the risk of developing CVD. These include modifiable risk factors such as unhealthy diet, physical inactivity, smoking, alcohol consumption, obesity, hypertension, diabetes, and high

cholesterol, as well as non-modifiable risk factors like age, gender, ethnicity, and family history of CVD (Centre of Disease Control, 2024).

1.6.5 UNDERGRADUATE STUDENTS

Individual currently enrolled in a bachelor's degree program at a college or university (Cambridge Dictionary, 2023). In the present study, undergraduate students are defined as individuals who are currently enrolled in a bachelor's degree program at Universiti Tunku Abdul Rahman (UTAR), Sungai Long, Kajang, Malaysia, and have no clinical diagnosis of CVD.

1.6.6 HIGHER EDUCATION INSTITUTION

An educational institution of collegiate or more advanced grade (Merriam-Webster, 2024). In this study, higher education institution refers to Universiti Tunku Abdul Rahman (UTAR) in Sungai Long, Kajang, Malaysia.

1.6.7 SOCIODEMOGRAPHIC FACTORS

1.6.7.1 GENDER

Socially constructed characteristics, norms, roles, and behaviours associated with men and women (WHO, 2021). In this study, gender was classified into two distinct categories: male and female.

1.6.7.2 BODY WEIGHT STATUS

Body weight status refers to an individual's Body Mass Index (BMI), which is calculated as weight in kilograms divided by height in meters squared (kg/m^2) (Mbarushimana, et al., 2021; WHO, 2024). In this study, body weight status was categorized as nominal data into three groups based on the BMI classification for Asian and South Asian adults: underweight (< 18.5 Kg/ m^2), normal weight (⩽ 22.9 Kg/m^2) or overweight/obese (⩾ 23 Kg/m^2) (Weir and Jan, 2025; WHO, 2024).

1.6.7.3 SMOKING STATUS

Smoking status refers to an individual's categorisation according to their tobacco-use behaviour (Institute for Public Health, 2015). In this study, smoking status as nominal data is categorized 3 groups:

- Current/Daily smoker (smoke at least 1 tobacco product every day, over a period of one month and more**)**
- Current/Occasional smoker (currently smokes but not every day or used to smoke daily but currently not every day)
- Non-smoker (Never smoked or former daily smoker or former occasional smoker) (IPH, 2015).

1.6.7.4 FACULTY IN UNIVERSITY

A department within a university or college devoted to a particular branch of knowledge (Cambridge Dictionary, 2025). In this study, faculty in university as nominal data was categorized into two groups:

- Science stream : comprising participants from the M. Kandiah Faculty of Medicine and Health Sciences (MK-FMHS) and the Lee Kong Chian Faculty of Engineering and Science (LKC-FES).
- Non-science stream: comprising participants from the Faculty of Accounting and Management (FAM) and the Faculty of Creative Industries (FCI).

1.6.7.5 FAMILY HISTORY OF CVD

One or more of any blood-related family members who are currently diagnosed with or have had any form of CVD, such as stroke, heart attack, heart failure or coronary heart disease (Heart Foundation, 2024). In this study, family history of CVD was recorded as a nominal variable, with responses categorized as “Yes” or “No”.

1.7 SIGNIFICANCE OF THE STUDY

This study highlights the importance of improving university students' knowledge and preventive practices concerning CVD risk factors. It aims to improve awareness and promote informed lifestyle choices as a means of primary prevention against premature CVD. By providing evidence-based and updated information, the study seeks to positively influence students' understanding and engagement in preventive health behaviours. The findings could guide the creation of tailored educational programs, offer a foundation for subsequent studies, and enhance nursing practice by incorporating evidence-based approaches.

1.8 SUMMARY

This study aims to assess the level of knowledge and preventive practices related to CVD risk factors among undergraduate students at a higher education institution in Kajang, Selangor. It further highlights the relationship between knowledge and preventive practices, as well as the association between sociodemographic factors and undergraduate students' knowledge and preventive practices regarding CVD risk factors.

CHAPTER 2
LITERATURE REVIEW

2.0 CHAPTER OVERVIEW

This chapter presents the study's search strategy and literature review.

2.1 SEARCH STRATEGY

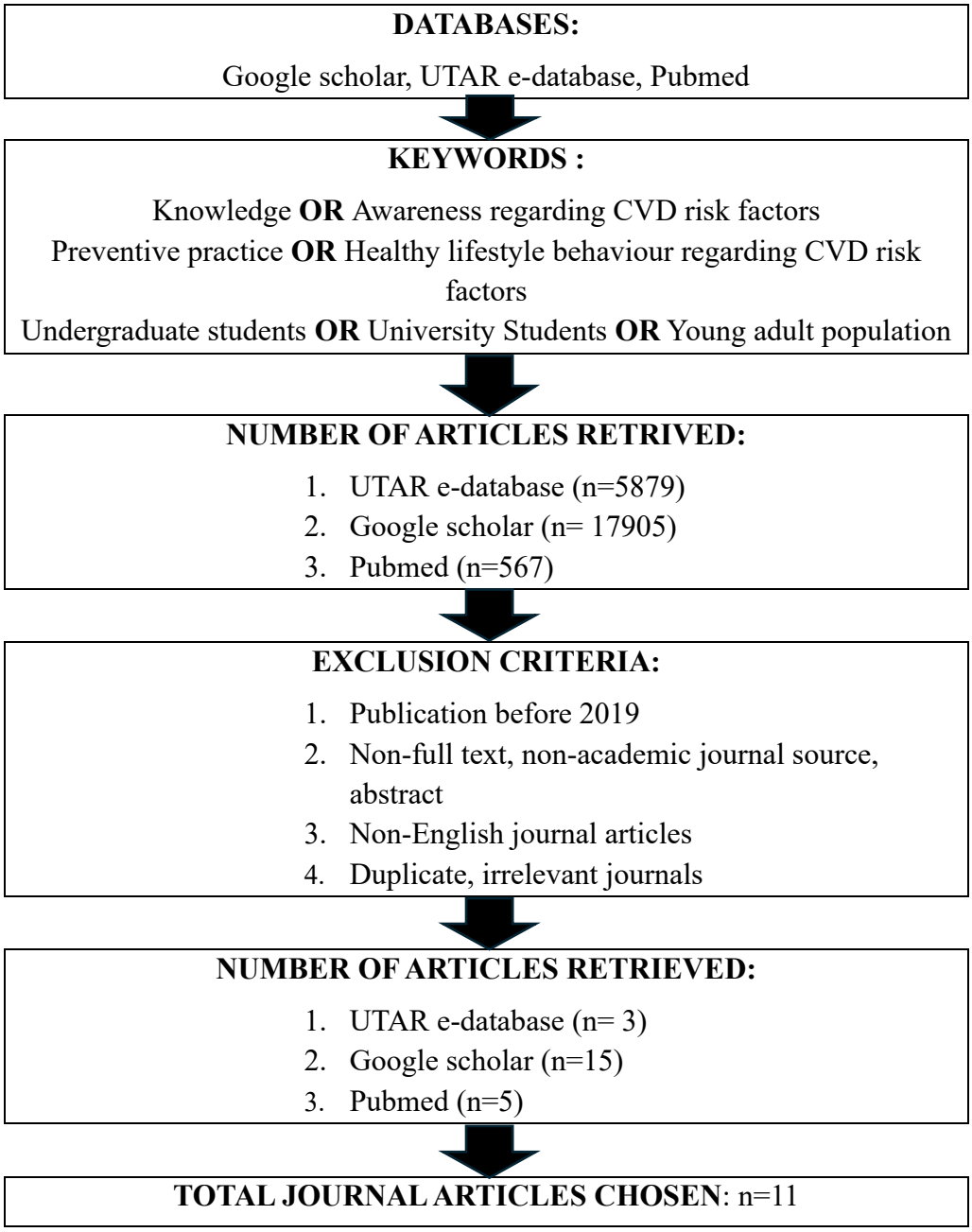

Diagram 2.1 Search strategy flowchart

The search strategy, depicted in **Diagram 2.1**, involved sourcing literature from UTAR's e-database, Google Scholar, and PubMed. Boolean logic ("AND"/"OR") and targeted keywords were applied, resulting in the inclusion of 11 articles for analysis.

2.2 REVIEW OF LITERATURE

This section reviews current literature on CVD risk factor knowledge and preventive practices, along with sociodemographic influences, and highlights key findings that inform this research.

2.2.1 KNOWLEDGE REGARDING CVD RISK FACTORS

Shalihin, et al. (2022) conducted a cross-sectional survey of 247 preclinical students at the International Islamic University Malaysia (IIUM) and reported that 97.2% demonstrated good knowledge of CVD risk factors, 2.8% moderate knowledge, and 0% poor knowledge. Likewise, Cammalleri, et al. (2023) assessed 744 Italian undergraduates and found that over 90% could accurately identify common risk factors such as age, diet, physical activity, tobacco and alcohol use, body weight, stress, lipid levels, hypertension, and family history, indicating broadly satisfactory awareness.

By contrast, Abdela, et al. (2019) observed that only 32.2% of 423 Ethiopian undergraduates attained a good knowledge level. Therefore, while undergraduates generally demonstrated strong knowledge of CVD risk factors, notable gaps persist within the undergraduate population.

2.2.2 PREVENTIVE PRACTICE REGARDING CVD RISK FACTORS

A cross-sectional study conducted in Malaysia among 247 preclinical students at IIUM found that only 16.2% had good preventive practices regarding CVD risk factors, while 78.1% had moderate and 5.7% had poor levels of practices (Shalihin, et al., 2022). In contrast, a study in China involving 8,145 middle school students reported that 89.3% achieved a passing rate for adequate preventive practices, indicating a generally good level of practices (Yang, et al., 2024). Most existing studies tend to assess preventive practices by examining individual components such as physical activity, nutrition, or health responsibility separately. There is a lack of literature focusing on evaluating the overall level of preventive practice as a whole, especially among undergraduate populations. Therefore, further research is needed to address this gap comprehensively.

2.2.3 ASSOCIATION BETWEEN KNOWLEDGE AND PREVENTIVE PRACTICE.

A cross-sectional study by Ibrahim, et al. (2016) among 163 students at the IIUM, Kuantan, found no association (p=0.855) between knowledge and preventive practices regarding CVD risk factors**.** Similarly, a cross-sectional study among 744 Italian undergraduates found that knowledge is not associated to healthy behaviour (p>0.05) (Cammalleri, et al., 2023). However, a 6-month pre-test/post-test educational intervention among 128 first-year undergraduates in Egypt, recorded an increased adequate CVD risk factor knowledge from 58.3% to 99.2%. The intervention significantly ($p < 0.001$) improved all aspects of Cardiovascular Disease Risk Factors Knowledge Level (CARRF-KL) scores, with total CARRF-KL positively correlating with health responsibility and nutritional habits ($p < 0.05$) (Abdo, et al., 2019). Therefore, the inconsistent findings on the role of knowledge translating into better preventive practices for CVD risk factors, along with limited research among Malaysian undergraduate students, highlight a gap in understanding its impact on healthy behaviour, thereby warranting further investigation.

2.2.4 SOCIODEMOGRAPHIC FACTORS

2.2.4.1 GENDER

A cross-sectional study among 247 preclinical students at IIUM found no significant association between gender and knowledge, attitude and practice (KAP) (p=0.667) regarding CVD risk factors (Shalihin, et al., 2022). In contrast,

Güneş, et al. (2019) examined 2,450 undergraduates in Turkey using cross-sectional method found that women scored significantly higher than men on CVD risk-factor awareness ($p < 0.001$). Similarly, a cross-sectional study among 6327 university students in the East Midlands, United Kingdom (UK) found that men ($p<0.001$) engaged in more physical activity and had lower sedentary behaviour than women. However, no significant difference ($p=1.000$) was observed between gender and diet quality (Savage, et al., 2024). These mixed findings suggest that gender influences CVD knowledge and preventive practices differently across cultures, highlighting a gap in the literature on its relationship with knowledge and preventive practice.

2.2.4.2 BODYWEIGHT STATUS

A cross-sectional study by Shalihin, et al. (2022) among 247 preclinical students in IIUM, Malaysia found that BMI is not associated ($p=0.210$) with KAP scores regarding CVD risk factors. In contrast, study by Güneş, et al. (2019) found that obese group have lower awareness on CVD risk factors ($p<0.001$) compared to the normal-weight group. Moreover, a cross-sectional study conducted among 995 university students across 15 universities in Beijing, China found that normal ($p=0.013$) and higher ($p=0.006$) BMI is significantly associated with higher physical activity (Sun, et al., 2023). Findings on the relationship between BMI and CVD knowledge or preventive practices are inconsistent, with some studies showing no association and others linking higher BMI to lower

awareness or healthier behaviours. The difference highlights a gap in literature regarding how BMI influence knowledge and healthy lifestyle practice.

2.2.4.3 SMOKING STATUS

A cross-sectional study by Shalihin, et al. (2022) conducted among 247 preclinical students at IIUM, Kuantan, Malaysia, found no significant association ($p=0.454$) between smoking status and KAP regarding CVD risk factors. However, findings from other studies suggest a potential link. A cross-sectional study conducted at Family Mall, the largest shopping mall in Erbil, Iraq, among 1,100 individuals (mean age: 29.13 ± 9.31 years), with half of the participants (52.3%) fell within the 18–27-year age range revealed that history of smoking (smoker) ($p<0.05$) was inversely significantly associated with knowledge of CVD risk factors (Sulaiman and Andsoy, 2024). Additionally, a cross-sectional study among 683 undergraduate students across multiple higher education institutions (HEIs) in North-West Ireland found that smoking is associated with poor diet quality ($p=0.001$) and low fruits and vegetable consumption ($p<0.001$) (Doak, et al., 2023). Findings on the association between smoking status, knowledge, and preventive practices regarding CVD risk factors remain inconsistent, with some studies reporting no significant link while others suggest an inverse relationship. These differences highlight a gap in literature regarding how smoking status influence knowledge and preventive practice

2.2.4.4 FACULTY IN UNIVERSITY

A cross-sectional study among 302 university students from Shahid Beheshti University of Medical Sciences in Tehran, Iran, found that medical students had significantly better awareness of underlying CVD risk factors than non-medical students ($p<0.001$), the difference was likely due to differences in their field of study (Estebsari, et al., 2024). Similarly, a cross-sectional study among 170 undergraduate students at the University of Ghana in Africa, found a significant association ($p=0.001$) between student type (medical versus non-medical) and knowledge of CVD risk factors, with medical students having over six times higher odds of possessing greater CVD risk factors knowledge compared to non-medical students. Specifically, of 69.5% of medical students demonstrated good knowledge of CVD risk factors, compared to only 25.6% of non-medical students. However, the same study found no association ($p=0.551$) between student type and preventive practices related to CVD risk factors (Falade and Yorke, 2023).

In contrast, a cross-sectional study by Marendić, et al. (2024) among 783 university students in University of Split, Croatia, found that health science students ($p<0.001$) exhibited healthier lifestyles (diet and physical activity) than non-health science students. Research shows that medical and health science students generally have greater CVD knowledge, but findings on preventive practices remain inconclusive. In Malaysia, no studies have examined the link between faculty type (science vs. non-science) and both knowledge and

preventive practices regarding CVD risk factors. This gap in the literature underscores the need to explore how academic background influences students' awareness and health behaviours.

2.2.4.5 FAMILY HISTORY OF CVD

A cross-sectional study by Shalihin, et al. (2022) among 247 preclinical students at IIUM, Kuantan, Malaysia found that family history is significantly associated ($p=0.034$) with KAP score on CVD risk factors among 247 preclinical students, Kuantan, Malaysia.

However, a cross-sectional study among 744 university students from centre and south Italy, found that having a family history of CVD is not associated ($p>0.05$) with knowledge on identifying most of the CVD risk factors except for gender ($p=0.016$), physical activity ($p=0.033$), menopause ($p=0.016$) (Cammalleri, et al., 2023). Similarly, a cross-sectional study among 12,848 adults from the baseline survey of the Centre for Cardiometabolic Risk Reduction in South Asia (CARSS) cohort found no significant association ($p>0.05$) between family history of CVD and healthy behaviours, among the young adults aged 20 to 44 (Garg, et al., 2022).

Findings on the association between family history of CVD, knowledge and preventive practices are inconsistent. While some studies show a significant link, others report no association. These inconsistencies underscore a critical gap in understanding how familial CVD history shapes health awareness and preventive behaviours.

2.3 CONCEPTUAL FRAMEWORK

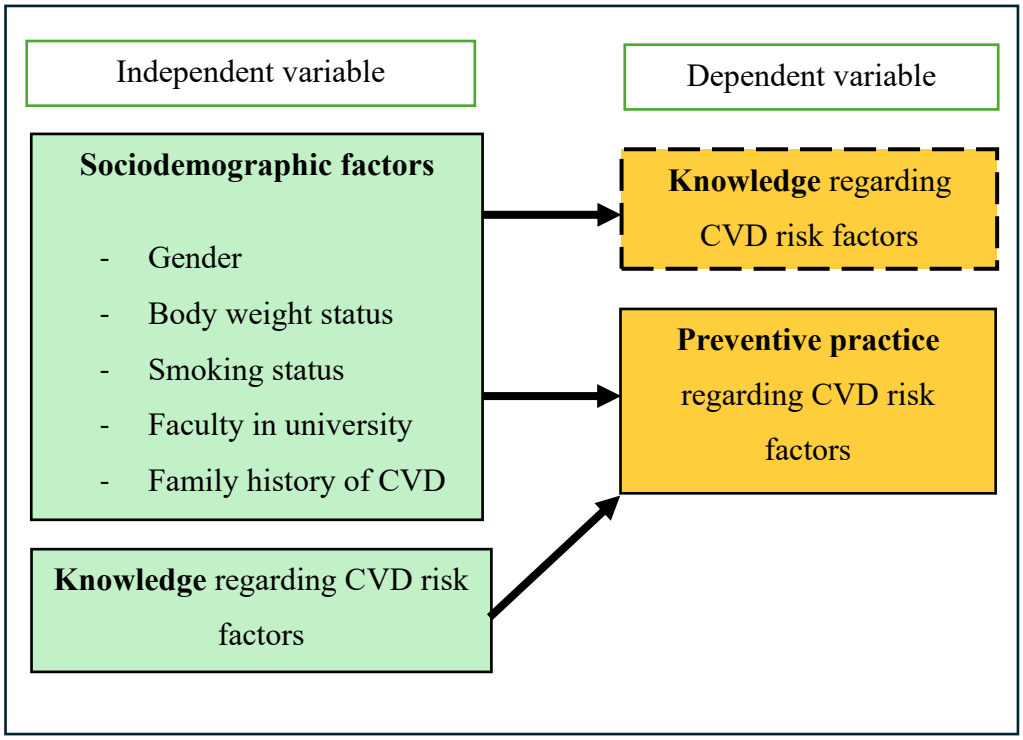

Diagram 2.2 Conceptual framework on knowledge and preventive practice regarding cardiovascular disease (CVD) risk factors among undergraduate students at a higher education institution in Kajang, Selangor.

Diagram 2.2 illustrates the conceptual framework delineating the relationships between sociodemographic factors, knowledge and preventive practices towards CVD risk factors within an undergraduate student population. Sociodemographic factors and knowledge were designated as independent variables to assess their impact on preventive practices (the dependent variable), addressing research objectives 2 and 3. Knowledge, however, functioned as both a predictor and an outcome in this study. Specifically, it was hypothesized to be influenced by sociodemographic factors, aligning with research objective 4.

2.4 SUMMARY

To conclude, the literature review reveals a multifaceted relationship between knowledge, preventive practices, and sociodemographic factors (gender, body weight status, smoking status, faculty in university and family history of CVD) in shaping awareness and engagement in preventive behaviours. Despite this interplay, significant gaps remain in both students' understanding of CVD risk factors and their overall preventive practices. Addressing these gaps among undergraduate populations is therefore essential for designing effective risk-management strategies and implementing early prevention efforts to curb premature CVD onset within the university.

CHAPTER 3
METHODOLOGY

3.0 CHAPTER OVERVIEW

Chapter 3 outlines the research design, study variables, sampling methods, research instruments, data collection procedures, ethical considerations, and provides a summary of the chapter.

3.1 RESEARCH DESIGN

A quantitative cross-sectional design was used for this study. This design was selected as it allows data to be collected from a population at a specific point in time. It is commonly used to determine the prevalence of health-related outcomes and is known for being quick, cost-effective, and straightforward to implement (Wang and Cheng, 2020).

3.1.1 RESEARCH SETTING

The research was carried out at Universiti Tunku Abdul Rahman (UTAR)'s Sungai Long campus, a non-profit private university established in 2002. UTAR provides a comprehensive portfolio of academic programs at this campus, spanning foundation studies, undergraduate degrees, postgraduate diplomas, master's programs, and doctoral (PhD) qualifications across diverse disciplines.

3.1.2 POPULATION

3.1.2.1 TARGET POPULATION

All undergraduate bachelor's degree students currently enrolled in UTAR.

3.1.2.2 ASSESSIBLE POPULATION

Participants comprised undergraduate students who gave explicit consent to respond to the questionnaire during the designated study timeframe.

3.1.2.3 SAMPLE

The sample is undergraduate students who met the inclusion criteria at a higher education institution in Kajang, Selangor.

3.2 VARIABLES

3.2.1 INDEPENDENT VARIABLES

The study comprised two independent variables: sociodemographic factors and knowledge of CVD risk factors. The sociodemographic factors included gender, body weight status, smoking status, faculty in university, and family history of CVD. These variables were used to address the third and fourth specific research objectives. The second independent variable, knowledge regarding CVD risk factors, was examined in relation to the second specific research objective, as it may influence the level of preventive practices regarding CVD risk factors.

3.2.2 DEPENDENT VARIABLES

The study included two dependent variables: knowledge and preventive practices related to CVD risk factors. The knowledge was used to examine the fourth specific objective and preventive practice was used to assess the second and third specific objectives.

3.3 SAMPLING

3.3.1 SAMPLING TECHNIQUE

Participants were recruited using quota sampling method, based on the specific inclusion and exclusion criteria. In this study, quotas were established based on faculty in university and gender to enhance the accuracy of population representation. To gather data, questionnaires were disseminated to participants via face-to-face method using hard copies.

3.3.2 SAMPLE SIZE

The required sample size was calculated using the formula established by Krejcie and Morgan (1970), as outlined below.

$$S = \frac{X^2 NP(1-P)}{d^2(N-1) + X^2 P(1-P)}$$

S = Sample size required

$X^2 = 3.841$, for 0.95 confidence level

N = Population size = 6484

P= Prevalence of previous study = 0.162 (Shalihin, et al., 2022)

d = Degree of accuracy = 0.05

By using the prevalence of 16.2% (0.162), from previous study on good preventive practice on CVD risk factors in a Public University into the formula (Shalihin, et al., 2022).

$$S = \frac{(3.841)(6484)(0.162)(1-0.162)}{(0.05)^2(6484-1) + (3.841)(0.162)(1-0.162)}$$

S = 203

N = 203 + 0.2 (203)

N= 244

The total sample size if 203. Including the 20% attrition rate, the final sample size was adjusted to 244 participants.

Table 3.1 Quota sampling faculty in university distribution

Faculty in university	Total number of participants	Percentage of whole campus	Participants needed
MK-FHMS	653	10%	24
LKC-FES	2982	46%	112
FAM	1764	27%	66
FCI	1085	17%	42
Total	6484	100%	244

Table 3.1 presents the quota sampling distribution of students from different faculties at the selected higher education institution in Kajang, Selangor. Accordingly, the required sample included 24 participants from MK-FMHS, 112 from LKC-FES, 66 from FAM, and 42 from FCI. Then the required sample of faculty in university according to "science stream" (MK-FMHS and LKCFES) would be 136 participants and "non-science stream" would be 108 participants.

Table 3.2 Quota sampling gender distribution

Gender	Total number of participants	Percentage of whole campus	Participants required
Male	3284	50.65%	124
Female	3200	49.35%	120
Total	6484	100%	244

Table 3.2 presents the quota sampling distribution of participants by gender at the selected at the higher education institution in Kajang, Selangor. A total of 124 male and 120 female participants were required.

3.3.3 SAMPLING CRITERIA

3.3.3.1 INCLUSION CRITERIA

1. Currently enrolled on a bachelor's degree programme at the selected higher education institution in Kajang, Selangor.
2. Provided consent and agreed to participate in this research.
3. Not clinically diagnosed with any form of cardiovascular disease.

3.3.3.2 EXCLUSION CRITERIA

1. Enrolled on a foundation or postgraduate programme (Master's or PhD) at the selected higher education institution in Kajang, Selangor.
2. Declined or unable to participate in the research.
3. Clinically diagnosed with any form of cardiovascular disease.

3.4 INSTRUMENT

This study utilized the Knowledge on CVD Risk Factors and Preventive Measures questionnaire by Shalihin, et al. (2022) and the Health-Promoting Behaviours (HPB) questionnaire by Lim, et al. (2016), which is a modified version of the Health-Promoting Lifestyle Profile-II (HPLP-II) by Walker, et al. (1987), with three domains removed. The research instrument comprises three sections: Section A, Section B, and Section C (as shown in Appendix B).

3.4.1 SECTION A: SOCIODEMOGRAPHIC DATA

Section A comprises of five sociodemographic variables: gender, body weight status, smoking status, faculty in university, and family history of CVD. Participants will self-report each variable, including their weight and height, then calculate their BMI using the provided formula with example in Section A of the questionnaire. Based on their calculated BMI, they will then classify themselves as either ‘underweight’, ‘normal weight’ or ‘overweight/obese’ according to the standardized classification for Asian and South Asian population in the questionnaire (Weir and Jan 2025; WHO, 2024).

3.4.2 SECTION B: KNOWLEDGE REGARDING CVD RISK FACTORS

Section B of the questionnaire was adapted from Shalihin, et al. (2022) and consisted of 14 items assessing various CVD risk factors, including family history, gender, physical activity, diet, hyperlipidaemia, weight, psychological and emotional health, as well as questions related to CVD prevention. Each item

provided three response options: “True,” “False,” and “Don’t Know.” Respondents were instructed to select one option per item. A correct answer was awarded one point, while incorrect or “Don’t Know” responses were scored as zero. Each participant’s overall knowledge score was calculated by summing their responses to all 14 items. Using the median score as the threshold, participants were classified into two groups: those demonstrating good knowledge (scores ≥ the median) and those with inadequate knowledge (scores < the median). A higher overall score reflects greater knowledge of CVD risk factors.

3.4.3 SECTION C: PPREVENTIVE PRACTICE REGARDING CVD RISK FACTOR

Section C of the questionnaire was adapted from Lim, et al. (2016), which is a modified version of the Health-Promoting Lifestyle Profile II (HPLP-II) developed by Walker, et al. (1987). In this adaptation, three original domains : spiritual growth, interpersonal relations, and stress management were removed. The modified version by Lim, et al. (2016) has been validated as a suitable tool for assessing health-promoting behaviours related to CVD prevention among undergraduate students. Section C consists of 26 items, divided into 3 domains, health responsibility (9 items), nutrition (9 items), physical activity (8 items). Each item is rated on a 4-point Likert scale: “Never” (1 point), “Sometimes” (2 points), “Often” (3 points), and “Routinely” (4 points). Total scores for each participant were calculated by summing their responses across all 26 items. A mean score was then derived, and participants were classified into two categories:

those with good preventive practices (scores ≥ the mean) and those with inadequate preventive practices (scores < the mean). Additionally, total scores for each domain were calculated and converted into mean percentages for comparative analysis. A higher mean percentage indicated better preventive practice within that specific domain. Overall, a higher total score reflected better preventive practices toward CVD risk factors.

3.4.4 VALIDITY AND RELIABILITY

Validity and reliability were crucial for evaluating the study instrumentation (Mohajan, 2017). Validity refers to what an instrument measures and how accurately it does so, while reliability pertains to the consistency of the data obtained and the extent to which a measurement tool minimizes random error (Ahmed and Ishtiaq, 2021). According to Lim, et al. (2016), the Health Promoting Behaviour (HPB) scale demonstrated satisfactory convergent validity, with composite reliability (CR) estimates ranging from 0.664 to 0.844. With CR values meeting the recommended threshold of ≥ 0.70, the scale is considered reliable for assessing health-promoting behaviours that is related to CVD prevention among undergraduate students (Lim, et al., 2016; Traymbak, et al., 2022).

In the current study, the instrument underwent content validation by an internal expert (nursing lecturer) specializing in CVD from the MK-FMHS faculty in UTAR and an external CVD expert outside of UTAR (as shown in Appendix F).

Based on their feedback, several revisions were made. These included clarifying the difference between “often” and “routinely” on the Likert scale, removing redundant or irrelevant items (e.g., “CVD is a disease related to the heart,” “CVD is a disease related to the blood vessels,” and “Tobacco cessation programs are available in your hometown”), and adding evidence-based examples, such as specifying carbohydrate servings to improve participant understanding.

A pilot study was conducted from 12 March 2025 to 14 March 2025 to assess the feasibility, reliability, and validity of the research instruments, while also identifying potential issues, such as unclear questions, enabling researchers to refine the study and enhance its overall quality before the main study (Aschbrenner, et al., 2022; Sundram and Romli, 2023). Using 10% of the total sample size (244), 25 participants were recruited through face-to-face method. To eliminate duplicate responses, these participants were excluded from the main study dataset**.** The reliability of Section C in the pilot study was assessed using Cronbach’s alpha, yielding a coefficient of 0.848, which indicates strong internal consistency (George and Mallery, 2003). Based on feedback from participants, several items were refined for clarity, grammatical accuracy, and simplified language, including adding examples of moderate-intensity exercises and simplifying complex terms like "hereditary".

3.5 DATA COLLECTION PROCEDURE

The data collection process was conducted from 17 March 2025 to 2 April 2025 (refer to Appendix H). The questionnaires were distributed via face-to-face method to undergraduate students during their classes break times, before class or after classes. To ensure participants fully understood the questionnaire and had the opportunity to seek clarification, the researcher was present throughout the data collection process. Participants were mandated to acknowledge the recruitment protocol, furnish informed consent, and endorse the PDPA agreement as stipulated in the study documentation (refer to Appendices A, C, and G). To ensure data completeness, all questionnaire items were mandatory. The collected data were then analysed using SPSS version 27.0.

3.6 ETHICAL CONSIDERATION

3.6.1 UNIVERSITY ETHICAL BOARD AND COMMITTEE

Prior to conducting the research, ethical clearance for the study was formally sought from the university's ethics review board. Official approval was granted on 12 March 2025 with approval number of U/SERC/78-475/2025 (refer to Appendix E).

3.6.2 PERMISSION TO USE RESEARCH INSTRUMENT

The questionnaire was adapted from Shalihin, et al. (2022) and Lim, et al. (2016), with permissions secured on 24 February 2025 and 12 December 2023, respectively. The official authorization permitting the use of the research instrument is documented in Appendix D.

3.6.3 CONSENT INFORMATION

Prior to data collection, informed consent was obtained from all participants. Identifiable information was kept anonymous and confidential. To ensure privacy and confidentiality, hard copies were securely sealed and locked. All collected data will be securely archived for a retention period of five to seven years before authorized disposal. The informed consent form is provided in Appendix A for reference.

3.7 SUMMARY

This study employed a cross-sectional design with quota sampling to evaluate undergraduate students' understanding of CVD risk factors and their engagement in preventive practices at a selected university in Kajang, Selangor. Data analysis was performed using SPSS (version 27.0), and comprehensive findings are reported in Chapter 4.

CHAPTER 4 DATA ANALYSIS AND RESULT

4.0 CHAPTER OVERVIEW

This chapter presents the statistical analyses, encompassing both descriptive and inferential statistics, and outlines the results of the study.

4.1 DESCRIPTIVE AND INFERENTIAL ANALYSIS

4.1.1 DESCRIPTIVE ANALYSIS

In this study, participants' sociodemographic data were categorized and presented using frequencies and percentages. The knowledge and preventive practice scores regarding CVD risk factors were also presented as categorical data with frequency, percentage, mean, median, standard deviation, minimum, and maximum values to address the first specific research objective, that is to determine level of knowledge and preventive practice regarding CVD risk factors. Furthermore, the subscales of preventive practice were analysed and presented using mean percentages to facilitate comparison across subscale domains.

4.1.2 INFERENTIAL ANALYSIS

The Chi-square test was employed to address the second, third, and fourth research objectives, which involved evaluating: The association between participants' knowledge of CVD risk factors and their preventive practices; The relationship between sociodemographic factors and preventive practices; The correlation between sociodemographic factors and knowledge of CVD risk factors. The outcomes of these analyses were tabulated to display the Chi-square

statistic and p-values, which determined the statistical significance of associations between categorical variables.

4.2 STATISTICAL DATA PROCESSING AND ANALYSIS

All data were manually input into SPSS version 27.0 by the researcher. The final sample comprised 244 participants, achieving a complete (100%) response rate. Descriptive and inferential statistical analyses were conducted using a 95% confidence interval, with statistical significance defined at $p < 0.05$.

4.3 RESULTS

4.3.1 SOCIODEMOGRAPHIC FACTORS

The sociodemographic factors analysed in this study includes gender, body weight status, smoking status, faculty in university and family history of CVD. Data were summarized using descriptive statistics, presented as frequencies and percentages.

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Table 4.1 Frequency and percentage distribution of participants based on sociodemographic factors, (N=244)

Sociodemographic factors	Frequency (percentage) n (%)
Gender	
Female	120 (49.2)
Male	124 (50.8)
Body weight status	

Normal weight	134 (54.9)
Overweight/Obese	60 (24.6)
Underweight	50 (20.5)
Smoking status	
Current/Daily smoker	11 (4.5)
Current/Occasional smoker	0 (0)
Non-smoker	233 (95.5)
Faculty in university	
Science stream	136 (55.7)
Non-science stream	108 (44.3)
Family history of CVD	
Yes	74 (30.3)
No	170 (69.7)

N = total sample size, n= number of participants, categorical presented by n (%)

Table 4.1 presents the sociodemographic characteristics of the 244 participants, summarized using frequency and percentage. A higher proportion of participants were male (50.8%), had normal weight (54.9%), were non-smokers (95.5%), from the science stream (55.7%), and had no family history of CVD (69.7%).

4.3.2 KNOWLEDGE REGARDING CVD RISK FACTORS

The first research question, 'What is the level of knowledge regarding CVD risk factors among undergraduate students at a higher education institution in Kajang?' was addressed using descriptive statistics, including frequency, percentage, median, and score range (minimum to maximum).

Table 4.2 Frequency and percentage distribution of participants based on knowledge regarding CVD risk factors, (N=244)

	Knowledge questions	Frequency (percentage) n (%)		
		True	False	Don't Know
1.	Cardiovascular disease (CVD) is the leading cause of death in Malaysia.	173 (70.9)**	18 (7.4)	53 (21.7)
2.	Light walking is a preventive factor for CVD.	155 (63.5)**	18 (7.4)	71 (29.1)
3.	Engaging in adequate exercise can prevent CVD. (**Adequate exercise**: at least 150–300 minutes of moderate-intensity or 75–150 minutes of vigorous-intensity aerobic exercise per week **Example of moderate-intensity exercise**: jogging, bicycling, swimming, hiking. **Example of vigorous-intensity exercise that makes you huff and puff**: fast running, heavy lifting in gym, high impact aerobics, swimming laps, jumping rope.)	197 (80.7)**	9 (3.7)	38 (15.6)
4.	Consuming at least 2 servings of fruits and 3 servings of vegetables can prevent from CVD. (**Example of 1 serving of fruits**: 1 whole medium banana or 1 whole medium apple.) (**Example of 1 serving of vegetable**: ½ cups of cooked mixed vegetables.)	171 (70.1)**	17 (7)	56 (22.9)
5.	Most CVD cases are hereditary (**hereditary mean passed down through family genes**).	134 (54.9)	53 (21.7)**	57 (23.4)
6.	Controlling high fat food consumption is essential.	213 (87.3)**	17 (7)	14 (5.7)
7.	Irregular eating pattern <u>is not</u> harmful to your health.	45 (18.4)	179 (73.4)**	20 (8.2)

	(Irregular eating pattern mean **inconsistent meal timing, skipping meals, or consuming food at varying intervals**)			
8.	CVD is a disease that affect women only.	14 (5.7)	202 (82.8)**	28 (11.5)
9.	Doing housework as an exercise is enough for a day.	52 (21.3)	136 (55.7)**	56 (23)
10.	If you have a slim body, you do not need to exercise.	13 (5.3)	221 (90.6)**	10 (4.1)
11.	CVD can occur to young people.	209 (85.7)**	11 (4.5)	24 (9.8)
12.	High density lipoprotein (HDL) is a good type of cholesterol.	61 (25)**	42 (17.2)	141 (57.8)
13.	BMI of more than 30 is considered as obese.	198 (81.1)**	10 (4.1)	36 (14.8)
14.	Prayer can help to reduce stress.	122 (50)**	60 (24.6)	62 (25.4)

**Correct answer, N = total sample size, n= number of participants, categorical presented by n (%)

As presented in **Table 4.2**, items 1, 3, 4, 6, 7, 8, 10, 11, and 13 recorded over 70% of correct responses. The highest was item 10, where 90.6% of participants correctly disagreed that having a slim body eliminates the need for exercise. In item 3, 80.7% correctly indicated that adequate physical activity can help prevent CVD. A total of 87.3% acknowledged the importance of limiting high fat intake (item 6), while 73.4% correctly recognized that an irregular eating pattern is harmful to health (item 7). Additionally, 70.1% correctly agreed that consuming at least two servings of fruits and three servings of vegetables daily contributes to CVD prevention (item 4), and 85.7% were aware that CVD can occur in young individuals (item 11).

Conversely, several items demonstrated lower correct response rates or higher uncertainty. Item 5 had the lowest correct rate, with only 21.7% of participants correctly disagreeing that most CVD cases are hereditary, while 54.9% answered incorrectly. Item 12 recorded the highest uncertainty, with 57.8% unsure whether HDL is considered "good" cholesterol, and only 25% answering correctly. For item 14, exactly 50% agreed that prayer can help reduce stress, with 25.4% uncertain. In item 9, 55.7% disagreed that housework is sufficient to substitute for exercise, while 23% were unsure. Although 63.5% correctly agreed in item 2 that light walking is a preventive factor for CVD, 29.1% reported uncertainty.

Table 4.3 Median, minimum and maximum of the total knowledge score regarding CVD risk factors, (N=244)

Variable	Median	Minimum	Maximum
Total knowledge score regarding CVD risk factors	10	0	14

N = total sample size

Table 4.3 presents the median total knowledge score regarding CVD risk factors as 10, with score ranging from 0 to 14. Knowledge is categorised based on median score, median score ≥ 10 as good knowledge and < 10 as inadequate knowledge.

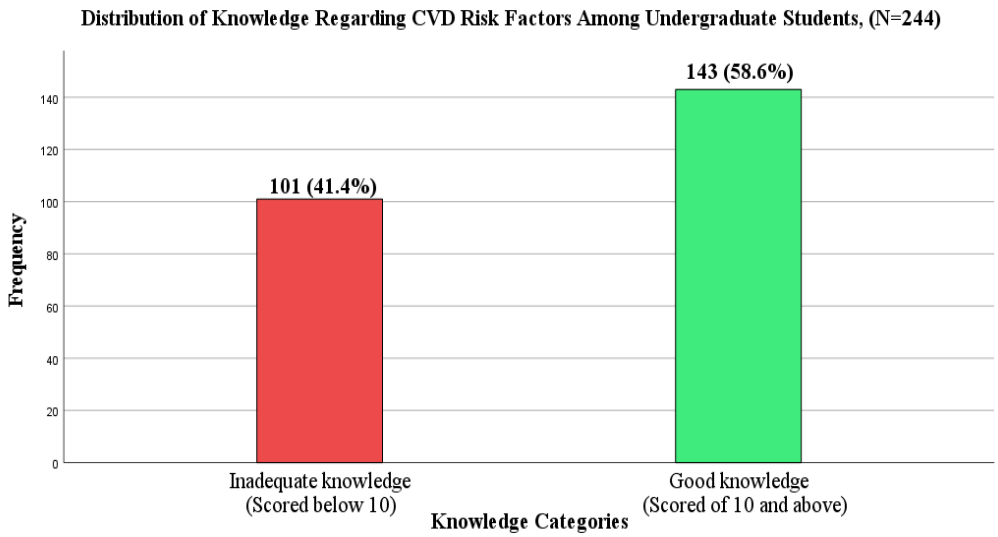

Figure 4.1 Distribution of Knowledge Regarding CVD Risk Factors Among Undergraduate Students, (N=244)

Figure 4.1 presents the distribution of knowledge regarding CVD risk factors among 244 undergraduate students. A total of 143 participants (58.6%) demonstrated good knowledge, while 101 participants (41.4%) had inadequate knowledge.

4.3.3 PREVENTIVE PRACTICE REGARDING CVD RISK FACTORS

Preventive practice regarding CVD risk factors among undergraduate students was evaluated using a 4-point Likert scale. To address the first specific research question 'What is the level of preventive practice regarding CVD risk factors among undergraduate students at a higher education institution in Kajang?' descriptive analysis was conducted, results are presented as frequency, percentage, mean with standard deviation, and score range (from minimum to maximum).

Table 4.4 Frequency and percentage distribution of the participants based on preventive practice regarding CVD risk factors, (N=244)

Preventive practice questions	Frequency (percentage) n (%)			
	Never	Sometimes	Often	Routinely
Health responsibility:				
2. Report any unusual signs or symptoms to a physician or other health professional	54 (22.1)	124 (50.8)	49 (20.1)	17 (7)
5. Read or watch TV programs about improving health.	58 (23.8)	127 (52)	42 (17.2)	17 (7)
8. Enquire health professionals to understand their instructions. (**Example:** asking for clarification on lifestyle changes, CVD risk factors, CVD signs and symptoms, medication adherence and regularity of health screening)	73 (29.9)	115 (47.1)	43 (17.6)	13 (5.4)
11. Get a second opinion when I questioned my healthcare provider's advice.	64 (26.2)	120 (49.2)	52 (21.3)	8 (3.3)
14. Discuss my health concerns with health professionals.	86 (35.2)	112 (45.9)	40 (16.4)	6 (2.5)
17. Inspect my body for physical changes/danger signs at least once a month.	85 (34.8)	111 (45.5)	40 (16.4)	8 (3.3)
20. Ask for more information from health professionals about how to take care of myself.	87 (35.7)	109 (44.7)	35 (14.3)	13 (5.3)
23. Attending educational programs on personal healthcare.	104 (42.6)	96 (39.3)	35 (14.3)	9 (3.8)
26. Seek guidance or counselling when necessary. (**Example:** health care professional, counsellors, friends or family)	41(16.8)	121 (49.6)	59 (24.2)	23 (9.4)
Nutrition				

1.	Choose a diet low in fat, and cholesterol. (**Example:** choose lean chicken meat, fish, tofu, limit used of oil during cooking, avoid fried food, avoid red meat like beef and pork, avoid use of butter and margarine, avoid organ meat like liver)	12 (4.4)	117 (48)	100 (41.5)	15 (6.1)
4.	Limit use of sugars, foods containing sugar. (**Example**: candy, desserts like cookies, ice cream and cakes, energy drink, sports drink, sodas)	13 (5.3)	129 (52.9)	77 (31.6)	25 (10.2)
7.	Eat 6–11 servings of bread, cereal rice or pasta each day. (**Example of 1 serving of grain products :** 1/2 cup of cooked rice/cereals/pasta about a size of a tennis ball **or** 1 slice of bread)	48 (19.7)	104 (42.6)	63 (25.8)	29 (11.9)
10.	Eat 2–4 servings of fruits each day. (**Example of 1 serving of fruits:** 1 whole medium banana **or** 1 whole medium apple)	19 (7.8)	158 (64.8)	55 (22.5)	12 (4.9)
13.	Eat 3–5 servings of vegetables each day. (**Example of 1 serving of vegetable:** ½ cups of cooked mixed vegetables)	18 (7.4)	86 (35.2)	93 (38.1)	47 (19.3)
16.	Eat 2–3 servings of milk, yogurt, or cheese each day. (**Example of 1 serving of milk and milk products:** 1 glass of milk **or** 2 slices of cheese)	50 (20.5)	137 (56.1)	48 (19.7)	9 (3.7)
19.	Eat only 2–3 servings from meat, poultry, fish, dried beans, eggs, and nuts group each day. (**Example of 1 serving of meat, poultry, fish, eggs and nuts group:** 1 medium chicken drumstick **or** 1 palm size lean beef **or** 2 chicken eggs **or** 1 medium Indian mackerel fish **or** 1 ½ square pieces tauhu)	20 (8.2)	99 (40.6)	95 (38.9)	30 (12.3)
22.	Read labels to identify nutrients, fats, and sodium content in packaged food.	38 (15.6)	119 (48.8)	62 (25.4)	25 (10.2)

25.	Eat breakfast. (The first meal of the day **within 2 hours after waking up <u>OR</u> before 10 a.m**.; coffee, water and non-alcohol beverage is **<u>NOT</u>** included in the food group for breakfast)	29 (11.9)	114 (46.7)	52 (21.3)	49 (20.1)
Physical activity					
3.	Follow a planned exercise program.	40 (16.4)	119 (48.8)	51 (20.9)	34 (13.9)
6.	Exercise vigorously for **20 or more minutes at least three times a week**. (**Example of vigorous exercise that makes you huff and puff**: fast running, heavy lifting in gym, high impact aerobics, swimming laps, jumping rope)	45 (18.4)	119 (48.8)	50 (20.5)	30 (12.3)
9.	Take part in <u>light to moderate</u> physical activity. (**Example:** sustained walking for 30–40 minutes, 5 or more times a week, jogging)	30 (12.3)	102 (41.8)	77 (31.6)	35 (14.3)
12.	Take part in leisure-time/free-time (recreational) physical activities. (**Example:** going for a slow walk, stairs walking, slow bicycling, yoga, stretching)	14 (5.7)	130 (53.3)	75 (30.7)	25 (10.3)
15.	Do stretching exercises <u>at least 3 times a week</u>.	53 (21.7)	115 (47.1)	46 (18.9)	30 (12.3)
18.	Get exercise during usual daily activities. (**Example:** walking during lunch, using stairs instead of elevators, parking car away from destination and walking).	20 (8.2)	98 (40.2)	84 (34.4)	42 (17.2)
21.	Check my pulse rate when exercising.	93 (38.1)	90 (36.9)	48 (19.7)	13 (5.3)
24.	Reach standardised target heart rate when exercising. (For 18 to 29-years old, **<u>during</u> moderate-intensity exercise** should reach 96-141 beat per minute; **vigorous-intensity exercise** should reach 134-172 beats per minute)	48 (19.7)	107 (43.9)	69 (28.3)	20 (8.1)

N = total sample size, n= number of participants, categorical presented by n (%)

Table 4.4 shows the frequency and percentage distribution of participants' preventive practices regarding cardiovascular disease (CVD) risk factors. These practices are grouped into three domains: Health Responsibility, Nutrition, and Physical Activity. Across all domains, the most common response was "sometimes", followed by "never", "often", and "routinely". This pattern suggests that most participants engage in preventive behaviours irregularly rather than consistently.

In the Health Responsibility domain, "sometimes" responses ranged from 39.3% (item 23 – attending educational programmes on personal health) to 52.0% (item 5 – for reading or watching TV programmes about health improvement). Routine engagement was generally low, from 2.5% (item 14 – discussing health concerns with professionals) to 9.4% (item 26 – seeking guidance or counselling). The most frequently practised behaviour was seeking guidance or counselling (item 26), with 24.2% choosing "often" and 9.4% "routinely", while only 16.8% selected "never". In contrast, attending educational programmes was the least practised, with the highest "never" rate (42.6%) and the lowest "routinely" engagement (3.8%).

In the Nutrition domain, "sometimes" responses ranged from 52.9% (item 4 – limiting sugar intake) to 64.8% (item 10 – eating 2 to 4 servings of fruit daily). Routine practice remained low, from 3.7% (item 16 – consuming two to three servings of milk products daily) to 20.1% (item 25 – eating breakfast). Eating

breakfast (item 25) was the most consistently practised behaviour in this domain, with 20.1% selecting "routinely". In contrast, consuming dairy products (item 16) was the least practised, showing both the lowest “routinely” engagement (3.7%) and the highest "never" response (20.1%).

In the Physical Activity domain, "sometimes" responses ranged from 36.9% (item 21 – checking pulse during exercise) to 53.3% (item 12 – participating in recreational activities). Routine engagement varied from 5.3% (item 21 – checking pulse during exercise) to 17.2% (item 18 – getting exercise during daily activities). Daily activity-based exercise (item 18) was the most practised item, with the highest "routinely" (17.2%) and "often" (34.4%) responses. The least practised was checking the pulse during exercise, with the lowest "routinely" (5.3%) and the highest "never" (38.1%) responses.

Table 4.5 Mean, standard deviation (SD), minimum and maximum of the total preventive practice score regarding CVD risk factors, (N=244)

Variable	Mean	Standard deviation (SD)	Minimum	Maximum
Total preventive practice score regarding CVD risk factors	58	11.424	26	103

N = total sample size

Table 4.5 displays the mean total preventive practice score regarding CVD risk factors as 58 (SD = 11.424), with scores ranging from 26 to 103. Preventive practice is categorised based on mean score, mean score of ≥ 58 as good preventive practice and < 58 as inadequate preventive practice.

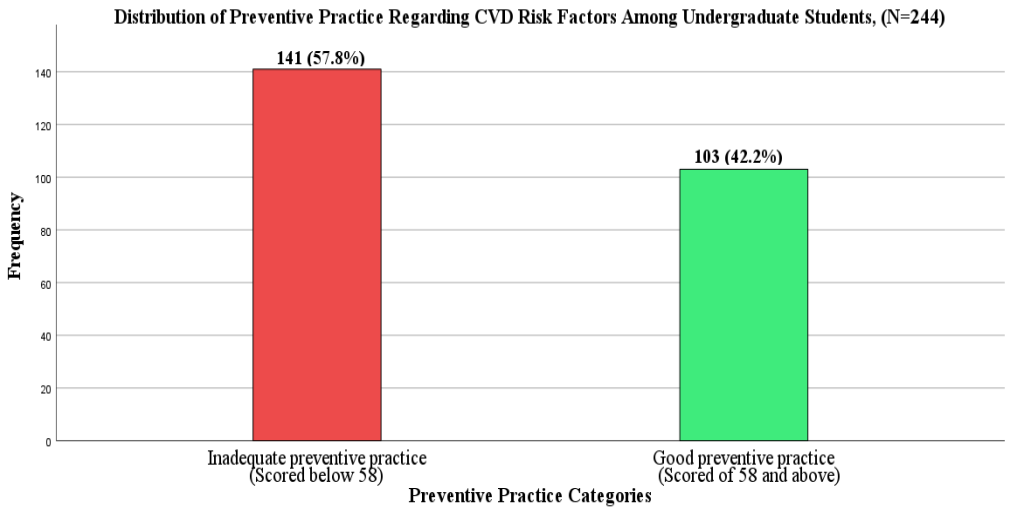

Figure 4.2 Distribution of Preventive Practice Regarding CVD Risk Factors Among Undergraduate Students, (N=244)

Figure 4.2 displays the distribution of preventive practice regarding CVD risk factors among 244 undergraduate students. Among them, 141 (57.8%) were categorized as having inadequate preventive practice, while 103 (42.2%) demonstrated good preventive practice.

Table 4.6 Mean Percentage and Standard Deviation (SD) of Preventive Practice Subscales regarding CVD risk factors, (N=244)

Subscales of preventive practice	Mean (%)	Standard deviation (SD)
Health Responsibility	49.67	14.88
Physical Activity	57.26	14.34
Nutrition	60.02	10.14

Table 4.6 presents the mean scores and standard deviations for all three domains of preventive practices regarding CVD risk factors among 244 undergraduate students. The scores were converted into percentages for comparative analysis, where a higher mean percentage indicates better preventive practice in that domain. Among the preventive practice subscales, nutrition had the highest mean score (M = 60.02%, SD = 10.14), followed by Physical Activity (M = 57.29%, SD = 14.34) and Health Responsibility (M = 49.67%, SD = 14.88), indicating greater engagement in nutrition-related preventive practices and least in health responsibility.

4.3.4 ASSOCIATION BETWEEN KNOWLEDGE AND PREVENTIVE PRACTICE REGARDING CVD RISK FACTORS.

For the second research question, 'What is the association between undergraduate students' knowledge of CVD risk factors and their preventive practices at a higher education institution in Kajang?', data were analysed using the Chi-square test and visualized in cross-tabulation format.

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Table 4.7 Association between knowledge and preventive practice regarding CVD risk factors among undergraduate students, (N=244)

Knowledge Categories	Preventive Practice Categories		χ^2 (p-value)
	Inadequate Practice n (%)	Good Practice n (%)	
Inadequate Knowledge	66 (65.3)	35 (34.7)	4.037 (0.045)*
Good Knowledge	75 (52.4)	68 (47.6)	

**Significant level at p<0.05*

Table 4.7 presents the association between knowledge and preventive practice regarding CVD risk factors. Participants with inadequate knowledge were more likely to exhibit inadequate preventive practices (65.3%, n = 66) compared to those with good knowledge (52.4%, n = 75). Conversely, good knowledge was associated with a higher proportion of good preventive practices (47.6%, n = 68) versus inadequate knowledge (34.7%, n = 35). A statistically significant association was observed between knowledge and preventive practices (χ^2 = 4.037, p = 0.045).

4.3.5 ASSOCIATION BETWEEN SOCIODEMOGRAPHIC FACTORS AND PREVENTIVE PRACTICE REGARDING CVD RISK FACTORS.

The third research question, 'What is the association between sociodemographic factors (gender, body weight status, smoking status, faculty in university, and family history of CVD) and undergraduate students' preventive practices regarding CVD risk factors at a higher education institution in Kajang?', data were analysed using the Chi-square test and visualized in cross-tabulation format.

Table 4.8 Association between sociodemographic factors and preventive practice regarding CVD risk factors among undergraduate students, (N=244)

Sociodemographic factors	Preventive Practice Categories		χ^2 (p-value) / Fisher exact (p-value)^b
	Inadequate Practice n (%)	Good Practice n (%)	
Gender			
Female	76 (63.3)	44 (36.7)	2.978 (0.084)
Male	65 (52.4)	59 (47.6)	
Body weight status			
Normal weight	72 (53.7)	62 (46.3)	
Overweight/Obese	37 (61.7)	23 (38.3)	2.065 (0.356)
Underweight	32 (64)	18 (36)	
Smoking status			
Current/Daily smoker	6 (54.5)	5 (45.5)	(1.000)^b
Non-smoker	135 (57.9)	98 (42.1)	
Faculty in university			
Science-stream	74 (54.4)	62 (45.6)	
Non-science stream	67 (62)	41 (38)	1.435 (0.231)
Family history of CVD			
Yes	41 (55.4)	33 (44.6)	
No	100 (58.8)	70 (41.2)	0.247 (0.619)

**Significant level at p<0.05*
( )^b Fisher's Exact Test was used due to expected count <5

Table 4.8 presents the chi-square analysis of the association between sociodemographic characteristics and preventive practice regarding CVD risk factors analysed among 244 undergraduate students. No statistically significant association was observed for gender (χ^2 =2.978, p-value = 0.084), body weight status (χ^2 =2.065, p-value = 0.356), smoking status (Fisher Exact p-value = 1.000), faculty in university (χ^2 =1.435, p-value = 0.231) and family history of CVD (χ^2 =0.247, p-value = 0.619). Fisher's Exact Test was used for smoking status due to 25% of expected counts being less than 5.

4.3.6 ASSOCIATION BETWEEN SOCIODEMOGRAPHIC FACTORS AND KNOWLEDGE REGARDING CVD RISK FACTORS.

The fourth research question, 'What is the association between sociodemographic factors (gender, body weight status, smoking status, faculty in university and family history of CVD) and undergraduate students' knowledge regarding CVD risk factors at a higher education institution in Kajang?', data were analysed using the Chi-square test and visualized in cross-tabulation format.

Table 4.9 Association between sociodemographic factors and knowledge regarding CVD risk factors among undergraduate students, (N=244)

Sociodemographic factors	Knowledge Categories		χ^2 (p-value) / Fisher exact (p-value)^b
	Inadequate Knowledge n (%)	Good Knowledge n (%)	
Gender			
Female	50 (41.7)	70 (58.3)	0.007 (0.932)
Male	51 (41.1)	73 (58.9)	
Body weight status			
Normal weight	56 (41.8)	78 (58.2)	
Overweight/Obese	21 (35)	39 (65)	1.919 (0.383)
Underweight	24 (48)	26 (52)	
Smoking status			
Current/Daily smoker	6 (54.5)	5 (45.5)	(0.370)^b
Non-smoker	95 (40.8)	138 (59.2)	
Faculty in university			
Science-stream	57 (41.9)	79 (58.1)	0.034 (0.854)
Non-science stream	44 (40.7)	64 (59.3)	
Family history of CVD			
Yes	17 (23)	57 (77)	14.856 (<0.001)*
No	84 (49.4)	86 (50.6)	

**Significant level at p<0.05*

( )^b Fisher's Exact Test was used due to expected count <5

Table 4.9 presents the chi-square analysis of the association between sociodemographic characteristics and knowledge regarding CVD risk factors analysed among 244 undergraduate students. Finding indicates that there is a statistically significant association between family history of CVD ($\chi^2 = 14.856$, p-value <0.001) with knowledge regarding CVD risk factors. Participants with presence of family history of CVD (77%, n=57), exhibit higher good knowledge regarding CVD risk factors compared to participants without family history of CVD (50.6%, n=86). Likewise, participants without family history of CVD (49.4%, n=84) have higher prevalence of inadequate knowledge compared to participants that have (23%, n=17).

However, there is no statistically significant association were found between gender ($\chi^2 = 0.007$, p-value =0.932), body weight status ($\chi^2 = 1.919$, p-value =0.383), smoking status (Fisher Exact p value = 0.370), and faculty in university ($\chi^2 = 0.034$, p-value =0.854) with knowledge regarding CVD risk factors. Fisher's Exact Test was used for smoking status due to 25% of expected counts being less than 5.

4.4 SUMMARY

In conclusion, among 244 undergraduate students, 58.6% (n=143) had good knowledge, while 42.4% (n=103) had good preventive practice regarding CVD risk factors. Knowledge was significantly associated with preventive practice and family history of CVD is significantly associated with knowledge regarding CVD risk factors. However, no significant associations were found between other sociodemographic factors with knowledge or preventive practice regarding CVD risk factors.

CHAPTER 5
DISCUSSION

5.0 OVERVIEW

This chapter presents a discussion of the findings in relation to the study's specific objectives, with consideration of relevant literature. The discussion begins by examining participants' knowledge regarding CVD risk factors, followed by their preventive practices. It then explores the association between knowledge and preventive practices regarding CVD risk factors. Subsequently, the association between sociodemographic characteristics and preventive practices is discussed. Finally, the chapter analyses the association between sociodemographic characteristics and knowledge of CVD risk factors.

5.1 DICUSSION OF MAJOR FINDINGS

5.1.1 KNOWLEDGE REGARIDNG CVD RISK FACTORS

The present study revealed that just over half of the participants (58.6%, n = 143) demonstrated good knowledge of CVD risk factors, while the remaining 41.4% (n = 101) exhibited inadequate understanding. High recognition rates were observed for several core risk factors: limiting high fat intake (87.3%), the protective role of exercise (80.7%), the susceptibility of young people (85.7%) and both genders (82.8%) to CVD, the classification of BMI > 30 as obesity (81.1%), and the necessity of exercise irrespective of body shape (90.6%).

Nevertheless, notable misconceptions persisted. Only 21.7% correctly rejected the assertion that most CVD cases are hereditary; 54.9% endorsed this misconception, and 23.4% remained uncertain. Additionally, only 25% correctly

identified HDL as the “good” type of cholesterol, while 57.8% were unsure. Although 63.5% acknowledged that light walking offers protective benefits, 21.9% were unsure, and only 55.7% agreed that routine domestic chores are inadequate as the sole form of daily exercise. It is also important to note that only 70.1% understood that consuming two servings of fruit and three servings of vegetables daily contributes to CVD prevention, whereas 3.7% disagreed and 23.0% were uncertain.

In terms of total knowledge levels, the present findings are consistent with those of Abdo, et al. (2019), who reported that only 58.3% of first-year science students demonstrated adequate pre-intervention knowledge of CVD risk factors. Similarly, Oyewole and Solabi (2020) reported that 56.4% of undergraduates had good knowledge of modifiable CVD risk factors. In contrast, Cammalleri, et al. (2023) in Italy found that over 90% of undergraduates accurately recognized most CVD risk factors, and Shalihin, et al. (2022) reported that 97.2% of preclinical students had good overall knowledge on CVD risk factors, both substantially higher than the current study.

These disparities in total level of knowledge may stem from differences in participants’ fields of study and regional health education priorities. As Abdo, et al. (2019) and Thomas, et al. (2021) suggested, students enrolled in medical or health science programs, such as those in Shalihin, et al. (2022) study, likely benefit from formal healthcare curricula emphasizing CVD risk factors, unlike

in our study which included both science and non-science students. Geographical and socioeconomic contexts may also contribute to these gaps. For instance, higher-income countries like Italy often implement robust public health strategies, including CVD management programs and policies targeting tobacco use and unhealthy diets, which are less systematically prioritized in middle-income settings like that of the current study (Khaltaev and Axelrod, 2022). Additional contributing factors may include population characteristics, study tools used, and the level of information available on CVD (Sulaiman and Andsoy, 2024).

For item of knowledge, Ibrahim, et al. (2016) found that over 80% of participants correctly identified key CVD risk factors: exercise (95.6%), limiting high-fat foods (93.7%), obesity defined as BMI > 30 (83.6%), and that CVD affects both genders (96.9%) and young people (93.7%). Our study yielded similar item-level results, all above 80%, though at slightly lower percentages. However, only 41.5% of preclinical students in the study by Ibrahim, et al. (2016), correctly rejected the notion that "most CVD cases are hereditary," compared to just 21.7% in our study. These findings indicate that although the majority of participants are able to identify key CVD risk factors, many still hold the misconception that these risk factors are not the primary cause of CVD in the absence of a family history. This misunderstanding obscure the importance of lifestyle-related factors and can lead to an underestimation of one's actual risk of developing CVD (Grauman, et al., 2021). Furthermore, the absence of a family history of CVD is linked to reduced engagement in preventive measures relative to those with such a history

(Pahn and Yang, 2021; Shalihin, et al., 2022; Yang, et al., 2024). Thus, this study stresses the critical need to educate individuals that most CVD cases stem from modifiable behaviours, not familial predisposition, to improve preventive practices against CVD risk factors (World Heart Federation, 2023 ;Yusuf, et al., 2020)

Moreover, Yeluri, et al. (2021) and Ibrahim, et al. (2016) reported that only 41.4% and 69.2% respectively have correct knowledge on “HDL is a good cholesterol” which is higher than our current finding (25%), but similarly inadequate. This low level of understanding may be attributed to the use of complex medical terminology, which can hinder comprehension among non-medical populations. Consistent with our findings, Ibrahim et al. (2016) reported that only 77.4% of participants were aware that light walking serves as a preventive measure for CVD, and just 78% recognized the role of fruit and vegetable consumption in CVD prevention. These figures reflect a similarly unsatisfactory level of awareness, highlighting the need for clearer, more accessible health education strategies targeting young population. In contrast, Oyewole and Solabi (2020) found that only 64.2% of respondents knew that CVD can occur in young people, which is lower compared to our finding (85.7%). This suggests that undergraduate students in Malaysia may have comparatively better awareness that cardiovascular disease is no longer confined to older age groups. These disparities may also be attributed to regional, cultural, and educational differences between middle- and low-income countries.

5.1.2 PREVENTIVE PRACTICE REGARDING CVD RISK FACTORS

Findings from the current study demonstrated that less than half of the participants (42.2%, n = 103) exhibited good preventive practices regarding CVD risk factors, while more than half (57.8%, n = 141) had inadequate preventive practices. The current finding aligns with a study by Shalihin, et al. (2022), which reported that only 16.2% of participants had good preventive practices, while the majority (78.1%) demonstrated moderate levels. Although our study showed a higher percentage of participants with good knowledge compared to study by Shalihin et al. (2022), but the overall adoption of healthy lifestyle behaviours among undergraduates remains insufficient (Al-Awwad, et al., 2021; Horaist and Watson, 2024; Shalihin, et al., 2022). The main barriers to adopting healthy behaviours include among undergraduates are stress and academic pressure, which contribute to limited time availability and low intrinsic motivation. (Jurado-Gonzalez, et al., 2025; Tomy, et al., 2019). Organismic Integration Theory (OIT) posits that external pressures, such as academic stress, can undermine students' perceived autonomy and competence, thereby leading to increased anxiety. (Liu, et al., 2022a; Liu, et al., 2023b; Sheldon and Prentice, 2019). In attempt to cope with this anxiety, undergraduates may resort to unhealthy eating patterns and sedentary lifestyles, which can gradually become habitual. (Chai, et al., 2024).

Conversely, Yang, et al. (2023) reported that 89.3% of middle school students engaged in good preventive practices. This disparity may be attributed to the greater autonomy experienced by university and college students, who are less

strictly supervised by parents and teachers and are more likely to live independently during their studies, unlike middle school students (Liu, et al., 2019). This is further supported by findings indicating that the transition to college is often accompanied by an increase in unhealthy behaviors (Zhang, et al., 2025). Additionally, differences in sample size, demographic characteristics, regional factors, and variations in scoring systems across studies may also contribute to the inconsistent findings.

Most existing studies have explored preventive practices by separating them into specific domains such as health responsibility, nutrition, and physical activity (Lim, et al., 2021). As such, more studies are needed to assess these elements collectively in order to provide a holistic understanding of preventive practices. This is essential for developing tailored health promotion interventions aimed at improving overall health outcomes (Lim, et al., 2021).

In the current study, participants scored highest in the domain of nutrition, followed by physical activity, and lastly, health responsibility. This trend is consistent with previous findings by Musić, et al. (2021), Chao (2023), and Lim, et al. (2021). Health responsibility refers to an individual's proactive engagement in monitoring their health, seeking professional care when needed, and participating in routine health screenings (Musić, et al., 2021). It is a key component in fostering sustainable healthy behaviours (Liu, et al., 2019; Tabrizi, et al., 2024). However, several studies have emphasized that health responsibility

tends to be low among young adults, possibly due to their belief that their youth and current good health absolve them of the need to adopt preventive behaviours now (Musić, et al., 2021; Al-Momani, 2021; Hwang and Oh, 2020; Chao, 2023).

The low scores in the health responsibility domain observed in this study may also be partly due to limited access to CVD screening services for younger populations in Malaysia. While the Ministry of Health Malaysia (MOH, 2017) encourages screening from age 30 onward, its guidelines do not specify a recommended earliest age for CVD risk assessment (Lim, et al., 2021; Noraza, et al., 2018). In contrast, the American Heart Association (AHA) advocates for screening beginning at age 20 years old (AHA, 2024). This discrepancy is concerning, as evidence shows that subclinical atherosclerosis can develop in young adults even without apparent CVD risk factors (Devesa, et al., 2023). Therefore, it is recommended that national health policies in Malaysia consider revising current guidelines to include cardiovascular risk screening for individuals as early as twenties. This proactive approach could promote earlier detection of subclinical conditions and foster greater health responsibility among younger population.

In contrast, a study by Zambrano, et al. (2023) among undergraduate health sciences students in Colombia reported the highest scores in health responsibility (mean = 22.6), followed by nutrition (mean = 21.6) and physical activity (mean = 18.2). However, all domain mean scores remained lower than those observed in the present study. Similar patterns of low physical activity levels among nursing students have been documented in other contexts (Fashafsheh, et al., 2021; Hwang and Oh, 2020). This trend is often attributed to intertwined psychological, social, cultural, and behavioural barriers, such as time constraints, academic pressures, and societal norms that prioritize sedentary lifestyles over exercise (Alzahrani, et al., 2019).

Overall, the current study found that more than half of the participants demonstrated inadequate preventive practices, highlighting an urgent need for intervention. Particular emphasis should be placed on enhancing health responsibility to promote overall healthy behaviours, which are crucial in mitigating early atherosclerotic changes during young adulthood.

5.1.3 ASSOCIATION BETWEEN KNOWLEDGE AND PREVENTIVE PRACTICE REGARDING CVD RISK FACTORS.

The second research objective was to analyse the association between knowledge and preventive practice regarding CVD risk factors among the undergraduate students at a higher education institution in Kajang. The study findings revealed a weak yet statistically significant relationship between

awareness of CVD risk factors and preventive health behaviours among participants. This is the first study to establish such a direct association within an undergraduate population.

The finding is consistent with Lim, et al. (2021), who reported that CVD risk factors knowledge is linked to health-promoting behaviour (health, responsibility, nutrition) but indirectly via perceived benefits ($p < 0.012$) among the undergraduates. Align with Health Belief Model (HBM) that is validated by Lim, et al. (2021), who found that those who are knowledgeable would perceive higher benefits to reduce CVD risk and therefore have better preventive practice (Alyafei and Easton-Carr, 2025). Perceived benefit refers to an individual's belief in the effectiveness of specific actions to prevent illness (Alyafei and Easton-Carr, 2025). In accordance, Wang, et al. (2022) reported that perceived benefit is positively associated ($p<0.001$) with preventive behaviours against CVD. Although the current study did not measure perceived benefits, this theoretical pathway plausibly explains the direct significant association between knowledge and preventive practices concerning CVD risk factors. The current findings are consistent with a 6-month intervention-based educational study by Abdo, et al. (2019), which demonstrated significant increases in overall knowledge of CVD risk factors (rising from 58.3% pre-intervention to 99.2% post-intervention), alongside notable enhancements in health responsibility and dietary habits, all of which showed statistically significant improvements ($p<0.001$) among undergraduate students following the intervention. This indicates that health education and promotion related to CVD risk factors should

be continuously disseminated among university students, as increased awareness can enhance perceived benefits and lead to improved preventive practices (Abdo, et al., 2019; Lim, et al. 2021; Sterpetti, et al., 2024).

In contrast, Ibrahim, et al. (2016), Shahilin, et al. (2022) and Cammalleri, et al. (2023) found there is no association found between knowledge on CVD risk factors and the adoption of healthy behaviour ($p>0.05$) among the undergraduates, suggesting that competing academic and social obligations, sedentary lifestyles, inadequate dietary practices and elevated stress levels create systemic barriers that prevent students from translating CVD awareness into action (Ibrahim, et al., 2016; Shalihin, et al., 2022). These discrepancies may also be attributable to variations in regional factors, academic disciplines, measurement instruments, and scoring systems employed.

5.1.4 ASSOCIATION BETWEEN SOCIODEMOGRAPHIC FACTORS AND PREVENTIVE PRACTICE REGARDING CVD RISK FACTORS.

The result from current study shows that there is no significant association between sociodemographic factors (gender, body weight status, smoking status, faculty in university and family history of CVD) and preventive practice regarding CVD ($p>0.05$).

Shalihin, et al. (2022) found no significant association between gender and preventive practice ($p>0.05$) among university student, which is consistent with the current finding. In contrast, Khaw, et al. (2022) reported a significant association ($p<0.05$) between gender and preventive practice and found that young adults (aged 18 to 30 years), female were three times more likely to engage in healthier lifestyle behaviour than male. This finding is consistent with Najman, et al. (2024) and Antza, et al. (2023), who also found females have healthier lifestyle practices compared to males. This could be due to women tending to be more health-conscious, following a healthier diet, seeking and adhering to professional health advice more readily, and being less likely than men to engage in smoking and drinking habits (Khaw, et al., 2022). This in turn could be explained by females tending to have higher levels of conscientiousness, which is associated with positive health behaviour (Intiful, et al., 2019; Stieger, et al., 2020; Sutin, et al., 2016).

Shalihin, et al. (2022) and Woodman, et al. (2024) found no significant association ($p > 0.05$) between body weight status and preventive practices (nutritional, physical activity, and sedentary behaviour) regarding CVD risk factors among university students. In contrast, Szemik, et al. (2024) found a significant association ($p = 0.046$), with higher BMI linked to lower physical activity among university students. This aligns with a systematic review by Curran, et al. (2023), which found a consistent positive correlation ($p < 0.05$) between higher BMI and physical inactivity. Similarly, studies by Arslan, et al. (2023), Saujan, et al. (2024), and Xie, et al. (2020) reported significant

associations ($p < 0.05$) between higher BMI and increased fast food and unhealthy diet consumption among university students. These discrepancies may be due to differences in study design, cultural contexts, or use of measurement tools. However, the observed trends linking higher BMI to physical inactivity may be explained by greater physical limitations, lower cardiorespiratory fitness, and psychological barriers such as low confidence and negative self-perception in individuals with higher BMI (Curran, et al., 2023). Furthermore, the link between higher BMI and unhealthy food consumption may be explained by a neurobiological predisposition. Individuals with higher BMI often show stronger brain responses to food cues in the ventromedial prefrontal cortex (vmPFC), which is involved in reward processing. At the same time, they may have weaker executive control due to dorsolateral prefrontal cortex (dlPFC) dysfunction. This combination leads to difficulty resisting unhealthy food cravings, even after feeling full. In contrast, individuals with normal BMI tend to have stronger dlPFC activity, which helps them better regulate their food intake after eating (Du, et al., 2023).

The current finding aligns with Shalihin, et al. (2022) and Al-Othman, et al. (2021), who also reported no significant association ($p>0.05$) between smoking status and preventive behaviours on CVD risks factors among undergraduate students. In contrast, studies by Liu, et al. (2019) and Mansouri, et al. (2020) reported that smoking is associated with lower physical activity. Moreover, Ramón-Arbués, et al. (2021) and Mesas, et al. (2024) found that smoking is associated with poor diet quality and increased intake of ultra-processed food.

Smoking negatively affects cardiovascular and lung function, reducing cardiopulmonary endurance and VO_2max (maximum oxygen uptake), which makes physical activity, especially aerobic exercise, more difficult. As a result, smokers are less likely to engage in physical exercise compared to non-smokers (Acar, et al., 2024; Guo, 2023). These discrepancies may also be due to unequal distribution in the smoking status category in the current study, as well as differences in demographic factors, regional contexts, or research instruments used.

Falade and Yorke (2023) and Gallè, et al. (2020) reported no significant association ($p > 0.05$) between enrolment in health-related courses and preventive practices regarding CVD risk factors among university students. However, contrasting findings were observed in other studies. For instance, Chao (2023) found that students from health-related fields demonstrated significantly healthier lifestyle behaviours related to CVD prevention compared to those from non-health-related fields ($p = 0.04$). Similarly, Marendić, et al. (2024) reported that health science students exhibited significantly healthier lifestyles than their non-health science counterparts. Their study highlighted a twofold difference in adherence to the mediterranean diet (10.6% among health-science versus 5.9% non-health science, $p < 0.001$). Health science students were also more likely to prepare meals at home (41.1% vs. 28.5%; $p = 0.001$) and less reliant on canteen meals (70.5% compared to 21.0%; $p < 0.001$). Additionally, they engaged in regular physical activity more frequently ($p = 0.022$) and spent fewer hours sedentary ($p< 0.001$). Dietary analyses further revealed higher

consumption rates of olive oil, fruits, nuts, and fish among health science students. These favourable health behaviours may be attributed to the academic training of health-related students, who are being prepared for roles as future healthcare professionals. This training likely fosters a deeper internalisation of health as a concept of adaptability and functional well-being, which is reflected in their daily lifestyle practices (Marendić, et al., 2024). Furthermore, students in health-related programmes reported higher levels of Perceived Health Status (PHS) and Health Conception (HC), both of which are positively associated with enhanced health-promoting behaviours (Chao, 2023). The disparities in findings may also be attributed to differences in cultural context, regional factors, or the instruments used.

Similar to current finding, Garg, et al. (2022) found no significant association ($p > 0.05$) between family history of CVD and healthy behaviours related to CVD risk factors prevention among young adults in the general population (aged 20 to 44 years). In contrast, Lim, et al. (2021) reported a significant negative association ($p = 0.003$) between family history of CVD and health-promoting behaviours among university students, suggesting that fear of developing CVD, avoidance coping, lack of motivation, and time constraints may paradoxically hinder engagement in preventive practices. Conversely, Yang, et al. (2024) identified a positive association ($p < 0.001$) between family history of chronic diseases and preventive practices among middle school students, indicating that early awareness of familial health risks may foster health literacy and self-efficacy, thereby encouraging proactive health behaviours. These contrasting

findings may be attributed to differences in age groups, educational backgrounds, cultural beliefs, and the operational definitions of preventive practices employed across studies.

5.1.5 ASSOCIATION BETWEEN SOCIODEMOGRAPHIC FACTORS AND KNOWLEDGE REGARDING CVD RISK FACTORS

The findings from current finding demonstrated significant association between family history of CVD with knowledge regarding CVD risk factors. However no significant association were found between gender, body weight status, smoking status and faculty in university with knowledge regarding CVD risk factors.

Shalihin, et al. (2022) and Taiek, et al. (2024) found no significant association between gender and knowledge regarding CVD risk factors. In contrast, Yang, et al. (2024) reported a significant association among middle school students, with females (60.38%, n = 5,788) demonstrating better knowledge than males (52.98%, n = 4,315). Similarly, Othman, et al. (2020) found that young adult females exhibited higher knowledge compared to males. This difference is likely attributable to females placing greater importance on health (Yang, et al., 2024). Additionally, these inconsistencies may be explained by variations in sample populations, as prior studies focused on lower secondary education and community groups.

In alignment with Shahilin, et al. (2022), the current study found no significant association ($p > 0.05$) between BMI and CVD-risk knowledge. However, Güneş, et al. (2019) observed lower CVD-risk awareness among obese students compared to normal-weight peers in their Turkish university sample. This disparities in finding may stem from contextual or methodological factors such as differences in geographical location and weight-related stigma. Conversely, Muhihi, et al. (2020), who included young and older adults, reported that overweight/obese individuals had better CVD-risk knowledge than normal-weight peers ($p = 0.002$). This finding could reflect age-related dynamics, as older adults, who face higher CVD risk, may actively seek health information, thereby elevating knowledge levels in the overweight and obese subgroup (Di Novi, et al., 2024).

The current finding aligns with Shalihin et al. (2022) and Celebi, et al. (2021), who also reported no significant link between smoking status and knowledge regarding CVD risk factors ($p > 0.05$). In contrast, Sulaiman and Andsoy (2024) found a significant inverse association between smoking and CVD risk factor knowledge among young adults aged 18 to 27 years ($p < 0.05$), suggesting that smokers may underestimate or overlook CVD risks. These discrepancies may be attributed to methodological variations, cultural influences, differences in sample characteristics, and the unequal distribution of participants by smoking status in the present study.

Falade and Yorke (2023) reported that medical students were significantly more knowledgeable about CVD risk factors than their non-medical peers (69.5% vs. 25.6%, $p = 0.001$). Likewise, Estebsari, et al. (2024) and Cammalleri, et al. (2023) found that students enrolled in medical programs demonstrated superior awareness of CVD risk factors compared to those in non-medical fields ($p < 0.05$), underscoring the impact of structured health education in cultivating CVD literacy. By contrast, our "health sciences" cohort encompassed both clinical and non-clinical disciplines such as engineering, architecture, game development, early-childhood education, and quantity surveying, alongside traditional health programs. This broader categorization may have diluted the influence of health-specific curricula, which could explain the absence of a significant association between faculty affiliation and CVD risk factors knowledge in the current study.

Shalihin, et al. (2022) found that family history of CVD is significantly associated ($p < 0.05$) with knowledge regarding CVD risk factors among university students, which aligns with the current study. This finding is also consistent with Abdo, et al. (2019) and Yang, et al. (2024), who reported that students with a family history of CVD demonstrated significantly higher overall knowledge of CVD risk factors compared to those without such a history ($p < 0.05$). In contrast, Cammalleri, et al. (2023) reported no significant association between family history of CVD and knowledge related to the recognition of most CVD risk factors ($p < 0.05$). This discrepancy may be due to variations in the specific knowledge domains assessed. It is plausible that individuals with a family history of CVD are more likely to be motivated to adopt healthier

lifestyles, adhere to preventive medical advice, and seek health-related information, thereby enhancing their awareness of CVD risk factors (Abdo, et al., 2019; Yang, et al., 2024).

5.2 SUMMARY

This chapter critically reviewed prior research to examine three key areas: (1) undergraduate students' knowledge of CVD risk factors and their preventive practices; (2) the association between CVD knowledge and preventive behaviours; and (3) the influence of sociodemographic characteristics on both CVD knowledge and preventive practice. Chapter 6 will present the study's conclusions and offer recommendations for practice and future research.

CHAPTER 6
CONCLUSION AND RECOMMENDATION

6.0 STRENGTH AND LIMITATION

6.0.1 STRENGTH

This study achieved a 100% response rate through face-to-face data collection, minimizing non-response bias and enabling real-time clarification of participant queries to enhance response accuracy. Post-questionnaire feedback provided participants with immediate, actionable knowledge about CVD risk factors, fostering both data quality and educational value. Quota sampling ensured balanced representation across gender and faculty in university, bolstering the generalizability of findings within the university population. These methodological strategies not only strengthened internal validity but also identified students' specific informational gaps, directly informing the creation of targeted CVD educational materials, a critical foundation for designing effective campus health interventions.

6.0.2 LIMITATION

The use of quota sampling, while ensuring representation of key subgroups, is non-randomized and may introduce selection bias. The predominance of Chinese students, reflecting the university's demographics, limits generalizability to Malaysia's broader multiethnic population, including Malay, Indian, and Indigenous communities. Second, face-to-face data collection may have introduced social desirability bias, particularly for sensitive topics such as smoking and dietary habits. Third, reliance on self-reported measures for BMI, smoking status, and family history of CVD raises concerns about recall errors or intentional misreporting, potentially affecting data accuracy. Fourth, the cross-

sectional design restricts causal inference and limits assessment of changes in knowledge or preventive practices on CVD risk factors over time. Finally, the findings are context-specific to a Chinese-majority Malaysian university; institutions with different ethnic compositions or sociocultural contexts may yield divergent results due to variations in dietary norms, healthcare access, and health education policies.

6.1 IMPLICATIONS OF STUDY

This study provides valuable insights into undergraduate students' knowledge and preventive practices related to CVD risk factors, identifying key areas where misconceptions persist and where knowledge enhancement is needed. The findings contribute to the broader field of CVD education by pinpointing specific content that can guide the development of future educational materials tailored to university students and younger population. Additionally, the results highlight the importance of targeted CVD awareness campaigns to address these knowledge gaps and promote a more accurate understanding of CVD risk factors among younger populations. These findings may also serve as a foundation for future research, offering evidence to inform subsequent studies and interventions in similar populations.

6.2 RECOMMENDATION FOR FUTURE RESEARCH

For future research, adopting stratified random sampling is recommended to minimize selection bias and enhance the generalizability of findings. Additionally, recruiting participants from multiple institutions in both urban and rural and across diverse ethnic groups will further strengthen generalizability and enable meaningful cross-contextual comparisons. Employing longitudinal study designs is essential to establish causal relationships, monitor changes over time, and evaluate the sustained impact of interventions. Finally, incorporating objective measures such as calibrated weighing scales, stadiometers for accurate BMI assessment, and biochemical verification of smoking status will markedly improve data accuracy.

From a practical nursing standpoint, priority should be given to health promotion and preventive education by implementing campus-based workshops and targeted screening programs for CVD risk factors. These initiatives can improve knowledge on lifestyle modification strategies, identify high-risk individuals early, and facilitate timely intervention to prevent subclinical atherosclerosis. Furthermore, CVD awareness and knowledge can be enhanced through educational campaigns and accessible, evidence-based materials including brochures, digital platforms, and peer-led initiatives to support ongoing engagement with the latest CVD prevention strategies and management.

6.3 CONCLUSION

In conclusion, while slightly more than half (58.6%) of undergraduate students demonstrated good knowledge of CVD risk factors, a substantial proportion (41.4%) still exhibited insufficient knowledge. Additionally, over half (57.8%) reported inadequate preventive practices related to CVD risk factors. Statistically significant association were found between knowledge and preventive practice regarding CVD risk factors and family history of CVD with knowledge on CVD risk factors. Specifically, students with higher knowledge demonstrated better preventive practices on CVD risk factors, and those with a family history of CVD were significantly more knowledgeable on CVD risk factors. These findings highlight the need for targeted awareness programs to enhance knowledge and promote effective prevention strategies among young adults population, ultimately contributing to the reduction of premature CVD morbidity and mortality.

(10976 words)

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APPENDICES

APPENDIX A: CONSENT DECLARATION FORM

Written Consent Form
(Surat Perakuan)

Project Title:

A STUDY ON KNOWLEDGE AND PREVENTIVE PRACTICE REGARDING CARDIOVASCULAR DISEASE RISK FACTORS AMONG UNDERGRADUATE STUDENTS AT A HIGHER INSTITUTION IN KAJANG

I_____(NRIC no.)_____
(Name of volunteer in block letters)

have read or have been verbally explained by the researcher and understood all information given to me about my participation this study. I have been given the opportunity to discuss it and ask questions. All my questions have been answered to my satisfaction, and I voluntarily agree to take part in this study. I understand that I will receive a copy of this signed Written Informed Consent Form.

_____ _____
Signature of Participant Date

I have explained the nature and purpose of the study to the participants named above.

_____ _____ _____
*Signature of Researcher NRIC no Date

*Name of Researcher _____

_____ _____ _____
*Signature of Witness NRIC no Date

Name of Witness:_____

*Delete where necessary

APPENDIX B: RESEARCH INSTRUMENT

KNOWLEDGE AND PREVENTIVE PRACTICE REGARDING CARDIOVASCULAR DISEASE RISK FACTORS AMONG UNDERGRADUATE STUDENTS AT A HIGHER EDUCATION INSTITUTION IN KAJANG, SELANGOR

This set of questionnaires contains 3 sections: Section A, Section B and Section C. You must answer **ALL** questions as honest as possible**.**

SECTION A: SOCIODEMOGRAPHIC DATA

This section required your sociodemographic data. Please **tick (√) one** and **write the appropriate personal information** from the options provided.

1	Gender	( ) Male ( ) Female
2	Body weight status (Please **calculate your BMI** by dividing your **weight (kg)** by your **height (m^2)** using the formula provided. Then, tick the BMI category that matches your result) **Example:** **BMI** = $\frac{55\ (Kg)}{1.67^2\ (m^2)}$	( ) Underweight (BMI < 18.5 Kg/ m^2) ( ) Normal weight (BMI ≤ 22.9 Kg/m^2) ( ) Overweight/obese (BMI ≥ 23 Kg/m^2) BMI = $\frac{(Kg)}{(m^2)}$
3	Smoking status (**Tobacco products** include **smoked tobacco**: hand rolled cigarette, water pipes/Sisha hookah and etc **And** **smokeless tobacco** such as e-cigarette, chewing tobacco etc.)	( ) Current/Daily smoker (smoke at least 1 tobacco product **every day**, **over a period of one month and more**) ( ) Current/Occasional smoker (currently smokes but not every day **or** used to smoke daily but currently not every day) ( ) Non-smoker (Never smoked **or** former daily smoker **or** former occasional smoker)
4	Faculty in university	( ) MK-FMHS ( ) LKC-FES ( ) FAM ( ) FCI
5	Family history of cardiovascular disease (CVD) (Any blood-related family member that have or had history of any CVD; Example: **grandfather or auntie or father**) Example of CVDs: **Stroke, heart failure, heart attacks, heart artery blockage etc.**	( ) Yes ( ) No

SECTION B: KNOWLEDGE REGARDING CVD RISK FACTORS

This section consists of 14 questions **to seek your understanding** on cardiovascular disease (CVD) risk factors.

For your information (FYI): Cardiovascular diseases (CVDs) are a group of disorders of the **heart AND blood vessels. Heart attacks and strokes are usually acute events** and are mainly caused by a blockage that prevents blood from flowing to the heart or brain.

The example of CVDs includes Stroke, **Coronary artery disease** (build-up of fats, cholesterol or other substance in the heart arteries that reduce blood supply to the heart), **congenital heart disease** (birth defects of the heart from birth), **Rheumatic heart disease** (damage of the heart muscle and heart valves from bacterial infection; rheumatic fever) etc.

Please **tick (√)** "**True**" or "**False**"; if you are unsure about the correct answer, you may tick "**Don't know**".

No	Statement	True	False	Don't Know
1	Cardiovascular disease (CVD) is the leading cause of death in Malaysia.			
2	Light walking is a preventive factor for CVD.			
3	Engaging in adequate exercise can prevent CVD. (**Adequate exercise**: at least 150–300 minutes of moderate-intensity or 75–150 minutes of vigorous-intensity aerobic exercise per week **Example of moderate-intensity exercise**: jogging, bicycling, swimming, hiking. **Example of vigorous-intensity exercise that makes you huff and puff**: fast running, heavy lifting in gym, high impact aerobics, swimming laps, jumping rope)			
4	Consuming **at least** 2 servings of fruits **and** 3 servings of vegetables can prevent from CVD. (**Example of 1 serving of fruits**: 1 whole medium banana or 1 whole medium apple)			

	(**Example of 1 serving of vegetable**: ½ cups of cooked mixed vegetables)			
5	Most CVD cases are hereditary (**hereditary mean passed down through family genes**)			
6	Controlling high fat food consumption is essential.			
7	Irregular eating pattern is not harmful to your health. (Irregular eating pattern mean **inconsistent meal timing, skipping meals, or consuming food at varying intervals**)			
8	CVD is a disease that affect women only.			
9	Doing housework as an exercise is enough for a day.			
10	If you have a slim body, you do not need to exercise.			
11	CVD can occur to young people.			
12	High density lipoprotein (HDL) is a good type of cholesterol.			
13	BMI of more than 30 is considered as obese.			
14	Prayer can help to reduce stress.			

SECTION C: PREVENTIVE PRACTICE REGARDING CVD RISK FACTORS

This section contains 26 questions to **assess your lifestyle habits related to CVD risk factor prevention**. Please **tick (√)** the option that **best reflects your usual lifestyle choice.**

Never = has **never engage** in the specific preventive practice.

Sometimes = engage in the specific preventive practice **occasionally without clear pattern.**

Often = engage in the specific preventive practice **frequently with some variation in pattern.**

Routinely = engage in the specific preventive practice **consistently and systematically.**

		Never	Sometimes	Often	Routinely
1	Choose a diet low in fat, and cholesterol. (**Example:** choose lean chicken meat, fish, tofu, limit used of oil during cooking, avoid fried food, avoid red meat like beef and pork, avoid use of butter and margarine, avoid organ meat like liver)				
2	Report any unusual signs or symptoms to a physician or other health professional.				
3	Follow a planned exercise program.				
4	Limit use of sugars, foods containing sugar. (**Example**: candy, desserts like cookies, ice cream and cakes, energy drink, sports drink, sodas).				
5	Read or watch TV programs about improving health.				
6	Exercise vigorously for 20 or more minutes at least three times a week. (**Example of vigorous exercise that makes you huff and puff**: fast running, heavy lifting in gym, high impact aerobics, swimming laps, jumping rope)				

7	Eat 6–11 servings of bread, cereal rice or pasta each day. (**Example of 1 serving of grain products** : 1/2 cup of cooked rice/cereals/pasta about a size of a tennis ball **or** 1 slice of bread)				
8	Enquire health professionals to understand their instructions. (**Example**: asking for clarification on lifestyle changes, CVD risk factors, CVD signs and symptoms, medication adherence and regularity of health screening)				
9	Take part in light to moderate physical activity. (**Example:** sustained walking for 30–40 minutes, 5 or more times a week, jogging)				
10	Eat 2–4 servings of fruits each day. (**Example of 1 serving of fruits:** 1 whole medium banana **or** 1 whole medium apple)				
11	Get a second opinion when I questioned my healthcare provider's advice.				
12	Take part in leisure-time/free-time (recreational) physical activities. (**Example:** going for a slow walk, stairs walking, slow bicycling, yoga, stretching)				
13	Eat 3–5 servings of vegetables each day. (**Example of 1 serving of vegetable:** ½ cups of cooked mixed vegetables)				
14	Discuss my health concerns with health professionals.				

15	Do stretching exercises at least 3 times a week.				
16	Eat 2–3 servings of milk, yogurt, or cheese each day. (**Example of 1 serving of milk and milk products:** 1 glass of milk **or** 2 slices of cheese)				
17	Inspect my body for physical changes/danger signs at least once a month.				
18	Get exercise during usual daily activities. (**Example:** walking during lunch, using stairs instead of elevators, parking car away from destination and walking).				
19	Eat only 2–3 servings from meat, poultry, fish, dried beans, eggs, and nuts group each day. (**Example of 1 serving of meat, poultry, fish, eggs and nuts group:** 1 medium chicken drumstick **or** 1 palm size lean beef **or** 2 chicken eggs **or** 1 medium Indian mackerel fish **or** 1 ½ square pieces tauhu)				
20	Ask for more information from health professionals about how to take care of myself.				
21	Check my pulse rate when exercising.				
22	Read labels to identify nutrients, fats, and sodium content in packaged food.				

23	Attending educational programs on personal healthcare.				
24	Reach standardised target heart rate when exercising. (For 18 to 29-years old, **during moderate-intensity exercise** should reach 96-141 beat per minute; **vigorous-intensity exercise** should reach 134-172 beats per minute)				
25	Eat breakfast. (The first meal of the day **within 2 hours after waking up OR before 10 a.m.**; coffee, water and non-alcohol beverage is **NOT** included in the food group for breakfast)				
26	Seek guidance or counselling when necessary. (**Example:** health care professional, counsellors, friends or family).				

APPENDIX C: COVER LETTER FOR RECRUITMENT

COVER LETTER OF RECRUITMENT

Dear Participant:

My name is Carolyn Ang Wei San, a final-year undergraduate student from Universiti Tunku Abdul Rahman (UTAR), Sungai Long campus. I am currently conducting a research study entitled: "Knowledge and Preventive Practice Regarding Cardiovascular Disease (CVD) Risk Factors Among Undergraduate Students at a Higher Education Institution in Kajang, Selangor." The aim of this study is to assess the knowledge and preventive practices related to CVD risk factors among undergraduate students.

If you are an undergraduate student at UTAR, Sungai Long, and do not have any heart-related health issue, consent and are able to participate in this study. I am inviting you to participate in this study by completing the attached questionnaire.

The questionnaire comprises three sections and will take approximately 10 minutes to complete. There are no known risks or monetary compensation associated with your participation. Your identity and responses will remain anonymous, and all collected data will be treated with strict confidentiality. Participation is entirely voluntary, and you may withdraw from the study at any time without facing any consequences. If you have decided to participate in this survey, please answer all questions as honestly as possible.

Thank you for taking the time to assist me in the research. Your input is valuable and will contribute significantly to future research and the development of effective strategies aimed at enhancing knowledge and preventive practices concerning CVD risk factors among undergraduate students in Kajang, Selangor. Feedback and information will be provided to all research participants for educational purposes after the study. Your participation is sincerely appreciated.

Yours sincerely,

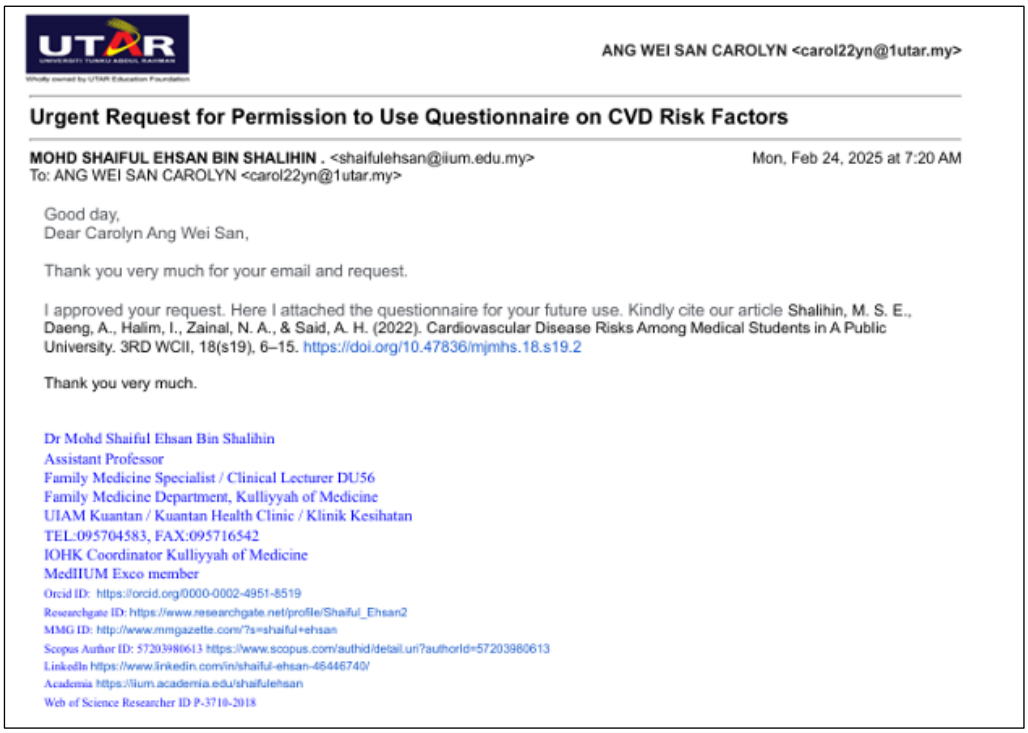
CAROLYN

……..

(Carolyn Ang Wei San)

(Carol22yn@1utar.my)

APPENDIX D: PERMISSION FOR USE OF INSTRUMENTS FROM AUTHORS



ANG WEI SAN CAROLYN <carol22yn@1utar.my>

Urgent Request for Permission to Use Questionnaire on CVD Risk Factors

MOHD SHAIFUL EHSAN BIN SHALIHIN . <shaifulehsan@iium.edu.my> Mon, Feb 24, 2025 at 7:20 AM
To: ANG WEI SAN CAROLYN <carol22yn@1utar.my>

Good day,
Dear Carolyn Ang Wei San,

Thank you very much for your email and request.

I approved your request. Here I attached the questionnaire for your future use. Kindly cite our article Shalihin, M. S. E., Daeng, A., Halim, I., Zainal, N. A., & Said, A. H. (2022). Cardiovascular Disease Risks Among Medical Students in A Public University. 3RD WCII, 18(s19), 6–15. https://doi.org/10.47836/mjmhs.18.s19.2

Thank you very much.

Dr Mohd Shaiful Ehsan Bin Shalihin
Assistant Professor
Family Medicine Specialist / Clinical Lecturer DU56
Family Medicine Department, Kulliyyah of Medicine
UIAM Kuantan / Kuantan Health Clinic / Klinik Kesihatan
TEL:095704583, FAX:095716542
IOHK Coordinator Kulliyyah of Medicine
MedIIUM Exco member
Orcid ID: https://orcid.org/0000-0002-4951-8519
Researchgate ID: https://www.researchgate.net/profile/Shaiful_Ehsan2
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LinkedIn https://www.linkedin.com/in/shaiful-ehsan-46446740/
Academia https://iium.academia.edu/shaifulehsan
Web of Science Researcher ID P-3710-2018

ANG WEI SAN CAROLYN <carol22yn@1utar.my>

Urgent Request for Permission to Use Questionnaire on CVD Risk Factors

ANG WEI SAN CAROLYN <carol22yn@1utar.my> Sun, Feb 23, 2025 at 9:40 PM
To: shaifulehsan@iium.edu.my

Dear,
Dr Mohd Shaiful.

I hope this email finds you well. My name is Carolyn Ang Wei San, and I am a final-year Bachelor of Nursing student at Universiti Tunku Abdul Rahman (UTAR). I am reaching out to request permission to use the "Knowledge on CVD Risk Factors and Preventive Measures" questionnaire, which you adapted from Ibrahim et al. (2016) in your research paper titled "Cardiovascular Disease Risks Among Medical Students in a Public University."

As part of my Final Year Project (FYP), I am conducting a study titled "A Study on Knowledge and Preventive Practice Regarding Cardiovascular Disease Risk Factors Among Undergraduate Students at a Higher Institution in Kajang." Currently, I am in Week 3, which involves conducting a pilot test. Unfortunately, I have been asked to revise my research instrument. Upon reviewing various options, I came across your questionnaire and found it highly relevant to my study objectives.

I would like to formally request your permission to use the questionnaire in my research, as it closely aligns with my study's themes and variables. I am confident that incorporating it will enhance the quality and depth of my findings.

I assure you that the questionnaire will be used exclusively for this research project, and any data collected will be handled with the utmost confidentiality. Additionally, the questionnaire will not be shared or used for any other purposes without your explicit consent.

If you grant permission, I am happy to comply with any conditions you may have regarding its use, such as citation requirements or providing a copy of my final research report. I deeply respect your work and am committed to adhering to any terms you specify.

Thank you for your time and consideration. I would be happy to provide further details about my study or answer any questions you may have. I look forward to your positive response.

Best regards,
Student Carolyn Ang Wei San
(University Tunku Abdul Rahman, Sungai Long, Malaysia)

ANG WEI SAN CAROLYN <carol22yn@1utar.my>

Re: Request permission to use HLPL-II questionnaires that only consist of 3 domains (Nutrition, Physical activity, Health Responsibility)

Kueh Yee Chang <yckueh@usm.my> Tue, Dec 12, 2023 at 10:05 AM
To: ANG WEI SAN CAROLYN <carol22yn@1utar.my>

Dear Ang,
You are welcome to use the questionnaire. There is another full Malay version for HLPL-II. You may want to use the full version. https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-019-7109-2. The questionnaire you can obtain from BMC.

Psychometric properties of the health-promoting lifestyle profile II: cross-cultural validation of the Malay language version - BMC Public Health

Background Health-promoting behaviour is an important concept for health education. Unfortunately, there is a dearth of validated instruments to measure levels of health-promoting behaviour in the Malaysian context. The purpose of this study was to validate a Malay-language version of the Health-Promoting Lifestyle Profile II (HPLP-II)

bmcpublichealth.biomedcentral.com

Regards,
Kueh Yee Chang (Erica), PhD | Lecturer
Biostatistics & Research Methodology Unit
School of Medical Sciences
UNIVERSITI SAINS MALAYSIA
16150 Kubang Kerian, Kelantan, Malaysia

T +609 767 6159
E yckueh@usm.my

Google Scholar ID: bqx7x4AAAAAJ&hl=en
ORCID: 0000-0003-2125-7297
ResearcherID: N-3991-2015

Academic editor, PLOS ONE
Editorial board member, Scientific Reports
Statistics editor, The Malaysian Journal of Medical Sciences

APPENDIX E: ETHICAL CLEARANCE APPROVAL LETTER

UNIVERSITI TUNKU ABDUL RAHMAN
Wholly Owned by UTAR Education Foundation (Company No. 578227-M)

Re: U/SERC/78-475/2025

12 March 2025

Ms Liew Siew Fun
Head, Department of Nursing
M. Kandiah Faculty of Medicine and Health Sciences
Universiti Tunku Abdul Rahman
Jalan Sungai Long
Bandar Sungai Long
43000 Kajang, Selangor

Dear Ms Liew,

Ethical Approval For Research Project/Protocol

We refer to your application for ethical approval for your student's research project from Bachelor of Nursing (Honours) programme enrolled in course UMNE4024. We are pleased to inform you that the application has been approved under Expedited Review.

The details of the research projects are as follows:

No	Research Title	Student's Name	Supervisor's Name	Approval Validity
1.	A Study on Knowledge and Preventive Practice Regarding Cardiovascular Disease Risk Factors Among Undergraduate Students at a Higher Institution in Kajang	Carolyn Ang Wei San	Ms Liew Siew Fun	12 March 2025 – 11 March 2026

The conduct of this research is subject to the following:

(1) The participants' informed consent be obtained prior to the commencement of the research;

(2) Confidentiality of participants' personal data must be maintained; and

(3) Compliance with procedures set out in related policies of UTAR such as the UTAR Research Ethics and Code of Conduct, Code of Practice for Research Involving Humans and other related policies/guidelines.

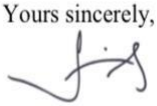
(4) Written consent be obtained from the institution(s)/company(ies) in which the physical or/and online survey will be carried out, prior to the commencement of the research.

Kampar Campus : Jalan Universiti, Bandar Barat, 31900 Kampar, Perak Darul Ridzuan, Malaysia
Tel: (605) 468 8888 **Fax**: (605) 466 1313
Sungai Long Campus : Jalan Sungai Long, Bandar Sungai Long, Cheras, 43000 Kajang, Selangor Darul Ehsan, Malaysia
Tel: (603) 9086 0288 **Fax**: (603) 9019 8868
Website: www.utar.edu.my

Should the students collect personal data of participants in their studies, please have the participants sign the attached Personal Data Protection Statement for records.

Thank you.

Yours sincerely,



Professor Ts Dr Faidz bin Abd Rahman
Chairman
UTAR Scientific and Ethical Review Committee

c.c Dean, M. Kandiah Faculty of Medicine and Health Sciences
Director, Institute of Postgraduate Studies and Research

Kampar Campus : Jalan Universiti, Bandar Barat, 31900 Kampar, Perak Darul Ridzuan, Malaysia
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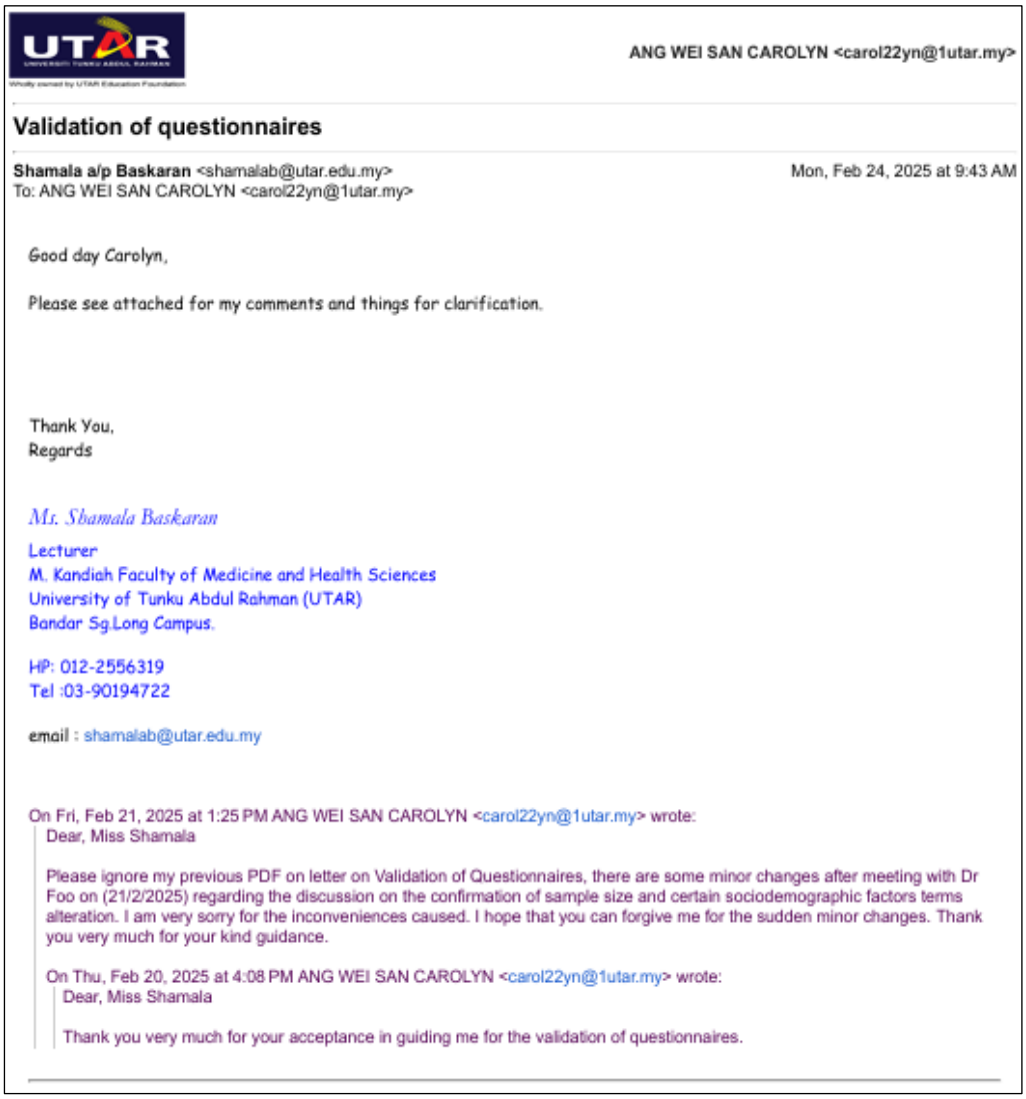
APPENDIX F: RESEARCH INSTRUMENT CONTENT VALIDATION



ANG WEI SAN CAROLYN <carol22yn@1utar.my>

Validation of questionnaires

Shamala a/p Baskaran <shamalab@utar.edu.my> Mon, Feb 24, 2025 at 9:43 AM
To: ANG WEI SAN CAROLYN <carol22yn@1utar.my>

Good day Carolyn,

Please see attached for my comments and things for clarification.

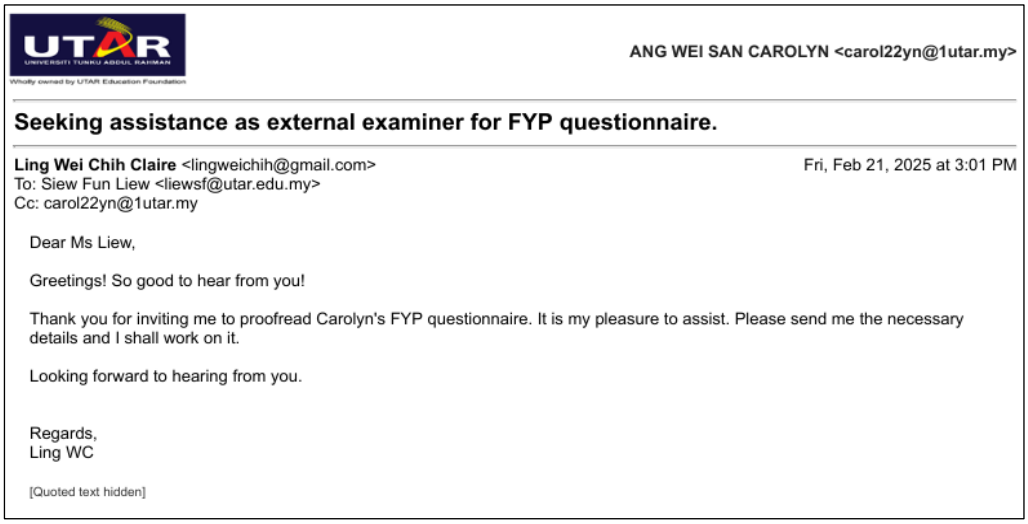
Thank You,
Regards

Ms. Shamala Baskaran
Lecturer
M. Kandiah Faculty of Medicine and Health Sciences
University of Tunku Abdul Rahman (UTAR)
Bandar Sg.Long Campus.

HP: 012-2556319
Tel :03-90194722

email : shamalab@utar.edu.my

On Fri, Feb 21, 2025 at 1:25 PM ANG WEI SAN CAROLYN <carol22yn@1utar.my> wrote:
> Dear, Miss Shamala
>
> Please ignore my previous PDF on letter on Validation of Questionnaires, there are some minor changes after meeting with Dr Foo on (21/2/2025) regarding the discussion on the confirmation of sample size and certain sociodemographic factors terms alteration. I am very sorry for the inconveniences caused. I hope that you can forgive me for the sudden minor changes. Thank you very much for your kind guidance.
>
> On Thu, Feb 20, 2025 at 4:08 PM ANG WEI SAN CAROLYN <carol22yn@1utar.my> wrote:
> > Dear, Miss Shamala
> >
> > Thank you very much for your acceptance in guiding me for the validation of questionnaires.



ANG WEI SAN CAROLYN <carol22yn@1utar.my>

Seeking assistance as external examiner for FYP questionnaire.

Ling Wei Chih Claire <lingweichih@gmail.com> Fri, Feb 21, 2025 at 3:01 PM
To: Siew Fun Liew <liewsf@utar.edu.my>
Cc: carol22yn@1utar.my

Dear Ms Liew,

Greetings! So good to hear from you!

Thank you for inviting me to proofread Carolyn's FYP questionnaire. It is my pleasure to assist. Please send me the necessary details and I shall work on it.

Looking forward to hearing from you.

Regards,
Ling WC

[Quoted text hidden]

APPENDIX G: PERSONAL DATA PROTECTION STATEMENT

PERSONAL DATA PROTECTION NOTICE

Please be informed that in accordance with Personal Data Protection Act 2010 ("PDPA") which came into force on 15 November 2013, Universiti Tunku Abdul Rahman ("UTAR") is hereby bound to make notice and require consent in relation to collection, recording, storage, usage and retention of personal information.

1. Personal data refers to any information which may directly or indirectly identify a person which could include sensitive personal data and expression of opinion. Among others it includes:

   a) Name
   b) Identity card
   c) Place of Birth
   d) Address
   e) Education History
   f) Employment History
   g) Medical History
   h) Blood type
   i) Race
   j) Religion
   k) Photo
   l) Personal Information and Associated Research Data

2. The purposes for which your personal data may be used are inclusive but not limited to:

   a) For assessment of any application to UTAR
   b) For processing any benefits and services
   c) For communication purposes
   d) For advertorial and news
   e) For general administration and record purposes
   f) For enhancing the value of education
   g) For educational and related purposes consequential to UTAR
   h) For replying any responds to complaints and enquiries
   i) For the purpose of our corporate governance
   j) For the purposes of conducting research/ collaboration

3. Your personal data may be transferred and/or disclosed to third party and/or UTAR collaborative partners including but not limited to the respective and appointed outsourcing agents for purpose of fulfilling our obligations to you in respect of the purposes and all such other purposes that are related to the purposes and also in providing integrated services, maintaining and storing records. Your data may be shared when required by laws and when disclosure is necessary to comply with applicable laws.

4. Any personal information retained by UTAR shall be destroyed and/or deleted in accordance with our retention policy applicable for us in the event such information is no longer required.

5. UTAR is committed in ensuring the confidentiality, protection, security and accuracy of your personal information made available to us and it has been our ongoing strict policy to ensure that your personal information is accurate, complete, not misleading and updated. UTAR would also ensure that your personal data shall not be used for political and commercial purposes.

Consent:

6. By submitting or providing your personal data to UTAR, you had consented and agreed for your personal data to be used in accordance to the terms and conditions in the Notice and our relevant policy.

7. If you do not consent or subsequently withdraw your consent to the processing and disclosure of your personal data, UTAR will not be able to fulfill our obligations or to contact you or to assist you in respect of the purposes and/or for any other purposes related to the purpose.

8. You may access and update your personal data by writing to us at_____.

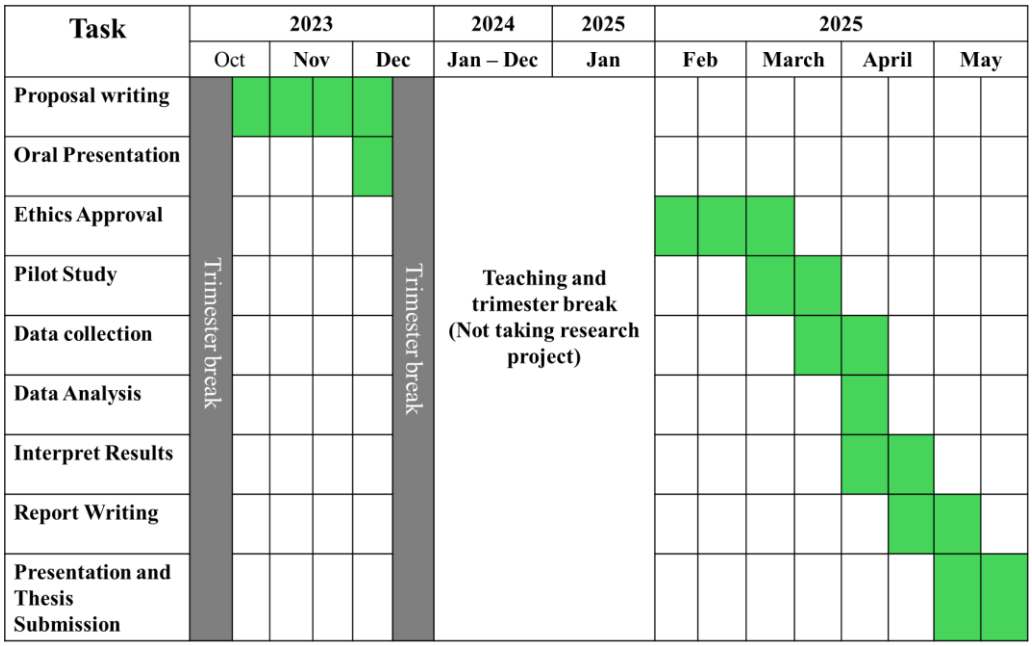
Acknowledgment of Notice

[ ] I have been notified and that I hereby understood, consented and agreed per UTAR above notice.

[ ] I disagree, my personal data will not be processed.

.....
Name:
Date:

APPENDIX H: GANTT CHART



APPENDIX I: TURNITIN ORIGINALITY REPORT

FYP 2025 2ND T.pdf

ORIGINALITY REPORT

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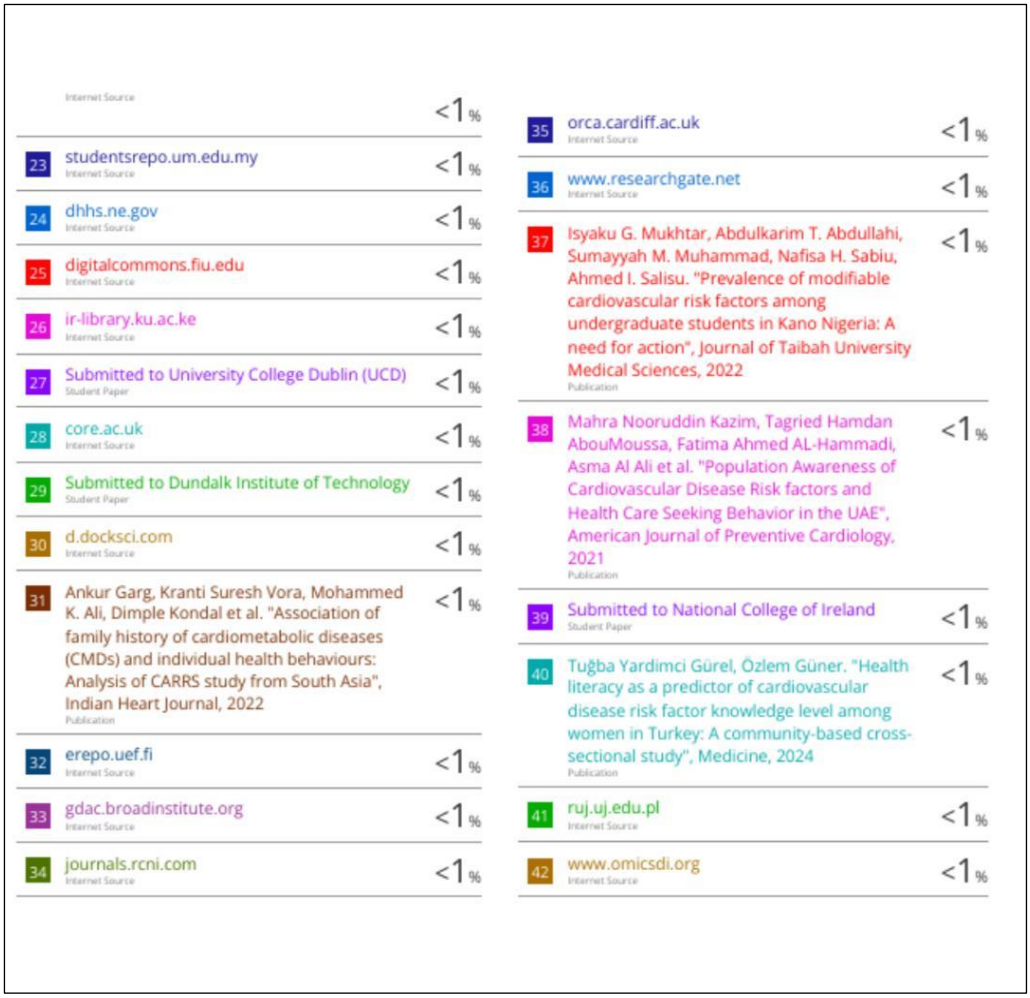

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38 Mahra Nooruddin Kazim, Tagried Hamdan AbouMoussa, Fatima Ahmed AL-Hammadi, Asma Al Ali et al. "Population Awareness of Cardiovascular Disease Risk factors and Health Care Seeking Behavior in the UAE", American Journal of Preventive Cardiology, 2021 Publication <1%

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44 Sheetal Bhandari, Manish Rajbanshi, Nabin Adhikari, Richa Aryal, Kshitij Kunwar, Rajan Paudel. "Knowledge, attitude, and practice regarding dengue among non-health undergraduate students of Nepal", PLOS Neglected Tropical Diseases, 2024 Publication <1%
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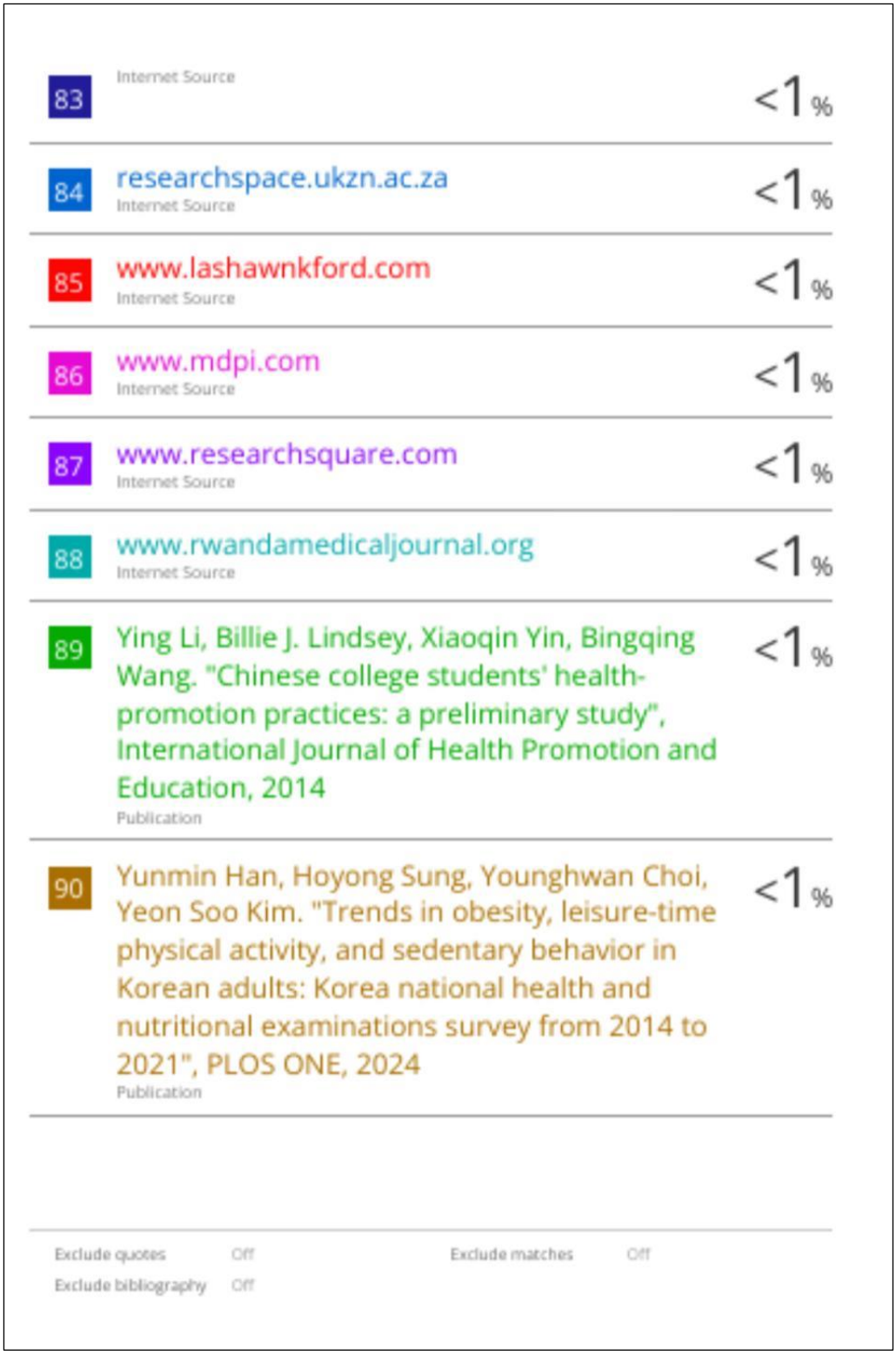
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90 Yunmin Han, Hoyong Sung, Younghwan Choi, Yeon Soo Kim. "Trends in obesity, leisure-time physical activity, and sedentary behavior in Korean adults: Korea national health and nutritional examinations survey from 2014 to 2021", PLOS ONE, 2024 Publication <1%
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