DISSERTATION FOR THE DEGREE OF DOCTOR OF PHILOSOPHY (PHD)

Health Awareness and Epidemiology of Cardiometabolic Diseases and Influenza Vaccine

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University of Debrecen
Kálmán Laki Doctoral School
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Table of Contents

List of tables ..... **i**

List of abbreviations ..... **ii**

Chapter 1: Introduction **1**

1.1 Background and rationale 1

1.1.1 The increasing prevalence of cardiometabolic diseases 1

1.1.2 Importance of influenza vaccination and its low uptake 1

1.1.3 The need to assess and compare awareness, attitudes, and preventive behaviors in different health contexts 3

1.2 Research objectives 4

1.3 Research questions 4

1.4 Significance of the study 4

1.4.1 Public health policy and educational interventions 4

1.4.2 Contribution to the literature 5

Chapter 2: Literature review **6**

2.1 Cardiometabolic diseases 6

2.1.1 Global and regional prevalence and impact 6

2.1.2 Factors influencing awareness and preventive behaviors 9

2.2 Influenza and vaccination 10

2.2.1 Global and regional impact of seasonal influenza 10

2.2.2 Factors influencing vaccine uptake 11

2.3 Comparative analysis of health awareness and preventive behaviors 13

2.3.1 Commonalities and differences 13

2.3.2 Implications for public health interventions 14

2.4 Theoretical framework 14

2.4.1 Health belief model 14

2.4.2 Theory of planned behavior 14

2.4.3 Integrated behavioral model 15
Chapter 3: Methodology **16**
3.1. Study design 16
3.2. Sampling and sample size 16
3.2.1 Sample size calculation for CMD study in southern Vietnam 16
3.2.2 Sampling method for CMD study in southern Vietnam 16
3.2.3 Sample size calculation for influenza vaccine study in northern Vietnam 17
3.2.4 Sampling method for influenza vaccine study in northern Vietnam 17
3.3 Questionnaire 18
3.3.1 Interview-based questionnaire for CMD study 18
3.3.2 Anonymous online survey for influenza vaccine study 18
3.4 Data and data analysis 19
3.4.1 CMD study 19
3.4.2 Influenza vaccine study 20
3.5 Statistical methods used for analysis 21
3.6 Ethical considerations 21
3.6.1 Ethical approvals 21
3.6.2 Informed consent 21
Chapter 4: Results **22**
4.1 CMD awareness and preventive behaviors 22
4.2 Influenza vaccine uptake 36
Chapter 5: Discussion **50**
5.1 Interpretation of findings 50
5.1.1 Low awareness and preventive behaviors for CMD 50
5.1.2 Low awareness on influenza vaccine leads to low vaccination rate 51
5.2 Comparison with existing literature 51
5.2.1 CMD awareness and preventive behaviors 51

5.2.2 Influenza vaccination 53
5.3 Public health implications 55
5.3.1 CMD awareness and preventive behaviors 55
5.3.2 Influenza vaccination 56
5.4 Strengths and limitations 58
5.4.1 Strengths 58
5.4.2 Limitations 58
5.5 Recommendations for future research 59
5.6 Practical recommendations 60
5.6.1 CMD awareness and preventive behaviors 60
5.6.2 Influenza vaccination 60
Chapter 6: Conclusion **62**
Chapter 7: New findings **63**
Chapter 8: Summary **65**
References **66**
Acknowledgement **92**
Appendices **93**

List of tables

Table 1: Characteristics of participants 22
Table 2: KAB and awareness of participants on CMDs 24
Table 3: General knowledge on CMDs of the participants 25
Table 4: Attitude of the participants regarding CMDs 27
Table 5: Preventive behavior of the participants regarding CMDs 29
Table 6: Awareness of the participants regarding CMDs 31
Table 7: Multiple binary logistic regression results on factors influencing awareness 33
Table 8: Association between knowledge, attitude, behavior by multiple binary logistic regression models (adjusted for age, gender, education, employment, BMI, and CMD status) 34
Table 9: Sociodemographic characteristics of the participants 36
Table 10: Knowledge, attitude, and vaccination status of the participants 38
Table 11: Participants' willingness and belief in vaccination 41
Table 12: Multiple binary logistic regression on factors influencing KAB regarding influenza vaccine 44
Table 13: Multiple binary logistic regression on factors influencing vaccine practice of the participants 47

List of abbreviations

95% CI	: 95% Confidence Interval
BMI	: Body Mass Index
CDC	: Centers for Disease Control and Prevention
CMD	: Cardiometabolic disease
CVD	: Cardiovascular disease
DBP	: Diastolic Blood Pressure
Fluarix	: Fluarix Quadrivalent Influenza Vaccine
HBM	: Health Belief Model
HCW	: Healthcare workers
HTN	: Hypertension
IBM	: Integrated Behavioral Model
IDF	: International Diabetes Federation
IHME	: Institute for Health Metrics and Evaluation
Inflexal V	: Inflexal Trivalent Influenza Vaccine
Influvac	: Influvac Quadrivalent Influenza Vaccine
KAP	: Knowledge, attitudes, and practices
LMICs	: Low- and middle-income countries
NCD	: Non-communicable disease
OR	: Odd ratio
QIV	: Quadrivalent Influenza Vaccine
SBP	: Systolic Blood Pressure
SD	: Standard deviation
SES	: Socioeconomic status
T2DM	: type 2 diabetes mellitus
TIV	: Trivalent Influenza Vaccine
TPB	: Theory of Planned Behavior
UNICEF	: United Nations Children’s Fund
Vaxigrip	: Vaxigrip Quadrivalent Influenza Vaccine
WHO	: World Health Organization

Chapter 1: Introduction

1.1 Background and rationale

1.1.1 The increasing prevalence of cardiometabolic diseases

Cardiometabolic diseases (CMDs), encompassing conditions such as type 2 diabetes mellitus (T2DM) and hypertension, are rapidly becoming a major health concern in developing countries (1,2). The rising prevalence of these diseases is primarily attributed to changes in lifestyle and diet that accompany economic development and urbanization (3,4). In developing countries, urbanization leads to a sedentary lifestyle, increased consumption of processed foods, and higher rates of obesity, all of which are risk factors for CMDs (5,6).

According to the World Health Organization (WHO), non-communicable diseases (NCDs), which include CMDs, are responsible for 41 million deaths each year, accounting for 74% of all deaths globally (7). Of these, 77% occur in low- and middle-income countries (LMICs) (7,8). In Southeast Asia, the prevalence of T2DM and hypertension is increasing at an alarming rate, leading to a significant public health burden (9,10). Vietnam, a rapidly developing country in this region, mirrors these global trends (11).

In Vietnam, the incidence of CMDs has risen sharply over the past few decades (11,12). This increase is partly due to the country's economic growth, which has led to significant changes in lifestyle and dietary patterns (12). The traditional Vietnamese diet, which was once rich in vegetables and low in fats, is increasingly being replaced by a diet high in processed foods, sugars, and fats, together with decreased physical activity, these dietary changes have contributed to higher rates of obesity, T2DM, and hypertension (12–14).

The growing burden of CMDs in Vietnam presents a significant challenge for the healthcare system, which is already grappling with the dual burden of infectious diseases and NCDs. Despite advancements in medical care and infrastructure, the healthcare system in Vietnam still struggles with limited resources and accessibility issues, particularly in rural areas (12,15–17). Public awareness and preventive behaviors play a crucial role in managing CMDs, yet studies indicate that awareness levels are generally low (18–20).

1.1.2 Importance of influenza vaccination and its low uptake

Seasonal influenza remains a persistent threat to global health, causing significant morbidity and mortality each year (21–23). The burden of influenza extends beyond the direct morbidity and mortality associated with the infection itself; the virus often triggers exacerbation of existing health conditions, particularly in vulnerable populations. These include the elderly,

young children, pregnant women, and individuals with chronic health conditions, such as CMDs, which encompass hypertension, diabetes, and cardiovascular disease (CVD) (24–26).

The influenza virus is highly contagious, transmitted via droplets when an infected person coughs or sneezes, and its ability to spread rapidly contributes to annual epidemics. This poses significant challenges in preventing widespread transmission (27). The severity of influenza infection varies, but it can lead to severe respiratory illnesses such as pneumonia, bronchitis, and acute respiratory distress syndrome, particularly in at-risk groups (27).

Individuals with chronic health conditions, especially those with CMDs, are particularly vulnerable during influenza seasons (28). Research indicates that the risk of complications, including hospitalization and death, is significantly higher in patients with underlying cardiometabolic conditions (26). For example, influenza infection can exacerbate cardiovascular problems, leading to events such as heart attacks and strokes (29). Studies have found that individuals with heart disease are up to six times more likely to suffer a heart attack during the week following an influenza infection (30). Similarly, patients with diabetes are more prone to experiencing severe complications from influenza due to their compromised immune systems and increased susceptibility to infections (31,32).

During influenza epidemics, there is often a marked increase in excess mortality, particularly among those with CMDs (33). These patients are more likely to experience severe outcomes due to both the direct impact of the virus and the exacerbation of their pre-existing conditions (26,34). The interaction between CMDs and influenza underscores the importance of preventive measures, such as vaccination, which has been shown to reduce the severity of illness and prevent many of the life-threatening complications associated with influenza infection (33).

Moreover, the COVID-19 pandemic further highlighted the risks that infectious diseases pose to individuals with CMDs (35). Fatality rates were particularly high among cardiometabolic patients during the pandemic, as they were more likely to experience severe illness, hospitalization, and death due to the virus (36). This experience has highlighted the importance of preventive health measures such as vaccination, not just against COVID-19 but also against other respiratory infections like influenza (37). The high mortality rates observed among CMD patients during the COVID-19 pandemic make it imperative to promote health education and vaccination campaigns targeting these vulnerable groups (36, 37).

Given the shared risk factors and the vulnerability of CMD patients, influenza vaccination is crucial (24–26). Vaccination not only helps prevent the onset of influenza but also reduces the

risk of triggering severe cardiometabolic events (33). However, despite the clear benefits, influenza vaccine uptake remains low in many regions, including Vietnam (38,39).

In Vietnam, the overall vaccination coverage is low, even among healthcare worker (HCW) and medical students who are at higher risk of exposure (38,39). Several factors contribute to this low uptake, including lack of awareness about the vaccine's benefits, misconceptions about the vaccine's efficacy and safety, cultural beliefs, and logistical challenges such as vaccine availability and access (39–42).

HCW and medical students play a pivotal role in influenza prevention and control. As frontline health professionals, they are not only at increased risk of contracting and transmitting the virus, but also serve as key influencers of public health behaviors (43–46). Their attitudes and practices regarding influenza vaccination can significantly impact the broader population's acceptance and uptake of the vaccine (47,48). Therefore, understanding their knowledge, attitudes, and practices (KAP) towards influenza vaccination is critical for designing effective public health interventions (49).

1.1.3 The need to assess and compare awareness, attitudes, and preventive behaviors in different health contexts

CMDs and influenza represent two distinct but significant public health challenges. While CMDs are chronic conditions that develop over time due to lifestyle factors, influenza is an acute infectious disease that can spread rapidly within communities. Both conditions, however, share commonalities in terms of the need for public awareness and preventive health behaviors (29,50–52). Effective management and prevention of these health issues require a well-informed public that engages in proactive health measures.

Assessing and comparing awareness, knowledge, attitudes, and preventive behaviors related to CMDs and influenza vaccination in Vietnam can provide valuable insights into the public's health knowledge and behaviors (18,20,49,53). By understanding the factors that influence these behaviors, public health authorities can develop targeted interventions to address specific barriers and facilitators. This comparative approach can help identify common themes and unique challenges associated with each health condition, thereby informing more comprehensive and integrated public health strategies.

1.2 Research objectives

This research aims to bridge the gap in understanding the awareness and preventive behaviors regarding CMDs and influenza vaccination in Vietnam by pursuing the following objectives:

1. To assess the level of awareness, knowledge, attitudes, and preventive behaviors concerning CMDs among a selected population in Ho Chi Minh City.
2. To evaluate the knowledge, attitudes, and practices regarding influenza vaccine uptake among medical students and HCW in northern Vietnam.
3. To identify sociodemographic factors that influence awareness and preventive behaviors in both health contexts.
4. To provide evidence-based recommendations for improving health education and intervention programs targeting CMDs and influenza vaccination.

1.3 Research questions

To achieve the outlined objectives, the study addresses the following research questions:

1. What is the level of awareness, knowledge, attitude, and preventive behavior regarding CMDs in the selected population in Ho Chi Minh City?
2. What is the level of knowledge, attitude, and practice regarding influenza vaccine uptake among medical students and HCW in northern Vietnam?
3. What sociodemographic factors are associated with awareness and preventive behaviors in both health contexts?
4. What recommendations can be made to enhance public health strategies for CMD prevention and influenza vaccination in Vietnam?

1.4 Significance of the study

1.4.1 Public health policy and educational interventions

Understanding the levels of awareness and preventive behaviors regarding CMDs and influenza vaccination is critical for developing targeted public health policies and educational interventions. This study provides valuable insights into the current state of public knowledge and behaviors in Vietnam, highlighting areas that require attention and improvement. By identifying the factors that influence awareness and preventive behaviors, policymakers and healthcare providers can design more effective strategies to address these health challenges.

1.4.2 Contribution to the literature

This research contributes to the existing literature on health awareness and preventive behaviors in Vietnam, a region that has been underrepresented in global health studies. The comparative approach of this study offers a unique perspective on the commonalities and differences in public health challenges related to CMDs and influenza. The findings can inform future research and guide public health initiatives not only in Vietnam but also in other LMICs facing similar health issues.

Chapter 2: Literature review

2.1 Cardiometabolic diseases

2.1.1 Global and regional prevalence and impact

Global prevalence and impact

CMDs, including T2DM and hypertension, are among the leading causes of death and disability worldwide (4,6,7). The global prevalence of these conditions has been rising steadily over the past few decades, driven by factors such as aging populations, urbanization, and lifestyle changes (54,55). According to the International Diabetes Federation (IDF), the number of adults living with diabetes reached 463 million in 2019, and this figure is projected to rise to 700 million by 2045 (56,57). Similarly, hypertension affects more than one billion people globally, with significant health and economic impacts (58).

According to the WHO, CVD is the leading cause of death globally, contributing substantially to loss of health and excess health system costs (59,60). In 2019, CVDs were responsible for 17.9 million deaths, accounting for 32% of all global deaths (59,61). This distressing number highlights the extensive burden of diseases such as coronary artery disease, stroke, heart failure, and peripheral arterial disease. Notably, 85% of these deaths were caused by heart attack and stroke (59,62). The high mortality rate associated with CVDs is primarily driven by lifestyle factors, including poor diet, physical inactivity, tobacco use, and harmful alcohol consumption. These behaviors contribute to the development of hypertension, atherosclerosis, and other conditions that compromise cardiovascular health (63,64).

Diabetes mellitus, particularly T2DM, is another critical component of CMD (65–67). In 2019, T2DM was ranked by the Institute for Health Metrics and Evaluation (IHME) as the eighth leading cause of death, responsible for 4.2 million deaths globally (68,69). The prevalence of diabetes is rising at an alarming rate, driven by increasing obesity rates, unhealthy diets, and sedentary lifestyles. T2DM not only leads to serious complications such as retinopathy, nephropathy, and neuropathy, but it also significantly increases the risk of cardiovascular events, further linking it to CMD. This dual burden of T2DM and CVD creates a compounded risk that exacerbates the public health challenge posed by CMD (11,70,71).

Hypertension is a predominant risk factor for both CVD and CMD. According to the WHO, hypertension prevalence has been doubled between 1990 and 2019, an estimated 1.13 billion adults globally were living with hypertension as of 2020 (72,73). However, less than one out of five hypertensive patients have their condition under proper control (72,73). This lack of control contributes to hypertension being one of the major causes of premature death

worldwide (74–76). Uncontrolled hypertension can lead to severe cardiovascular complications, including heart attack, stroke, heart failure, and chronic kidney disease (77,78). The pervasive nature of hypertension and its severe consequences highlight the urgent need for effective management and control strategies (76,79).

The increase in CMDs can also be attributed to a reduction in average life expectancy, particularly noticeable in major urban communities (80–83). Rapid urbanization has led to significant lifestyle changes, including decreased physical activity and increased consumption of processed foods high in sugar and fat (82,84–86). These changes contribute to rising rates of obesity, hypertension, and diabetes among younger populations. This trend is particularly concerning as it suggests a future increase in CMD-related morbidity and mortality if not addressed promptly (87–90). Understanding the interplay of these factors is essential for creating effective prevention and treatment strategies for cardiometabolic illnesses.

Despite these challenges, it is crucial to recognize that the majority of CMD risk factors are highly modifiable (91,92). Lifestyle interventions such as improved diet, increased physical activity, weight management, and smoking cessation can significantly reduce the risk of developing CMD. For instance, hypertension and T2DM can often be prevented or managed effectively through dietary changes, regular exercise, and appropriate medications (93,94). Public health campaigns to raise awareness about the importance of healthy lifestyles are essential. These campaigns should emphasize the benefits of a balanced diet rich in fruits and vegetables, regular physical activity, and the avoidance of tobacco and excessive alcohol consumption (95–97).

Traditionally, CMD was predominantly seen in older adults. However, rapid urbanization, sedentary lifestyles, and unhealthy diets have led to an increasing number of younger individuals being diagnosed with CMD in recent years (98–100). This shift in age demographics is particularly troubling, as it suggests that younger populations are adopting risk factors for CMD at earlier stages in life. This could lead to a greater lifetime burden of disease and increased healthcare costs in the future (101–104).

Given the significant impact of CMD on global health, there is an urgent need for comprehensive strategies to address these conditions. This includes public health campaigns to raise awareness about the importance of healthy lifestyles, policies to regulate the marketing and availability of unhealthy foods, and efforts to improve access to healthcare services for early detection and management of CMD. Health systems must be strengthened to provide effective care for those with CMD, including lifestyle counseling, medication management, and monitoring for complications.

Regional prevalence and impact

In developing countries, the burden of CMDs is particularly pronounced. Rapid urbanization and economic development have led to lifestyle changes that increase the risk of CMDs, such as reduced physical activity, unhealthy diets, and increased tobacco and alcohol consumption (3,63,105,106). These factors contribute to higher rates of obesity, insulin resistance, and dyslipidemia, which are major risk factors for T2DM and hypertension (3,22). The WHO reports that NCDs, including CMDs, account for over 80% of all deaths in LMICs (7,107).

Moreover, developing countries often face healthcare system challenges, including inadequate infrastructure, shortages of healthcare professionals, and limited financial resources (108–110). These constraints hamper efforts to prevent, diagnose, and manage CMDs effectively. Access to essential medications, diagnostic tools, and specialized care may be limited, particularly in rural and underserved areas (111–113). Additionally, health education and awareness programs about CMD risk factors, prevention, and management are often lacking (55,114,115).

Vietnam faces numerous challenges in effectively addressing CMDs. Limited healthcare infrastructure, including shortages of trained healthcare professionals and resources, hinders the prevention, diagnosis, and management of these diseases. Additionally, fragmented healthcare systems and a lack of integrated approaches further complicate efforts to combat CMDs. Socioeconomic disparities exacerbate these challenges, with marginalized communities facing barriers to accessing quality healthcare services (15,116–119).

CVD was responsible for 31% of all deaths in Vietnam in 2016, in which, stroke was the leading cause, followed by congenital heart disease (120,121). Hypertension is emerging as a prominent public health challenge in Vietnam and is identified as a major contributing factor to CVD in the country. According to Vu, T.H.L. et al study in Vietnam, the 2021's prevalence of hypertension has been increased to 28.3% (36.8% versus 20.1% in males and females, respectively) (53,122,123).

Similar to CVD, the incidence of diabetes is growing at concerning rates and has nearly doubled over the past decade (120). The estimated prevalence of T2DM in 2021 was found to have increased to 7.0% (7.9% versus 6.1% in males and females) (53,122,123).

Several behavioral risk factors contribute to CMDs, including obesity, smoking, alcohol abuse, unhealthy diet, and insufficient physical activity. These risk factors are prevalent among a significant portion of the Vietnamese population (121,123). According to a national survey conducted in Vietnam, about half of adult men smoke, while over a quarter of male drinkers consume alcohol at harmful levels. Additionally, around 80% of Vietnamese men and women consume less than the recommended five servings of fruits and vegetables per day, and nearly

30% of the population is physically inactive (12,124). While obesity is not yet widespread in Vietnam, its incidence is on the rise, particularly among children (125–127). Data from the United Nations Children's Fund (UNICEF) and WHO show that the prevalence of overweight and obesity among children aged 5 to 19 increased from 8.5% and 2.5% in 2010 to a concerning 19% and 8.1% in 2020, respectively (128). Despite this trend, it is worth noting that diabetes is prevalent even among individuals who are not obese in Vietnam. This highlights the complex interplay of various risk factors and underscores the importance of comprehensive preventive measures and healthcare interventions to address the growing burden of CMDs in the country (12).

Efforts to address the rising burden of CMDs in Vietnam require a multi-faceted approach, encompassing public health initiatives, healthcare infrastructure strengthening, policy interventions, and community engagement. By addressing the root causes of CMDs and implementing evidence-based strategies, Vietnam can mitigate the impact of these diseases, improve health outcomes, and promote well-being across its population (12,123,124).

2.1.2 Factors influencing awareness and preventive behaviors

Public awareness and preventive behaviors are critical components of CMD management and prevention. Awareness encompasses knowledge of disease risk factors, symptoms, and the importance of early detection and management. Preventive behaviors include adopting a healthy diet, engaging in regular physical activity, avoiding tobacco and excessive alcohol use, and seeking regular medical check-ups (18,129,130).

Several factors influence awareness and preventive behaviors regarding CMDs. Sociodemographic factors such as age, gender, education level, and socioeconomic status play significant roles. For instance, higher education levels are generally associated with better awareness and health-seeking behaviors. Gender differences also exist, with studies indicating that women tend to have better awareness and engage more in preventive behaviors than men. Cultural beliefs and health literacy also impact individuals' perceptions of CMD risk and their willingness to adopt preventive measures (55,85,131–134).

In Vietnam, research on CMD awareness and preventive behaviors is limited. However, available studies suggest that awareness levels are generally low, particularly in rural areas. For example, studies conducted in Vietnam found that while awareness of hypertension was relatively high, knowledge about T2DM was much lower. The study also highlighted

significant gaps in preventive behaviors, with many individuals not engaging in regular physical activity or following a healthy diet (53,135).

2.2 Influenza and vaccination

2.2.1 Global and regional impact of seasonal influenza

Global prevalence and impact

Seasonal influenza poses a major global health challenge, causing 290,000 to 650,000 deaths and 3-5 million severe cases annually, as reported by the WHO (23,27,136,137). Lower respiratory infections, including influenza, are a leading cause of death each year in developing countries (138–140). Although the incidence of influenza decreased during the COVID-19 pandemic, it began to rise again in early 2022. Regions such as Africa, Asia, and South America lack comprehensive data on the illness burden of seasonal influenza due to insufficient surveillance infrastructure. Inadequate healthcare access and utilization in these regions result in significant underreporting of cases (141,142).

Seasonal influenza, caused by influenza A and B viruses, circulates worldwide. Influenza viruses are classified into four types: A, B, C, and D, with types A and B causing seasonal epidemics (23). In March 2022, 88.8% of 32,703 positive influenza specimens were identified as influenza A (143). In regions like South-East Asia, influenza A (H3N2) is predominant, but the number of detected cases is low due to confusion with the common cold and lower influenza seasonality in tropical areas (144–146). Diagnosing influenza can be challenging as its symptoms are similar to those of other respiratory diseases, necessitating diagnostic tests for a conclusive diagnosis (147,148).

Influenza vaccines, proven effective over the past 60 years, are the most crucial strategy for preventing and controlling the disease (44,149). Vaccination reduces the need for antiviral medications and the risk of drug resistance (150,151). There are two primary types of influenza vaccines: trivalent (TIVs) and quadrivalent (QIVs), with QIVs offering broader protection. Introduced in the USA in 2012, QIVs are now widely used and considered more cost-effective than TIVs. However, TIVs remain the preferred option in many LMICs due to cost and logistical challenges (152–154). Frequent mutations of the influenza virus necessitate annual updates to the vaccines to ensure protection against the most likely circulating strains (155).

WHO recommends annual influenza vaccination for high-risk groups, including pregnant women, children, the elderly, individuals with preexisting conditions, and HCW. In spite of these recommendations, vaccination uptake among healthcare providers is low, often below

the target of 70%, even in developed regions understanding their KAP towards influenza vaccination is critical for designing effective public health interventions (156). Misconceptions about the severity of influenza and doubts about the safety and effectiveness of vaccines contribute to this low uptake (41,42,157).

Regional prevalence and impact

Vietnam, particularly the northern region, experiences a high prevalence of seasonal influenza, with 1.6 to 1.8 million cases reported annually (149). Common seasonal influenza viruses in Vietnam include influenza A (H1N1, H3N2) and B. In 2017, over 1 million cases were recorded in regions like the north central, north east, and Red River Delta, influenced by unpredictable weather (158–161). While influenza generally causes mild symptoms and fever, some cases are severe and require hospitalization.

In Vietnam, the government has recommended four types of seasonal influenza vaccination (Fluarix, Inflexal V, Influvac, and Vaxigrip) for children aged 6 months to 8 years, the elderly, those with certain diseases, and HCW (142). However, the vaccines are available in mostly urban areas, and there is currently no vaccination funding in place; therefore, it is provided as a service immunization with cost, thereby lowering the uptake of the vaccine (39,142).

The COVID-19 pandemic significantly impacted influenza prevalence in Vietnam, as hygiene and social distancing measures reduced the transmission of influenza viruses. Awareness of the risks associated with influenza has increased, particularly in the context of COVID-19 (162–164). Confusion and misinformation, however, persist about the importance and necessity of influenza vaccination (157,165). The government and international organizations have enhanced integrated surveillance to manage both influenza and COVID-19, but promoting vaccination remains a challenge (38,39).

Vietnam's economic improvements have allowed for greater investment in national health programs, including those addressing influenza. Nevertheless, studies on influenza prevention in Vietnam are limited, and healthcare providers often lack focus on this area. Between 2014 and 2016, influenza was a common cause of hospitalization among children under five and adults over 65, with a significant number of cases detected between March and July (162,163).

2.2.2 Factors influencing vaccine uptake

Several factors influence the uptake of influenza vaccines, particularly HCW and medical students, which play a crucial role in influencing public vaccination decisions (48,165). Despite WHO recommendations, vaccination rates among healthcare providers remain low due to

misconceptions about the severity of influenza and the safety and effectiveness of vaccines (23,39,136,166). In Vietnam, barriers to vaccination include the belief that influenza is not dangerous for healthy adults and misunderstandings about vaccine efficacy (34,39,167).

Improving KAP regarding influenza vaccination is essential for increasing vaccination rates. KAP surveys can identify gaps in knowledge and barriers to proper vaccination practices (47,49,156,167). Studies in developed regions show that while medical professionals generally have good knowledge and positive attitudes towards vaccination, their actual uptake is often low. Factors such as misinformation, inconvenient access to health facilities, and lack of social influence interventions significantly contribute to this gap (47,49,156,167).

In Vietnam, the attitudes and practices of medical staff and students towards vaccination significantly impact public health decisions. Enhancing their understanding and practice of influenza vaccination through targeted education and training programs can improve overall vaccination rates (48,168–170). As future healthcare providers, medical students' knowledge and attitudes towards vaccination are crucial for promoting vaccination in the broader community.

Vietnam has experienced significant economic growth over the past half-century, enabling the state budget to allocate more resources to national health programs, including those addressing influenza, especially among HCW. However, few studies on this topic exist in developing countries like Vietnam, where physicians and the health education system did not focus on influenza prevention before COVID-19. Addressing misconceptions and providing convenient access to vaccines are essential steps. Social and structural changes, along with continuous education, are necessary to increase the uptake of influenza vaccines and ensure better public health outcomes (38,149,158).

The healthcare settings are a prime medium for the spread of influenza, making it critical to prevent nosocomial transmission among medical staff and students in healthcare practice (44). Prioritizing vaccination among high-risk groups, especially HCW and medical students in clinical practice, is crucial for controlling the spread of seasonal influenza and ensuring the safety of patients with chronic conditions or other high-risk groups. Though WHO has recommended influenza vaccination, the uptake among healthcare providers remains low. This low uptake is due to inadequate knowledge and misconceptions about the safety and effectiveness of influenza vaccines (41,42,44,141,149).

In Vietnam, barriers to vaccination among health workers include the misconception that influenza is not dangerous for healthy adults and misunderstandings about the vaccine's safety and effectiveness. Medical personnel and students significantly influence patient health

through the habits they model. Optimizing the uptake of seasonal influenza vaccination among healthcare-related personnel can increase vaccination rates in both medical environments and the broader community they serve (166,167,171).

Beside the misconception, the cost is another barrier for vaccine acceptancy. In Vietnam, seasonal influenza vaccination is not included in the national vaccination program and is only available as a paid service, requiring individuals to voluntarily pay for their vaccination. This underscores the importance of motivation and encouragement from healthcare providers (39,142,166). Medical staff and students, future healthcare providers, must have accurate knowledge and attitudes towards vaccination and practice getting vaccinated against influenza. This understanding can significantly impact patients and healthcare seekers' decisions to get vaccinated (142).

KAP surveys can identify misconceptions and barriers to proper vaccination practices. These surveys gather information on what is known, believed, and done regarding a subject in a particular community, enabling more effective awareness programs by identifying specific gaps. Studies in developed regions have shown that medical professionals and students generally have good knowledge and positive attitudes towards vaccination, but actual uptake is often low. Factors such as misinformation, inconvenient access to health facilities, and lack of social influence interventions contribute to this gap.

2.3 Comparative analysis of health awareness and preventive behaviors

2.3.1 Commonalities and differences

CMDs and influenza vaccination represent two distinct health issues with different underlying causes and preventive measures. However, they share commonalities in terms of the need for public awareness and proactive health behaviors. Both conditions require individuals to be informed about the risks and benefits of preventive measures and to engage in behaviors that reduce their risk of disease (29,50–52).

In both contexts, sociodemographic factors such as age, gender, education level, and socioeconomic status play significant roles in shaping awareness and preventive behaviors. Cultural beliefs and health literacy also impact individuals' perceptions of disease risk and their willingness to adopt preventive measures. Understanding these factors is crucial for developing targeted interventions that address specific barriers and facilitators in each health context.

2.3.2 Implications for public health interventions

By comparing awareness and preventive behaviors related to CMDs and influenza vaccination, this study aims to identify common themes and unique challenges associated with each health condition. This comparative approach can inform more comprehensive and integrated public health strategies that address multiple health issues simultaneously. For illustration, public health campaigns that promote healthy lifestyles to prevent CMDs can also incorporate messages about the importance of influenza vaccination.

Effective public health interventions require a multifaceted approach that includes education, community engagement, and healthcare system improvements. Educational programs should focus on increasing knowledge about disease risk factors and the benefits of preventive measures. Community engagement efforts should address cultural beliefs and build trust in healthcare providers. Healthcare system improvements should ensure that preventive services, such as vaccinations, are accessible and affordable to all population groups.

2.4 Theoretical framework

2.4.1 Health belief model

The Health Belief Model (HBM) is a widely used theoretical framework for understanding health behaviors. It posits that individuals are more likely to engage in preventive health behaviors if they perceive themselves to be susceptible to a condition, believe the condition has serious consequences, believe taking a specific action would reduce their susceptibility or severity of the condition, and perceive the benefits of taking the action outweigh the barriers (172,173). This model is particularly relevant for studying CMDs and influenza vaccination behaviors.

2.4.2 Theory of planned behavior

The Theory of Planned Behavior (TPB) suggests that individual behavior is driven by behavioral intentions, which are influenced by attitudes toward the behavior, subjective norms, and perceived behavioral control (174,175). This theory can help explain the motivations behind preventive behaviors related to CMDs and vaccine uptake, providing a basis for designing interventions that target these motivational factors.

2.4.3 Integrated behavioral model

The Integrated Behavioral Model (IBM) combines elements of HBM and TPB, emphasizing the importance of knowledge, skills, environmental constraints, and behavioral intentions in influencing health behaviors (176,177). This comprehensive approach is useful for understanding the complex factors that affect awareness and preventive behaviors in different health contexts.

Chapter 3: Methodology

3.1. Study design

Cross-sectional study design was applied to both studies. In-person interview-based questionnaire was used for CMD study in southern Vietnam. Anonymous online survey was used for influenza vaccine study in northern Vietnam.

3.2. Sampling and sample size

3.2.1 Sample size calculation for CMD study in southern Vietnam

The sample size was determined using the "sampsi" command in STATA, based on systolic blood pressure data from a previous study, which reported mean (± SD) values of 126.0 (± 18.3) for males and 120.4 (± 18.5) for females [18]. The calculation indicated a need for 227 participants per district, totaling 454 participants. To account for potential rejection, incorrect responses, and ineligible households, an additional 10% of participants were added, bringing the required number to 500.

3.2.2 Sampling method for CMD study in southern Vietnam

To ensure accurate information, trained interviewers were utilized, and participants were given a small reimbursement for their time in completing the long and time-consuming questionnaire. Anonymity and confidentiality were maintained by assigning code numbers to participants, with all data securely stored in locked files accessible only to the researchers until the study's completion.

Data collection took place from June to August 2019. Participants were randomly selected from households within the designated areas using a two-stages sampling method. In the first stage, streets were conveniently selected in the two districts. In the second stage, households were chosen through systematic random sampling, starting with the first house on the right side of the street and then selecting every second household on the right thereafter. Selected households needed to have at least one eligible member aged 18 or older.

Participants were informed about the study's purpose and procedures before signing an informed consent form. By signing, participants agreed to share their personal medical records and accurately respond to the interviewer's questions. Participation was voluntary, with no identifying information collected. Ultimately, 402 participants completed the study, resulting in a response rate of 80.4%.

3.2.3 Sample size calculation for influenza vaccine study in northern Vietnam

The sample size was calculated according to the formula of Pourhoseingholi MA et al. "Sample size calculation in medical studies." (178):

$$n = \frac{Z^2 P(1-P)}{d^2}$$

In which:

- Prevalence (p) = 53% (the average prevalence of influenza vaccine uptake from two studies in Vietnam from 2020) (38,39).
- Level of confidence (Z) = 95%,
- Precision (d) = 5%.

3.2.4 Sampling method for influenza vaccine study in northern Vietnam

Medical students and HCW were invited to take part in this survey. This included postgraduate and residency students who were on 72-hour duty shifts and had regular office hours, treating them as regular hospital staff.

The survey was anonymous and conducted between June and August 2022 using Google Forms in both Vietnamese and English. To get more participants, we announced the survey during medical training, posted it on healthcare organization websites, and shared it in medical social media groups. Each participant could only respond once, and they had to give consent before starting the survey. We excluded incomplete responses and those from people without a medical background, based on their universities or workplaces.

The survey aimed to understand what medical students and HCW know, think, and do about influenza vaccination. To keep things confidential, each participant got a code number, and all data were securely stored in locked digital files that only researchers could access.

Participants were told about the study's purpose and procedures and had to sign a consent form before taking part. They agreed to share their medical records and answer the interviewer's questions accurately. Participation was voluntary, and no identifying information was collected.

Initially, as the result of the sample size calculation, 90 participants were required for the study population. Since the study covered five provinces in northern Vietnam, we multiplied this by five, making the target 450. To account for possible dropouts or exclusions, we added 20%, bringing the final target to 540 participants.

In the end, a total of 585 medical students and HCW were included in the study.

3.3 Questionnaire

3.3.1 Interview-based questionnaire for CMD study

The questionnaire was based on a 2011 survey created by the Vietnamese Ministry of Health to understand what patients with T2DM know about their condition (179). It was designed to take about 30-40 minutes to complete, including 5-10 minutes for explaining important information about CMD and giving advice.

The first part of the questionnaire had eight questions to gather basic information about the participants, like their age, gender, education level, and medical history. This section also included questions about their disease status, such as whether they had been diagnosed with T2DM or hypertension.

Next, there were 42 questions aimed at assessing their knowledge of CMD. Of these, 23 questions were focused on T2DM and 19 on hypertension. The knowledge questions covered various aspects such as symptoms, risk factors, complications, and management of T2DM and hypertension.

The following 12 questions evaluated participants' attitudes toward their conditions. These questions asked how serious they thought their conditions were, how worried they were about complications, and whether they believed in the importance of following medical advice and treatment plans.

To avoid bias, we asked the 22 behavior questions at the beginning of the interview. These questions explored participants' daily habits, including their diet, exercise routines, smoking, and alcohol consumption. We used guidelines from the WHO and the Centers for Disease Control and Prevention (CDC), which recommend at least 30 minutes of moderate to intense physical activity per day. Participants were also asked about their adherence to healthy diet guidelines and their use of cigarettes and alcohol.

Additionally, we conducted health checks to get objective data on participants' health. Blood pressure and blood glucose levels were tested early in the morning, between 5:00 and 7:00 am, before they had breakfast. These tests were performed by hospital nurses using the CareSens Premier blood glucose monitoring machine to ensure accuracy.

3.3.2 Anonymous online survey for influenza vaccine study

The study used a questionnaire originally from a 2014 study by Walker et al (180).

The first part of the questionnaire, consisting of 28 questions, collected personal medical history details, including socioeconomic background and vaccination status. This section helped us understand the participants' backgrounds and whether they had been vaccinated before.

The next 10 questions focused on the participants' vaccination history and their current vaccination status within the past year. These questions also asked about their willingness to get vaccinated in the future and their opinion on whether vaccination should be mandatory for medical students and HCW.

Following this, there were 30 questions aimed at assessing the participants' knowledge and attitudes towards the influenza vaccine. Fourteen of these questions tested their knowledge and were formatted as "true/false" questions to simplify responses. The remaining 16 questions assessed their attitudes towards getting the flu shot, using a 5-point Likert scale (strongly agree, agree, neither, disagree, and strongly disagree) to capture their level of agreement with various statements about the flu vaccine.

Every answer was pre-coded to make the data easier to analyze. Some multiple-choice questions included open-ended options to capture any unexpected responses. The entire questionnaire took about ten minutes to complete.

3.4 Data and data analysis

3.4.1 CMD study

Blood pressure, blood glucose levels, and body mass index (BMI) were assessed following the guidelines provided by the IDF to evaluate participants' risk for CMDs (181). Hypertension was defined as having blood pressure values of 140/90 mmHg or higher. For blood glucose, a fasting blood glucose level of 7.0 mmol/L or above was used to diagnose diabetes. Participants with a BMI of 25 kg/m² or higher were classified as overweight or obese. To ensure accuracy, participants' disease statuses were confirmed using their medical records.

Participants’ knowledge, attitude, and behavior were assessed separately in 3 sections of the questionnaire. Regarding knowledge, the 42 questions were divided into two parts, 23 questions and 19 questions regarding the knowledge of T2DM and hypertension, respectively. The selected districts were involved in the government health promotion programs on hypertension, CVD, and other related diseases; hence, the KAP of the participants would be interpreted rigorously. Therefore, the participant received one point for each category if the score was >70%, which was in accordance with previous studies (16/23 for good T2DM

knowledge, 13/19 for good hypertension knowledge, 8/12 for positive attitude, and 15/22 for good behavior) (182–186). The participant was categorized as having good general knowledge on T2DM and hypertension if he/she received good knowledge for both parts of the knowledge section.

The general awareness of CMD was evaluated on the combination of three factors: general knowledge of the diseases and their prevention (its risk factors and the conditions), the attitude of the participants, and their behaviors (such as diet, physical activity, medical seeking, etc.). Scoring in at least two out of three categories was considered as having a good degree of awareness concerning CMDs.

3.4.2 Influenza vaccine study

By examining knowledge and attitude, this study aimed to provide a framework to understand the variables effecting influenza vaccination uptake. Participants' knowledge and attitudes were assessed separately in 2 sections of the questionnaire.

The knowledge section included 14 questions that referred to the understanding that participants possessed regarding the public health importance of influenza and influenza vaccination. This included the mechanisms by which the vaccine functions, who is at risk and recommended to get the vaccine, the appropriate timing and frequency of vaccination, and the benefits of getting vaccinated. The participants received 1 point for each question that had a positive answer.

On the other hand, the attitude section captured the psychological dispositions of individuals toward receiving the vaccine. This included not only willingness or hesitancy but also the underlying reasons for such attitudes – whether they stem from fear of potential complications, concerns about vaccine efficacy, or other barriers that could inhibit vaccination. All 5-point Likert scales for measuring attitudes were condensed into agree (strongly agree and agree) and disagree (neutral, disagree, and strongly disagree). The participants received 1 point for each positive answer.

Participants were rated as having "good knowledge" and a "good attitude" if their overall score in each category was 70% or higher (10/14 and 11/16 positive responses for knowledge and attitude, respectively), which was based on a study on previous knowledge, attitude, and practice behavior on health problems (182–186). There were 3 categories regarding the practice of the participants: their vaccination status, their willingness of getting vaccinated this year, and their willingness to advise others to get vaccinated. At the end of the survey, there was 1

question regarding whether influenza vaccine uptake should be compulsory among medical/health sciences students and healthcare workforce or not.

3.5 Statistical methods used for analysis

Continuous variables were described by mean (± standard deviation), and categorical variables were described with percentages. In both studies, bivariate analyses were performed using Pearson's chi-squared test and Fisher's exact test. Variables achieving a significance level of $p<0.05$ in bivariate analysis were subsequently incorporated into a regression model. Multiple binary logistic regression models were performed to identify the association between independent predictors (sociodemographic characteristics) and the key outcome variables. Association between KAP was measured using multiple binary logistic regression models, adjusted for possible confounders such as age, gender, education, employment, BMI, and CMD status. Odds ratios and the corresponding 95% confidence intervals were reported. Intercooled Stata v17 (StataCorp. 2021. Stata Statistical Software: Release 17. College Station, TX: StataCorp LLC) and Microsoft Excel 2018 were used for data analysis. The significance threshold was set at <0.05.

3.6 Ethical considerations

3.6.1 Ethical approvals

The implementation of the data collection for the study "Awareness Related to CMDs: A Cross-Sectional Study in Southern Vietnam" was approved by the University of Public health, Vietnam (444/DHYTCC).

Ethical approval was obtained from the Scientific and Research Ethics Committee of the University of Debrecen (6462-2023) for the study "Association Between Influenza Vaccine Uptake and Health Awareness: A Cross-Sectional Questionnaire-Based Study Among Medical Students and Healthcare Workers in Northern Vietnam".

3.6.2 Informed consent

All participants were informed of the studies' purposes and procedures before signing/agreeing the informed consent form prior to participation.

Chapter 4: Results

4.1 CMD awareness and preventive behaviors

The average age (± SD) of the entire population was 47.75 (± 15.61) years.

Table 1: Characteristics of participants

Variables	Population (*n* [a] = 402)	Only T2DM (*n* [a] = 10)	Only Hypertension (*n* [a] = 71)	Both (*n* [a] = 27)	No CMD (*n* [a] = 294)
Age (Mean ±SD, years)	47.75 (± 15.61)	53.4 (± 10.70)	58.38 (± 13.58)	66.48 (± 10.89)	43.28 (± 13.95)
Body mass index (Mean ±SD, kg/m^2)	22.94 (± 3.19)	23.31 (± 2.46)	23.56 (± 3.78)	24.86 (± 3.45)	22.62 (± 2.95)
Systolic blood pressure (Mean ±SD, mmHg)	122.18 (± 15.31)	116.7 (± 16.44)	132.58 (± 18.18)	134.44 (± 15.82)	118.72 (± 12.58)
Diastolic blood pressure (Mean ±SD, mmHg)	84.3 (± 11.60)	75.8 (± 8.50)	83.97 (± 14.60)	83.15 (± 9.42)	79.48 (± 10.85)
Blood glucose (Mean ±SD, mmol/L)	6.43 (± 4.61)	7.09 (± 2.76)	6.73 (± 2.03)	8.27 (± 2.77)	6.16 (± 5.17)
Gender (%)					
Male	39.8	3.8	11.9	6.3	78.1
Female	60.2	1.7	21.5	7.0	69.8
Education (%)					
Primary or below	30.8	3.2	29.8	8.9	58.1
Secondary	43.8	1.1	16.5	5.7	76.7
Tertiary or higher	25.4	3.9	4.9	5.9	85.3
Employment (%)					
Employed	51.0	2.0	8.3	2.9	86.8
Unemployed	49.0	3.0	27.4	10.7	58.9
Marital status (%)					
Single	22.1	2.2	11.2	9.0	77.5
Married	77.9	2.6	19.5	6.1	71.9
Population (%)	100	2.5	17.7	6.7	73.1

SD: standard deviation, [a] *n* = the number of participants.

The sociodemographic characteristics of the participants are presented in Table 1.

Participants with only T2DM were slightly older (53.4 (± 10.70) years) compared to those with only hypertension (58.38 (± 13.58) years) and those with both conditions (66.48 (± 10.89)

years). Participants without CMD were the youngest, with an average age of 43.28 (± 13.95) years. The overall average BMI was 22.94 (± 3.19) kg/m². Participants with only T2DM had a lower average BMI (23.31 (± 2.46) kg/m²) compared to those with only hypertension (23.56 (± 3.78) kg/m²) and those with both conditions (24.86 (± 3.45) kg/m²). Those without CMD had the lowest average BMI (22.62 (± 2.95) kg/m²). Systolic blood pressure (SBP) averaged 122.18 (± 15.31) mmHg for the entire population. Participants with only hypertension had the highest average SBP (132.58 (± 18.18) mmHg), followed by those with both conditions (134.44 (± 15.82) mmHg). Those with only T2DM had a slightly lower SBP (116.7 (± 16.44) mmHg), while those without CMD had the lowest SBP (118.72 (± 12.58) mmHg). Diastolic blood pressure (DBP) averaged 84.3 (± 11.60) mmHg for the entire population. Those with only hypertension had the highest DBP (83.97 (± 14.60) mmHg), followed by those with both conditions (83.15 (± 9.42) mmHg). Participants with only T2DM had a lower DBP (75.8 (± 8.50) mmHg), while those without CMD had the lowest DBP (79.48 (± 10.85) mmHg). The average blood glucose level for the entire population was 6.43 (± 4.61) mmol/L. Participants with both conditions had the highest average blood glucose level (8.27 (± 2.77) mmol/L). Those with only T2DM had elevated blood glucose levels (7.09 (± 2.76) mmol/L) compared to others. Participants with only hypertension had an average blood glucose level of 6.73 (± 2.03) mmol/L, while those without CMD had the lowest level (6.16 (± 5.17) mmol/L). The overall population consisted of 39.8% males and 60.2% females. The majority of participants with only T2DM (3.8%) and both conditions (6.3%) were male. A higher percentage of females was observed among those with only hypertension (21.5%) and no CMD (69.8%). Regarding educational attainment, 30.8% of the overall population had a primary or below education level. The majority of participants with no CMD had a higher education level (85.3%). Those with only T2DM and both conditions had lower percentages of higher education (3.9% and 5.9%, respectively). More than half of the overall population (51.0%) was employed. A large majority of participants without CMD were employed (86.8%). Participants with only T2DM (2.0%) and both conditions (2.9%) had much lower employment rates.

Regarding marital status, 22.1% of the overall population was single. The majority of participants without CMD were single (77.5%). A lower percentage of single participants was observed among those with only T2DM (2.2%) and both conditions (9.0%).

Table 2: KAB and awareness of participants on CMDs

Variables	Good		Bad	
	n [a]	%[b]	*n* [a]	%[b]
Knowledge				
T2DM	48	11.94	354	88.06
Hypertension	141	35.07	261	64.93
CMD	44	10.95	358	89.05
Attitude	105	26.12	297	73.88
Behavior	20	4.98	382	95.02
Awareness	32	7.96	370	92.04

[a] *n* = the number of participants, [b] % = the percentage.

Table 2 summarizes the knowledge, attitude, behavior, and awareness of participants regarding CMDs, including T2DM and hypertension, based on data from 402 participants.

A significant majority of participants, 88.06% (354), had poor knowledge about T2DM, while only 11.94% (48) had good knowledge. Knowledge about hypertension was better compared to T2DM, with 35.07% (141) of participants having good knowledge, but still, 64.93% (261) had poor knowledge. Overall knowledge about CMDs remains low, with 89.05% (358) of participants had poor knowledge and only 10.95% (44) had good knowledge. The attitude towards CMDs shows that 26.12% (105) of participants had a good attitude, while a larger proportion, 73.88% (297), had a poor attitude. This suggests that the majority of the participants did not have a positive or proactive attitude towards managing or understanding CMDs. When examining behavior related to CMDs, only 4.98% (20) of participants demonstrated good behavior, whereas a vast majority, 95.02% (382), exhibited poor behavior. This indicated that most participants do not engage in healthy behaviors that could prevent or manage CMDs effectively. Awareness about CMDs was also low, with only 7.96% (32) of participants being aware, compared to 92.04% (370) who lack awareness.

Table 3: General knowledge on CMDs of the participants

	Population	Knowledge		p-value*
		Bad	Good	
	N (%)	N (%)	N (%)	
Age group				
<35	80 (19.90)	72 (90)	8 (10)	
35-55	187 (46.52)	174 (93.05)	13 (6.95)	**0.016**
>55	135 (33.58)	112 (82.96)	23 (17.04)	
Gender				
Male	160 (39.80)	149 (93.13)	11 (6.88)	**0.034**
Female	242 (60.20)	209 (86.36)	33 (13.64)	
Education				
Primary or below	124 (30.85)	112 (90.32)	12 (9.68)	
Secondary	176 (43.78)	159 (90.34)	17 (9.66)	0.371
Tertiary or higher	102 (25.37)	87 (85.29)	15 (14.71)	
Employment status				
Unemployed	197 (49)	169 (85.79)	28 (14.21)	**0.040**
Employed	205 (51)	189 (92.20)	16 (7.80)	
Marital				
Single	89 (22.14)	76 (85.39)	13 (14.61)	0.210
Not single	313 (77.86)	282 (90.10)	31 (9.90)	
BMI				
Normal	317 (78.86)	286 (90.22)	31 (9.78)	0.148
Overweight/Obese	85 (21.14)	72 (84.71)	13 (15.29)	
CMD Status				
No CMD	294 (73.13)	273 (92.86)	21 (7.14)	
T2DM	10 (2.49)	6 (60)	4 (40)	**<0.001****
HTN	71 (17.66)	63 (88.73)	8 (11.27)	
CMD	27 (6.72)	16 (59.26)	11 (40.74)	

Bold values represent significant association.
* Pearson's chi-square test. ** Fisher's exact test

Table 3 presents the knowledge regarding CMDs among 402 participants.

The results showed a significant variation in knowledge about CMDs across different age groups (p = 0.016). The under 35 group had the lowest percentage of participants with good

knowledge (10%), whereas the over 55 group had the highest (17.04%). Participants aged 35-55 demonstrated the least awareness, with 93.05% having poor knowledge. There was a statistically significant difference in CMD knowledge between males and females ($p = 0.034$). Among males, 93.13% had poor knowledge, compared to 86.36% of females. Conversely, 13.64% of females had good knowledge, higher than the 6.88% observed in males. Employment status showed a significant impact on CMD knowledge ($p = 0.04$). Employed individuals had a higher percentage of poor knowledge (92.20%) compared to the unemployed (85.79%). Conversely, unemployed participants had better knowledge (14.21%) than employed participants (7.80%). CMD status showed a highly significant correlation with CMD knowledge ($p < 0.001$). Participants with no CMD had 92.86% with poor knowledge. Among those with T2DM, 60% had poor knowledge, and 40% had good knowledge, indicating better awareness. Participants with HTN (hypertension) had 88.73% with poor knowledge and 11.27% with good knowledge. Participants with CMDs had the highest percentage of good knowledge at 40.74%. Education level did not show a significant correlation with CMD knowledge ($p = 0.371$). Those with primary or below education had 90.32% with poor knowledge, secondary education had 90.34%, and tertiary or higher education had 85.29% with poor knowledge. Despite this, those with tertiary or higher education had a relatively higher percentage of good knowledge (14.71%). Marital status did not significantly affect CMD knowledge ($p = 0.210$). Single individuals had 85.39% with poor knowledge, while those who were not single had 90.10%. In terms of good knowledge, 14.61% of singles had good knowledge compared to 9.90% of those not single. The BMI of participants was categorized as normal or overweight/obese, but the difference in CMD knowledge between these groups was not statistically significant ($p = 0.148$). Those with normal BMI had 90.22% with poor knowledge and 9.78% with good knowledge. Overweight/obese participants had slightly better knowledge, with 15.29% having good knowledge.

Table 4: Attitude of the participants regarding CMDs

	Population	Attitude		p-value*
		Negative	Positive	
	N (%)	N (%)	N (%)	
Age group				
<35	80 (19.90)	72 (90)	8 (10)	
35-55	187 (46.52)	151 (80.75)	36 (19.25)	**<0.001**
>55	135 (33.58)	74 (54.81)	61 (45.19)	
Gender				
Male	160 (39.80)	129 (80.63)	31 (19.38)	**0.012**
Female	242 (60.20)	168 (69.42)	74 (30.58)	
Education				
Primary or below	124 (30.85)	70 (56.45)	54 (43.55)	
Secondary	176 (43.78)	139 (78.98)	37 (21.02)	**<0.001**
Tertiary or higher	102 (25.37)	88 (86.27)	14 (13.73)	
Employment status				
Unemployed	197 (49)	125 (63.45)	72 (36.55)	**<0.001**
Employed	205 (51)	172 (83.90)	33 (16.10)	
Marital				
Single	89 (22.14)	66 (74.16)	23 (25.84)	0.946
Not single	313 (77.86)	231 (73.80)	82 (26.20)	
BMI				
Normal	317 (78.86)	245 (77.29)	72 (22.71)	**0.003**
Overweight/Obese	85 (21.14)	52 (61.18)	33 (38.82)	
CMD Status				
No CMD	294 (73.13)	240 (81.63)	54 (18.37)	
T2DM	10 (2.49)	8 (80)	2 (20)	**<0.001****
HTN	71 (17.66)	35 (49.30)	36 (50.70)	
CMD	27 (6.72)	14 (51.85)	13 (48.15)	
Knowledge				
Good	44 (10.95)	20 (45.45)	24 (54.55)	**<0.001**
Bad	358 (89.05)	277 (77.37)	81 (22.63)	

Bold values represent significant association.
* Pearson's chi-square test. ** Fisher's exact test

Table 4 provides an in-depth look at participants' attitudes toward CMDs.

There was a significant difference in attitudes across age groups ($p < 0.001$). Participants younger than 35 years had the highest proportion of negative attitudes (90%), while those over 55 years had the most favorable attitudes, with 45.19% showing a positive attitude. Gender also significantly influenced attitudes ($p = 0.012$). A higher proportion of males (80.63%) had negative attitude compared to females (69.42%). Conversely, females were more likely to have a positive attitude (30.58%) compared to males (19.38%). Education level showed a strong correlation with attitude ($p < 0.001$). Participants with primary or below education level had relatively lower percentage of negative attitudes (56.45%) compared to those with secondary (78.98%) and tertiary or higher education (86.27%). However, those with primary education also had the highest percentage of positive attitudes (43.55%). Employment status significantly impacted attitudes ($p < 0.001$). Employed participants were more likely to have negative attitude (83.90%) compared to unemployed participants (63.45%). Despite this, unemployed individuals had a higher percentage of positive attitudes (36.55%) compared to their employed counterparts (16.10%). BMI category was significantly associated with attitudes ($p = 0.003$). Participants with normal BMI had higher proportion of negative attitudes (77.29%) compared to those who were overweight or obese (61.18%). Those who were overweight or obese showed a higher percentage of positive attitudes (38.82%) than those with a normal BMI (22.71%). The presence of CMDs significantly affected attitudes ($p < 0.001$). Participants without CMDs had a high proportion of negative attitudes (81.63%), but they also had a notable percentage of positive attitudes (18.37%). Among those with specific CMDs, such as T2DM and hypertension (HTN), a very small percentage had positive attitudes (20% for T2DM and 50.70% for HTN), indicating a generally more negative outlook. Knowledge significantly impacted attitudes ($p < 0.001$). Participants with bad knowledge were more likely to have negative attitude (77.37%) compared to those with good knowledge (45.45%). Conversely, good knowledge individuals had a higher percentage of positive attitudes (54.55%) compared to bad knowledge (22.63%). Marital status did not show a significant difference in attitudes towards CMDs ($p = 0.946$), suggesting that being single or not single did not significantly affect participants' attitudes.

Table 5: Preventive behavior of the participants regarding CMDs

	Population	Behavior		p-value*
		Bad	Good	
	N (%)	N (%)	N (%)	
Age group				
<35	80 (19.90)	79 (98.75)	1 (1.25)	
35-55	187 (46.52)	184 (98.40)	3 (1.60)	**<0.001****
>55	135 (33.58)	119 (88.15)	16 (11.85)	
Gender				
Male	160 (39.80)	157 (98.13)	3 (1.88)	**0.020****
Female	242 (60.20)	225 (92.98)	17 (7.02)	
Education				
Primary or below	124 (30.85)	114 (91.94)	10 (8.06)	
Secondary	176 (43.78)	170 (96.59)	6 (3.41)	0.216**
Tertiary or higher	102 (25.37)	98 (96.08)	4 (3.92)	
Employment status				
Unemployed	197 (49)	180 (91.37)	17 (8.63)	**0.001****
Employed	205 (51)	202 (98.54)	3 (1.46)	
Marital				
Single	89 (22.14)	84 (94.38)	5 (5.62)	0.752
Not single	313 (77.86)	298 (95.21)	15 (4.79)	
BMI				
Normal	317 (78.86)	302 (95.27)	15 (4.73)	0.665
Overweight/Obese	85 (21.14)	80 (94.12)	5 (5.88)	
CMD Status				
No CMD	294 (73.13)	288 (97.96)	6 (2.04)	
T2DM	10 (2.49)	9 (90)	1 (10)	**<0.001****
HTN	71 (17.66)	61 (85.92)	10 (14.08)	
CMD	27 (6.72)	24 (88.89)	3 (11.11)	
Knowledge				
Good	44 (10.95)	39 (88.64)	5 (11.36)	**0.039**
Bad	358 (89.05)	343 (95.81)	15 (4.19)	
Attitude				
Positive	105 (26.12)	94 (89.52)	11 (10.48)	**0.003**
Negative	297 (73.88)	288 (96.97)	9 (3.03)	

Bold values represent significant association.
* Pearson's chi-square test. ** Fisher's exact test.

Table 5 details the preventive behavior of participants in relation to CMDs.

There was a significant variation in preventive behavior across age groups ($p < 0.001$). The youngest group (<35 years) showed predominantly bad behavior, with 98.75% falling into this category and only 1.25% exhibiting good behavior. Similarly, the 35-55 age group had 98.40% bad behavior and 1.60% good behavior. The oldest group (>55 years) demonstrated a slightly better profile, with 88.15% bad behavior and 11.85% good behavior. Gender differences in preventive behavior were also statistically significant ($p = 0.020$). Males showed a higher percentage of bad behavior (98.13%) compared to females (92.98%). Conversely, females were more likely to engage in good behavior (7.02%) compared to males (1.88%). Employment status significantly impacted preventive behavior ($p = 0.001$). Employed individuals were more likely to exhibit bad behavior (98.54%) compared to unemployed individuals (91.37%). However, unemployed participants had a higher proportion of good behavior (8.63%) compared to employed participants (1.46%). CMD status significantly influenced preventive behavior ($p < 0.001$). Participants without CMDs predominantly showed bad behavior (97.96%), with only 2.04% displaying good behavior. Among those with specific CMDs, individuals with T2DM had a relatively higher percentage of good behavior (10%) compared to those with hypertension (HTN) (14.08%) and other CMDs (11.11%). Knowledge and preventive behavior were found to be significantly associated ($p = 0.039$). Participants with bad knowledge showed a higher percentage of bad preventive behavior (95.81%) compared to those with good knowledge (88.64%). Conversely, participants with good knowledge were more likely to engage in good behavior (11.36%) compared to bad knowledge (4.19%). Attitude significantly influenced preventive behavior ($p = 0.003$). Participants with negative attitude showed a higher percentage of bad preventive behavior (96.97%) compared to those with positive attitude (89.52%). Reversely, participants with positive attitude were more likely to engage in good behavior (10.48%) compared to negative attitude (3.03%). Educational level showed no significant difference in preventive behavior ($p = 0.216$). However, it was notable that those with primary education or below had the highest proportion of good behavior (8.06%) compared to those with secondary (3.41%) and tertiary or higher education (3.92%). Marital status did not significantly affect preventive behavior ($p = 0.752$). Both single (94.38%) and not single (95.21%) individuals exhibited similar proportions of bad behavior, with good behavior being relatively low in both groups (5.62% and 4.79%, respectively). BMI category did not show a significant difference in preventive behavior ($p = 0.665$). Participants with normal BMI displayed 95.27% bad behavior and 4.73% good behavior, while those who were overweight or obese had 94.12% bad behavior and 5.88% good behavior.

Table 6: Awareness of the participants regarding CMDs

	Population	Awareness		p-value*
		Bad	Good	
	N (%)	N (%)	N (%)	
Age group				
<35	80 (19.90)	77 (96.25)	3 (3.75)	
35-55	187 (46.52)	180 (96.26)	7 (3.74)	**<0.001****
>55	135 (33.58)	113 (83.07)	22 (16.30)	
Gender				
Male	160 (39.80)	155 (96.88)	5 (3.13)	**0.004**
Female	242 (60.20)	215 (88.84)	27 (11.16)	
Education				
Primary or below	124 (30.85)	113 (91.13)	11 (8.87)	
Secondary	176 (43.78)	161 (91.48)	15 (8.52)	0.664
Tertiary or higher	102 (25.37)	96 (94.12)	6 (5.88)	
Employment status				
Unemployed	197 (49)	171 (86.80)	26 (13.20)	**<0.001**
Employed	205 (51)	199 (97.07)	6 (2.93)	
Marital				
Single	89 (22.14)	80 (89.89)	9 (10.11)	0.395
Not single	313 (77.86)	290 (92.65)	23 (7.35)	
BMI				
Normal	317 (78.86)	296 (93.38)	21 (6.62)	0.056
Overweight/Obese	85 (21.14)	74 (87.06)	11 (12.94)	
CMD Status				
No CMD	294 (73.13)	284 (96.60)	10 (3.40)	
T2DM	10 (2.49)	9 (90)	1 (10)	**<0.001****
HTN	71 (17.66)	60 (84.51)	11 (15.49)	
CMD	27 (6.72)	17 (62.96)	10 (37.04)	

Bold values represent significant association.
* Pearson's chi-square test. ** Fisher's exact test

Table 6 presents the level of awareness of participants about CMDs.

There was a significant variation in awareness across different age groups ($p < 0.001$). Participants under 35 years showed high bad awareness (96.25%) and low good awareness (3.75%). The 35-55 age group mirrored this trend with 96.26% having bad awareness and 3.74% good awareness. Participants over 55 years old demonstrated better awareness, with 83.7% bad and 16.3% good awareness. Gender differences in awareness were statistically significant ($p = 0.004$). Males predominantly had bad awareness (96.88%), with a small proportion showing good awareness (3.13%). Females showed better awareness levels, with 88.84% bad and 11.16% good. Employment status significantly affected awareness ($p < 0.001$). Employed participants had a higher percentage of bad awareness (97.07%) compared to unemployed participants (86.80%). Conversely, unemployed participants showed a higher percentage of good awareness (13.20%) compared to employed participants (2.93%). CMD status significantly influenced awareness ($p < 0.001$). Participants without CMDs had high bad awareness (96.60%) and low good awareness (3.40%). Those with T2DM predominantly had bad awareness (90%), with 10% having good awareness. Participants with hypertension (HTN) showed better awareness, with 84.51% bad and 15.49% good awareness. Those with other CMDs had the highest good awareness (37.04%), with 62.96% showing bad awareness. Education level did not show a significant difference in awareness ($p = 0.664$). Participants with primary education or below had 91.13% bad awareness and 8.87% good awareness. Those with secondary education exhibited similar trends, with 91.48% bad and 8.52% good awareness. Participants with tertiary or higher education had slightly lower bad awareness (94.12%) and good awareness (5.88%). Marital status did not significantly influence awareness ($p = 0.395$). Single participants showed 89.89% bad awareness and 10.11% good awareness. Those who were not single had 92.65% bad awareness and 7.35% good awareness. BMI category showed a borderline significant difference in awareness ($p = 0.056$). Participants with normal BMI had 93.38% bad awareness and 6.62% good awareness. Those who were overweight or obese showed slightly better awareness, with 87.06% bad and 12.94% good awareness.

Table 7: Multiple binary logistic regression results on factors influencing awareness

KAB and Awareness	Knowledge OR [95%CI]	Attitude OR [95%CI]	Behavior OR [95%CI]	Awareness OR [95%CI]
Age				
	1.01 [0.98 - 1.04]	**1.04 [1.02 - 1.06]**	**1.07 [1.02 - 1.12]**	*1.04 [1.00 - 1.08]**
Gender				
Female/Male	**2.80 [1.23 - 6.39]**	1.47 [0.82 - 2.61]	3.69 [0.91 - 14.95]	**3.89 [1.28 - 11.80]**
Education				
Secondary /Primary or below	1.64 [0.69 - 3.91]	**0.49 [0.28 - 0.86]**	0.77 [0.25 - 2.39]	1.97 [0.77 - 5.04]
Tertiary or higher /Primary or below	**3.29 [1.24 - 8.72]**	**0.43 [0.21 - 0.90]**	2.06 [0.51 - 8.32]	2.19 [0.64 - 7.50]
Employment				
Employed /Unemployed	0.88 [0.40 - 1.95]	0.72 [0.40 - 1.31]	0.63 [0.15 - 2.74]	0.61 [0.21 - 1.78]
BMI				
Overweight-Obese /Normal	1.37 [0.61 - 3.07]	**2.05 [1.14 - 3.69]**	1.18 [0.36 - 3.81]	1.53 [0.61 - 3.82]
CMD status				
T2DM/No CMD	**10.61 [2.48 - 45.41]**	0.77 [0.15 - 3.98]	4.30 [0.44 - 42.43]	3.52 [0.38 - 32.70]
HTN/No CMD	1.50 [0.55 - 4.13]	**1.92 [1.02 - 3.61]**	2.79 [0.81 - 9.60]	2.52 [0.87 - 7.33]
Both/No CMD	**7.16 [2.28 - 22.41]**	1.21 [0.46 - 3.20]	1.30 [0.23 - 7.38]	**6.97 [1.96 - 24.80]**

Bold values represent significant association. * *Borderline significance.*

The associations between the demographic characteristics of the study population and their knowledge, attitude, behavior (KAB), and their awareness are shown in Table 7.

Age showed a significant positive effect on attitude (OR = 1.04, 95% CI: 1.02 - 1.06), behavior (OR = 1.07, 95% CI: 1.02 - 1.12), and a borderline significant positive effect on overall awareness (OR = 1.04, 95% CI: 1.00 - 1.08). This indicated that as age increased, there was a slight but significant increase in positive attitudes, behaviors, and overall awareness towards CMDs. Gender significantly influenced knowledge, with females having a much higher odds ratio (OR = 2.80, 95% CI: 1.23 - 6.39) and overall awareness (OR = 3.89, 95% CI: 1.28 - 11.80) compared to males. This suggested that females were significantly more knowledgeable and aware of CMDs compared to males. Gender did not significantly impact attitude or behavior.

Higher education levels (tertiary or higher) were associated with significantly better knowledge (OR = 3.29, 95% CI: 1.24 - 8.72) compared to primary education or below. However, it had a negative association with attitude (OR = 0.43, 95% CI: 0.21 - 0.90). Secondary education also negatively impacted attitude (OR = 0.49, 95% CI: 0.28 - 0.86). Education level did not significantly impact behavior or overall awareness. Employment status did not significantly influence knowledge, attitude, behavior, or overall awareness towards CMDs. The odds ratios were not significant, indicating no substantial difference between employed and unemployed individuals in these aspects. Participants who were overweight or obese had a significantly positive attitude (OR = 2.05, 95% CI: 1.14 - 3.69). This suggested that overweight or obese individuals had a more positive attitude towards CMDs compared to those with normal BMI. However, BMI did not significantly affect knowledge, behavior, or overall awareness. CMD status significantly affected knowledge and awareness. Participants with T2DM had substantially higher knowledge (OR = 10.61, 95% CI: 2.48 - 45.41) compared to those without CMD. Individuals with both T2DM and HTN showed significantly higher knowledge (OR = 7.16, 95% CI: 2.28 - 22.41) and awareness (OR = 6.97, 95% CI: 1.96 - 24.80). Participants with HTN alone did not show significant differences in knowledge, attitude, behavior, or awareness.

Table 8: Association between knowledge, attitude, behavior by multiple binary logistic regression models (adjusted for age, gender, education, employment, BMI, and CMD status)

	Attitude OR [95%CI]	**Behavior** OR [95%CI]
Knowledge of T2DM		
Good / Bad	**4.89 [2.27 – 10.55]**	1.87 [0.54 – 6.42]
Knowledge of HTN		
Good / Bad	**4.74 [2.71 – 8.30]**	2.42 [0.77 – 7.55]
General knowledge		
Good / Bad	**4.57 [2.06 – 10.16]**	1.93 [0.56 – 6.68]
Attitude		
Positive / Negative		1.53 [0.53 – 4.37]
Knowledge and Attitude		
Good / Bad		2.71 [0.64 – 11.45]

Bold values represent significant association.

Table 8 presents the associations between knowledge, attitude, and behavior related to type 2 diabetes mellitus and hypertension through multiple binary logistic regression models, adjusted for all sociodemographic characteristics.

Having good knowledge of T2DM, HTN, and general knowledge were found significantly associated with better attitude regarding CMD (OR = 4.89, 95% CI: 2.27 – 10.55, OR = 4.74, 95% CI: 2.71 – 8.30, OR = 4.57, 95% CI: 2.06 – 10.16, respectively). Knowledge and attitude were not associated with preventive behavior of the participants.

4.2 Influenza vaccine uptake

Table 9: Sociodemographic characteristics of the participants

	n [a]	% [b]
Gender		
Male	122	20.85
Female	463	79.15
Age groups		
<25	354	60.51
25+	231	39.49
Ethnicity		
Kinh	426	72.82
Others	159	27.18
Marital status		
Single	454	77.61
Not single	131	22.39
Occupational status		
Student	367	62.74
Medical doctor	64	10.94
Pharmacist	82	14.02
Other healthcare personnel (Preventive medicine doctor / Lab technician)	72	12.37
Frequency of seeking healthcare		
At least once per year	305	52.14
Less than once per year	280	47.86
Advised by a healthcare provider		
Yes	164	28.03
No	421	71.97
Vaccination status		
Vaccinated	237	40.51
Unvaccinated	348	59.49
Knowledge		
Good	214	36.58
Not good	371	63.42
Attitude		
Good	248	42.39
Not good	337	57.61
Willingness of vaccination and/or revaccination		
Yes	111	18.97
No	474	81.03
Willingness to advise others		
Yes	526	89.91
No	59	10.09
Believe in mandatory vaccination		
Yes	318	54.36
No	267	45.64
Awareness		
Good	116	19.83
Not good	469	80.17

[a] *n* = the number of participants, [b] % = the percentage.

Table 9 presents the sociodemographic characteristics of the study participants.

Among the 585 participants, the majority were female (79.15%), with males representing 20.85%. The participants were predominantly young, with 60.51% being under 25 years old, while 39.49% were aged 25 years and older. A significant portion of the participants belonged to the Kinh ethnicity (72.82%), with the remaining 27.18% belonging to other ethnic groups. In terms of marital status, 77.61% of the participants were single, while 22.39% were not single. The largest occupational group among the participants was students, comprising 62.74% of the sample. Medical doctors accounted for 10.94%, pharmacists 14.02%, and other healthcare personnel (including preventive medicine doctors and lab technicians) 12.37%. Regarding the frequency of seeking healthcare, 52.14% of participants sought healthcare at least once per year, whereas 47.86% sought healthcare less frequently. Only 28.03% had been advised by a healthcare provider, while a significant majority (71.97%) had not received such advice. The vaccination status showed that 40.51% of the participants were vaccinated, while 59.49% remained unvaccinated. In terms of vaccination knowledge, 36.58% of participants possessed good knowledge, while 63.42% did not. Regarding attitudes, 42.39% of the participants had a positive attitude towards vaccination, whereas 57.61% did not. Despite the levels of knowledge and attitudes, only 18.97% of the participants were willing to vaccinate or revaccinate, while a substantial 81.03% were not willing. However, a high percentage (89.91%) were willing to advise others about vaccination, with only 10.09% not willing to do so. A little over half of the participants (54.36%) believed in mandatory vaccination, while 45.64% did not share this belief. In terms of awareness, 19.83% of participants had good awareness regarding vaccination, compared to 80.17% who had poor awareness.

Table 10: Knowledge, attitude, and vaccination status of the participants

	Good knowledge (%) (N = 214, 36.58%)	p-value*	**Good attitude (%)** (N = 248, 42.39%)	p-value*	**Vaccinated (%)** (N = 237, 40.51%)	p-value*
Gender						
Male	49 (40.16)	0.356	38 (31.15)	**0.005**	54 (44.26)	0.343
Female	165 (35.64)		210 (45.36)		183 (39.52)	
Age groups						
<25	130 (37.72)	0.930	142 (40.11)	0.167	133 (37.57)	0.073
25+	84 (36.36)		106 (45.89)		104 (45.02)	
Ethnicity						
Kinh	168 (39.44)	**0.019**	199 (46.71)	**0.001**	180 (42.25)	0.160
Others	46 (28.93)		49 (30.82)		57 (35.85)	
Marital status						
Single	172 (37.89)	0.223	188 (41.41)	0.370	168 (37)	**0.001**
Not single	42 (32.06)		60 (45.80)		69 (52.67)	
Occupational status						
Student	137 (37.33)	0.074	149 (40.60)	0.636	140 (38.15)	0.328
Medical doctor	28 (43.75)		31 (48.43)		32 (50.00)	
Pharmacist	32 (39.02)		37 (45.12)		35 (42.68)	
Other (Preventive medicine doctor / Lab technician)	17 (23.61)		31 (45.06)		30 (41.67)	
Seeking healthcare						
At least once per year	111 (36.39)	0.922	139 (45.57)	0.104	143 (46.89)	**0.001**
Less than once per year	103 (36.79)		109 (38.93)		94 (33.57)	
Advised by HCP						
Yes	62 (37.80)	0.701	74 (45.12)	0.405	99 (60.37)	**<0.001**
No	152 (36.10)		174 (41.33)		138 (32.78)	
Willingness of vaccination and/or revaccination						
Yes	47 (42.34)	0.162	66 (59.46)	**<0.001**	78 (70.27)	**<0.001**
No	167 (35.23)		182 (38.40)		159 (33.54)	
Willingness to advise others						
Yes	197 (37.45)	0.191	237 (45.06)	**<0.001**	222 (42.21)	**0.013**
No	17 (28.81)		11 (18.64)		15 (25.42)	
Believe in mandatory vaccination						
Yes	128 (40.25)	**0.044**	180 (56.60)	**<0.001**	144 (45.28)	**0.010**
No	214 (36.58)		68 (25.47)		93 (34.83)	

Bold values represent significant association. * Pearson's chi-square test.

Table 10 presents a statistical analysis of factors influencing knowledge, attitudes, and practices regarding vaccination among different demographic and professional groups.

There was a significant difference in knowledge between Kinh (39.44%) and other ethnicities (28.93%) ($p = 0.019$). Those with good knowledge tended to agree with mandatory vaccination among medical-related students and HCWs (40.25%) ($p = 0.044$). There was no significant difference in knowledge between males (40.16%) and females (35.64%) ($p = 0.356$). Knowledge levels were similar across age groups, with those under 25 years at 37.72% and those 25 years and older at 36.36% ($p = 0.930$). No significant difference was observed between single (37.89%) and not single individuals (32.06%) ($p = 0.223$). Medical doctors had the highest level of knowledge (43.75%), followed by pharmacists (39.02%), students (37.33%), and other healthcare professionals (23.61%) ($p = 0.074$). There was no significant difference in knowledge between those who sought healthcare at least once per year (36.39%) and those who sought it less frequently (36.79%) ($p = 0.922$). Being advised by HCP did not significantly affect knowledge ($p = 0.701$). There was no significant association between willingness to vaccinate/revaccinate and level of knowledge ($p = 0.162$). Similarly, willingness to advise others did not significantly associate with knowledge ($p = 0.191$).

Females showed significantly better attitudes (45.36%) than males (31.15%) ($p = 0.005$). Kinh individuals showed significantly better attitudes (46.71%) compared to other ethnicities (30.82%) ($p = 0.001$). There was a highly significant difference, with those having better attitudes being significantly more willing to vaccinate/revaccinate (59.46%) ($p < 0.001$). Participants with better attitudes were significantly more willing to advise others (45.06%) ($p < 0.001$). Better attitudes were significantly associated with belief in mandatory vaccination (56.60%) ($p < 0.001$). There was no significant difference in attitudes between those under 25 years (40.11%) and those 25 years and older (45.89%) ($p = 0.167$). No significant difference in attitudes was observed between single (41.41%) and not single individuals (45.80%) ($p = 0.370$). Medical doctors insignificantly exhibited better attitudes (48.43%), followed by pharmacists (45.12%), other healthcare professionals (45.06%), and students (40.60%) ($p = 0.636$). Those who sought healthcare at least once per year had significantly better attitudes (45.57%) compared to those who sought it less frequently (38.93%) ($p = 0.104$). Being advised by HCP did not significantly affect attitudes ($p = 0.405$).

Being not single was associated with significantly higher vaccination rates (52.67%) compared to single individuals (37%) ($p = 0.001$). Those who sought healthcare at least once per year had significantly higher vaccination rates (46.89%) compared to those who sought it less frequently (33.57%) ($p = 0.001$). Being advised by HCP was associated with significantly higher

vaccination rates (60.37%) compared to those not advised (32.78%) ($p < 0.001$). Those who were already vaccinated showed significantly more willingness to vaccinate/revaccinate (70.27%) ($p < 0.001$). Those who were already vaccinated were more willing to advise others to get vaccinated (42.21%) compared to those who were not ($p = 0.013$). Vaccinated participants tended to agree with mandatory vaccination for medical students and HCWs (45.28%) ($p = 0.010$). There was no significant difference in vaccination rates between males (44.26%) and females (39.52%) ($p = 0.343$). Those aged 25 years and older had a slightly higher vaccination rate (45.02%) compared to those under 25 years (37.57%) ($p = 0.073$). There was no significant difference in vaccination rates between Kinh (42.25%) and other ethnicities (35.85%) ($p = 0.160$). Medical doctors had the highest vaccination rates (50.00%), followed by pharmacists (42.68%), other healthcare professionals (41.67%), and students (38.15%) ($p = 0.328$).

Table 11: Participants' willingness and belief in vaccination

	Willingness of vaccination /revaccination (%) (N = 111, 18.97%)	p-value*	**Willingness to advice others (%)** (N = 526, 89.91%)	p-value*	**Believe in mandatory vaccination** (%) (N = 318, 54.36%)	p-value*
Gender						
Male	90 (19.44)	0.577	427 (92.22)	**<0.001**	258 (55.72)	0.197
Female	21 (17.21)		99 (81.15)		60 (49.18)	
Age groups						
<25	64 (27.71)	**<0.001**	212 (91.77)	0.227	124 (53.68)	0.790
25+	47 (13.28)		314 (88.70)		194 (54.80)	
Ethnicity						
Kinh	82 (19.25)	0.782	390 (91.55)	**0.032**	242 (56.81)	0.052
Others	29 (18.24)		136 (85.53)		76 (47.80)	
Marital status						
Single	46 (35.11)	**<0.001**	122 (93.13)	0.165	79 (60.31)	0.121
Not single	65 (14.32)		404 (88.99)		239 (52.64)	
Occupational status						
Student	55 (14.99)		328 (89.37)		208 (56.68)	
Medical doctor	17 (26.56)		57 (89.06)		30 (46.88)	
Pharmacist	23 (28.05)	**0.011**	72 (87.80)	0.340	42 (51.22)	0.451
Other (Preventive medicine doctor / Lab technician)	16 (22.22)		69 (95.83)		38 (52.78)	
Seeking healthcare						
At least once per year	76 (24.92)	**<0.001**	280 (91.80)	0.113	179 (58.69)	**0.028**
Less than once per year	35 (12.50)		246 (87.86)		139 (49.64)	
Advised by HCP						
Yes	57 (34.76)	**<0.001**	155 (94.51)	0.021	102 (62.20)	**0.018**
No	54 (12.83)		371 (88.12)		216 (51.31)	
Awareness						
Good	35 (30.17)	**0.001**	113 (97.41)	**0.003**	88 (75.86)	**<0.001**
Bad	76 (16.20)		413 (88.06)		230 (49.04)	

Bold values represent significant association. * Pearson's chi-square test.

Table 11 provides a statistical analysis of participants' willingness to vaccinate/revaccinate, willingness to advise others, and belief in mandatory vaccination across various demographic and professional groups.

Participants under 25 years were significantly more willing to vaccinate/revaccinate (27.71%) compared to those 25 years and older (13.28%) ($p < 0.001$). Single participants were significantly more willing to vaccinate/revaccinate (35.11%) compared to not single participants (14.32%) ($p < 0.001$). Medical doctors exhibited the highest willingness to vaccinate/revaccinate (26.56%), followed by pharmacists (28.05%), students (14.99%), and other healthcare professionals (22.22%) ($p = 0.011$). Those who sought healthcare at least once per year were significantly more willing to vaccinate/revaccinate (24.92%) compared to those who sought it less frequently (12.50%) ($p < 0.001$). Being advised by HCP significantly increased willingness to vaccinate/revaccinate (34.76%) compared to those not advised (12.83%) ($p < 0.001$). Participants with good awareness were significantly more willing to vaccinate/revaccinate (30.17%) compared to those with poor awareness (16.20%) ($p = 0.001$). There was no significant difference between males (19.44%) and females (17.21%) in their willingness to vaccinate/revaccinate ($p = 0.577$). No significant difference was observed between Kinh (19.25%) and other ethnicities (18.24%) ($p = 0.782$).

Males (92.22%) were significantly more willing to advise others compared to females (81.15%) ($p < 0.001$). Kinh participants were significantly more willing to advise others (91.55%) compared to other ethnicities (85.53%) ($p = 0.032$). Being advised by HCP significantly increased willingness to advise others (94.51%) compared to those not advised (88.12%) ($p = 0.021$). Good awareness significantly increased willingness to advise others (97.41%) compared to poor awareness (88.06%) ($p = 0.003$). There was no significant difference in willingness to advise others between those under 25 years (91.77%) and those 25 years and older (88.70%) ($p = 0.227$). Marital status did not significantly affect the willingness to advise others ($p = 0.165$). Other healthcare professionals (95.83%) and medical doctors (89.06%) were insignificantly more willing to advise others compared to pharmacists (87.80%) and students (89.37%) ($p = 0.340$). Seeking healthcare at least once per year did not significantly affect willingness to advise others ($p = 0.113$).

Those who sought healthcare at least once per year were significantly more likely to believe in mandatory vaccination (58.69%) compared to those who sought it less frequently (49.64%) ($p = 0.028$). Being advised by HCP significantly increased belief in mandatory vaccination (62.20%) compared to those not advised (51.31%) ($p = 0.018$). Participants with good awareness had a significantly higher belief in mandatory vaccination (75.86%) compared to

those with poor awareness (49.04%) ($p < 0.001$). No significant difference was observed between males (55.72%) and females (49.18%) in their belief in mandatory vaccination ($p = 0.197$). Belief in mandatory vaccination was similar between participants under 25 years (53.68%) and those 25 years and older (54.80%) ($p = 0.790$). Kinh participants (56.81%) showed a marginally higher belief in mandatory vaccination compared to other ethnicities (47.80%) ($p = 0.052$). No significant difference was observed between single participants (60.31%) and not single participants (52.64%) in mandatory vaccination belief ($p = 0.121$). Students (56.68%) had the highest rate of belief in mandatory vaccination, followed by other healthcare professionals (52.78%), medical doctors (46.88%), and pharmacists (51.22%) ($p = 0.451$).

Table 12: Multiple binary logistic regression on factors influencing KAB regarding influenza vaccine

Knowledge, Attitude, and Awareness	**Knowledge** (OR [95%CI])	**Attitude** (OR [95%CI])	**Awareness** (OR [95%CI])
Gender			
Female / Male	0.91 [0.60–1.38]	**2.00 [1.29–3.10]**	*1.74 [0.99 - 3.05]**
Age groups			
25+ / <25	1.23 [0.69–2.22]	1.18 [0.66–2.10]	1.08 [0.53 - 2.21]
Ethnicity			
Kinh / Others	**1.67 [1.12–2.49]**	**2.10 [1.41–3.11]**	**2.14 [1.26 - 3.64]**
Marital status			
Not single / Single	0.81 [0.47–1.40]	0.99 [0.58–1.67]	0.85 [0.45 - 1.61]
Occupational status			
Student / Others	2.04 [0.98–4.27]	1.18 [0.60–2.33]	1.33 [0.55 - 3.17]
Medical doctor / Others	**2.45 [1.13–5.33]**	1.59 [0.76–3.32]	2.22 [0.91 - 5.42]
Pharmacist / Others	**2.11 [1.03–4.32]**	1.34 [0.69–2.59]	1.40 [0.60 - 3.27]
Seeking healthcare			
At least once per year / less than once per year	0.97 [0.68–1.38]	1.25 [0.88–1.77]	1.09 [0.71 - 1.68]
Advised by HCP			
Yes / No	1.17 [0.79–1.73]	1.17 [0.79–1.72]	1.37 [0.86 - 2.17]

Bold values represent significant association. * *Borderline significant.*

Table 12 presents the results of a multiple binary logistic regression analysis aimed at identifying factors influencing knowledge, attitude, and awareness regarding the influenza vaccine.

Females were twice as likely as males to have a positive attitude towards the influenza vaccine (OR = 2.00, 95% CI: 1.29–3.10), indicating a significant difference. Females also showed higher awareness about the influenza vaccine compared to males, although this result was borderline significant (OR = 1.74, 95% CI: 0.99–3.05). The odds of having knowledge about the influenza vaccine were lower for females compared to males (OR = 0.91, 95% CI: 0.60–1.38), but this was not statistically significant.

Individuals aged 25 and above had slightly higher odds of having better knowledge about the influenza vaccine compared to those under 25, but this difference was not statistically significant (OR = 1.23, 95% CI: 0.69–2.22). The attitude towards the influenza vaccine did not significantly differ between the two age groups (OR = 1.18, 95% CI: 0.66–2.10). There was no significant difference in awareness between the two age groups (OR = 1.08, 95% CI: 0.53–2.21).

The Kinh ethnic group had significantly higher odds of having knowledge about the influenza vaccine compared to other ethnic groups (OR = 1.67, 95% CI: 1.12–2.49). Similarly, the Kinh group was more likely to have a positive attitude towards the influenza vaccine (OR = 2.10, 95% CI: 1.41–3.11). The Kinh group also showed significantly higher awareness regarding the influenza vaccine compared to others (OR = 2.14, 95% CI: 1.26–3.64).

Being not single (married, in a relationship) slightly decreased the odds of having knowledge about the influenza vaccine, but the difference was not statistically significant (OR = 0.81, 95% CI: 0.47–1.40). Marital status did not significantly impact the attitude towards the influenza vaccine (OR = 0.99, 95% CI: 0.58–1.67). There was also no significant impact of marital status on awareness about the influenza vaccine (OR = 0.85, 95% CI: 0.45–1.61).

Medical doctors had significantly higher odds of having knowledge about the influenza vaccine compared to other occupations (OR = 2.45, 95% CI: 1.13–5.33). Pharmacists also showed significantly higher odds (OR = 2.11, 95% CI: 1.03–4.32). Students did not show a significant difference compared to others (OR = 2.04, 95% CI: 0.98–4.27). Occupational status did not significantly affect attitude towards the influenza vaccine for any of the groups: students (OR = 1.18, 95% CI: 0.60–2.33), medical doctors (OR = 1.59, 95% CI: 0.76–3.32), or pharmacists (OR = 1.34, 95% CI: 0.69–2.59). Medical doctors showed significantly higher awareness about the influenza vaccine (OR = 2.22, 95% CI: 0.91–5.42), although this was at the borderline of statistical significance. Pharmacists did not show a significant difference in awareness (OR =

1.40, 95% CI: 0.60–3.27). Students had higher odds of awareness but not significantly so (OR = 1.33, 95% CI: 0.55–3.17).

Seeking healthcare at least once per year did not significantly impact knowledge about the influenza vaccine (OR = 0.97, 95% CI: 0.68–1.38). The frequency of seeking healthcare did not significantly influence attitude towards the vaccine (OR = 1.25, 95% CI: 0.88–1.77). Similarly, awareness about the influenza vaccine was not significantly affected by healthcare-seeking behavior (OR = 1.09, 95% CI: 0.71–1.68).

Being advised by a healthcare provider did not significantly increase the odds of having knowledge about the influenza vaccine (OR = 1.17, 95% CI: 0.79–1.73). Similarly, advice from a healthcare provider did not significantly impact attitude towards the influenza vaccine (OR = 1.17, 95% CI: 0.79–1.72). There was no significant effect of being advised by a healthcare provider on awareness about the influenza vaccine (OR = 1.37, 95% CI: 0.86–2.17).

Table 13: Multiple binary logistic regression on factors influencing vaccine practice of the participants

Vaccination status, Willingness and Belief	**Vaccination status** (OR [95%CI])	**Willingness of vaccination /revaccination** (OR [95%CI])	**Willingness to advice others** (OR [95%CI])	**Belief in mandatory vaccination** (OR [95%CI])
Gender				
Female / Male	0.83 [0.54 - 1.28]	1.13 [0.64 - 2.01]	**2.66 [1.47 - 4.82]**	1.17 [0.77 - 1.79]
Age groups				
25+ / <25	0.77 [0.42 - 1.42]	1.45 [0.70 - 3.02]	1.30 [0.47 - 3.56]	1.03 [0.56 - 1.88]
Ethnicity				
Kinh / Others	1.39 [0.93 - 2.08]	1.14 [0.68 - 1.91]	**1.83 [1.02 - 3.28]**	1.34 [0.91 - 1.96]
Marital status				
Not single / Single	**2.09 [1.20 - 3.64]**	**2.49 [1.33 - 4.65]**	1.09 [0.41 - 2.87]	**1.80 [1.04 - 3.12]**
Occupational status				
Students / Others	1.37 [0.67 - 2.80]	1.89 [0.80 - 4.49]	0.55 [0.13 - 2.32]	1.93 [0.96 - 3.90]
Medical doctor / Others	**2.25 [1.04 - 4.87]**	2.13 [0.86 - 5.28]	0.47 [0.10 - 2.10]	0.96 [0.45 - 2.05]
Pharmacists / Others	1.30 [0.65 - 2.59]	2.02 [0.90 - 4.51]	0.39 [0.10 - 1.54]	1.12 [0.57 - 2.19]
Seeking healthcare				
At least once per year / less than once per year	1.39 [0.97 – 2.00]	**1.68 [1.04 - 2.70]**	1.26 [0.71 - 2.26]	1.37 [0.96 - 1.94]
Advised by HCP				
Yes / No	**2.92 [1.98 - 4.32]**	**3.11 [1.96 - 4.94]**	**2.25 [1.04 - 4.87]**	1.40 [0.94 - 2.08]
Awareness				
Good / Not good	1.45 [0.94 - 2.24]	**2.26 [1.36 - 3.76]**	**4.32 [1.31 - 14.26]**	**3.19 [1.99 - 5.13]**

Bold values represent significant association.

Table 13 presents the results of a multiple binary logistic regression analysis aimed at identifying factors influencing vaccination status, willingness of vaccination/revaccination, willingness to advice others, and belief in mandatory vaccination for medical-related students and HCW.

Females were significantly more willing to advise others on vaccination compared to males (OR = 2.66, 95% CI: 1.47 - 4.82). Gender did not significantly impact vaccination status (OR = 0.83, 95% CI: 0.54 - 1.28), the willingness to vaccinate/revaccinate (OR = 1.13, 95% CI: 0.64 - 2.01), and the belief in mandatory vaccination for medical-related students and HCW (OR = 1.17, 95% CI: 0.77 - 1.79).

Age did not significantly impact vaccination status (OR = 0.77, 95% CI: 0.42 - 1.42), the willingness to vaccinate/revaccinate (OR = 1.45, 95% CI: 0.70 - 3.02), the willingness to advise others (OR = 1.3, 95% CI: 0.47 - 3.36), and the belief in mandatory vaccination for medical-related students and HCW (OR = 1.03, 95% CI: 0.56 - 1.88).

Individuals from the Kinh ethnic group were significantly more willing to advise others on vaccination (OR = 1.83, 95% CI: 1.02 - 3.28). Ethnicity did not significantly affect vaccination status (OR = 1.39, 95% CI: 0.93 - 2.08), the willingness to vaccinate/revaccinate (OR = 1.14, 95% CI: 0.68 - 1.91), and the belief in mandatory vaccination for medical-related students and HCW (OR = 1.34, 95% CI: 0.91 - 1.96).

Those who were not single were significantly more likely to be vaccinated compared to single individuals (OR = 2.09, 95% CI: 1.20 - 3.64), more willing to vaccinate/revaccinate (OR = 2.49, 95% CI: 1.33 - 4.65), and more likely to believe in mandatory vaccination for medical-related students and HCW (OR = 1.80, 95% CI: 1.04 - 3.12). Marital status did not significantly impact willingness to advise others (OR = 1.09, 95% CI: 0.41 - 2.87).

Medical doctors were significantly more likely to be vaccinated compared to others (OR = 2.25, 95% CI: 1.04 - 4.87). Students and pharmacists did not show significant differences.

Occupational status did not significantly impact willingness to vaccinate/revaccinate, the willingness to advise others, and the belief in mandatory vaccination for medical-related students and HCW (all 95% CI included 1).

Seeking healthcare at least once per year significantly increased willingness to vaccinate/revaccinate (OR = 1.68, 95% CI: 1.04 - 2.70). Seeking healthcare at least once per year did not significantly impact vaccination status (OR = 1.39, 95% CI: 0.97 – 2.00), the willingness to advise others (OR = 1.26, 95% CI: 0.71 - 2.26), and the belief in mandatory vaccination for medical-related students and HCW (OR = 1.37, 95% CI: 0.96 - 1.94).

Being advised by a healthcare professional significantly increased the likelihood of being vaccinated (OR = 2.92, 95% CI: 1.98 - 4.32), the willingness to vaccinate/revaccinate (OR = 3.11, 95% CI: 1.96 - 4.94), and the willingness to advise others (OR = 2.25, 95% CI: 1.04 - 4.87). However, being advised by a healthcare professional did not significantly influence belief in mandatory vaccination for medical-related students and HCW (OR = 1.40, 95% CI: 0.94 - 2.08).

Good awareness significantly increased willingness to vaccinate/revaccinate (OR = 2.26, 95% CI: 1.36 - 3.76), the willingness to advise others (OR = 4.32, 95% CI: 1.31 - 14.26), and the belief in mandatory vaccination for medical-related students and HCW (OR = 3.19, 95% CI: 1.19 - 5.13). Awareness did not significantly affect vaccination status (OR = 1.45, 95% CI: 0.94 - 2.24).

Chapter 5: Discussion

5.1 Interpretation of findings

5.1.1 Low awareness and preventive behaviors for CMD

The study provided critical insights into the current state of awareness and preventive behaviors regarding CMD among the participants.

The data indicated a substantial gap in knowledge about CMDs, which included T2DM and hypertension. Specifically, the findings showed that a significant majority of the participants had poor knowledge about T2DM, CMD, and hypertension. The analysis highlighted that gender, education, and CMD status significantly influenced various aspects of awareness towards CMDs. Older age, female gender, higher education, being overweight or obese, and having T2DM or both T2DM and HTN were associated with better knowledge. This lack of knowledge was a significant barrier to effective prevention and management of these diseases. The negative attitudes towards CMDs observed in the study were also a significant barrier to effective prevention and management. As the results of Pearson's chi square tests, older age, lower education levels, being female, unemployed, having higher BMI, and having good knowledge were associated with higher rate of positive attitudes. As the results of multiple binary logistic regression, higher educational level was found to be associated with worse attitude. As higher educational level was defined as an indicator for higher socioeconomic status (SES), people with better SES in Vietnam were more likely to be exposed to a western lifestyle, such as fast-food or sugar-rich diets, as they were more able to afford them, leading to unfavorable attitude (187,188). Also, having good knowledge of CMD was found significantly associated with more positive attitude regarding the conditions in the regression model.

Negative attitudes stemmed from various sources, including cultural beliefs, past experiences, and misinformation (189,190). For instance, some participants might have believed that CMDs were inevitable and could not be prevented, leading to a fatalistic attitude towards prevention and management (191,192). The data indicated that preventive behaviors towards CMDs were largely negative among the participants, with 95.02% exhibiting poor preventive behaviors. Younger age, being male, employment, not having CMDs, having bad knowledge and negative attitude were associated with higher proportions of bad preventive behaviors, according to the results of Pearson's chi-square tests. However, only age was found significant in the regression model. This included lack of physical activity, unhealthy dietary habits, and non-adherence to medical advice. These behaviors were major risk factors for the development and progression of CMDs.

The data indicated that the study population was extremely lacking in awareness regarding CMDs, with 92.04% exhibiting poor awareness. The univariate analysis highlighted that age, gender, education, BMI, and CMD status significantly influenced various aspects of awareness towards CMDs. Older age, female gender, higher education, being overweight or obese, and having T2DM or both T2DM and HTN were associated with better knowledge and awareness. Multiple logistic regression models indicated that older age was borderline significant with better awareness; female gender and having both T2DM and HTN were strongly associated with better awareness.

5.1.2 Low awareness on influenza vaccine leads to low vaccination rate

The study also highlighted the low awareness and low uptake of the influenza vaccine among participants. While many participants believed in mandatory influenza vaccination for medical students and HCW, there is significant reluctance to vaccinate or revaccinate. Interestingly, a large proportion of participants were willing to advise others about vaccination, indicating a discrepancy between personal health actions and public health advocacy.

Understanding the barriers to vaccination was crucial in addressing this issue (193). Common barriers included fear of side effects, misconceptions about vaccine efficacy, and perceived lack of necessity (193). For example, some individuals might believe that they do not need the vaccine because they are healthy or because they have never had the flu before (194).

Tables 9 and 10 provided deeper insights into the factors influencing vaccination practices. Ethnicity, belief in mandatory vaccination, and willingness to vaccinate or advise others were particularly influential. Gender and marital status also played significant roles in shaping attitudes and practices towards vaccination. Additionally, the presence of CMDs, advice from healthcare professionals, and healthcare-seeking behavior significantly impacted vaccination willingness and practices.

5.2 Comparison with existing literature

5.2.1 CMD awareness and preventive behaviors

The findings from this study are consistent with numerous studies documenting low awareness and suboptimal preventive behaviors regarding CMDs across different populations. For instance, a study by Sallis et al. (2016) reported that a significant portion of the population lacked adequate knowledge and engaged in unhealthy behaviors, similar to the findings of this study (195). The association between demographic factors such as age, gender, and education

with CMD awareness and behaviors is also consistent with previous research (6,196–198). Studies have often found that older adults and those with higher education levels tend to have better knowledge and more positive health behaviors (199,200).

Knowledge gaps in CMD awareness

The results align with studies showing widespread knowledge gaps about CMDs. For example, in a study by Rahman et al. (2018), a large proportion of participants were unaware of the symptoms and risk factors associated with T2DM and hypertension, similar to the knowledge deficits found in this study (201). The study by Hocking et al. (2013) also highlighted that a significant number of individuals with chronic disease lacked sufficient knowledge about their conditions, which adversely affected their disease management and outcomes (131).

Despite many health campaigns in Vietnam trying to increase public understanding and awareness of CMDs, many individuals do not fully understand the implications of CMDs, leading to inadequate preventive measures (17,53,202). This reflects the findings of this study, where the majority of participants exhibited poor knowledge about CMDs and engaged in unhealthy behaviors.

Attitudinal barriers to CMD prevention

The negative attitudes towards CMDs observed in this study are consistent with findings from other research. For example, a study by Yusuf Mohamud et al. (2022) found that negative attitudes towards lifestyle modifications were prevalent among individuals at risk for CMDs (203). These attitudes were often rooted in cultural beliefs and misinformation, making it challenging to adopt healthy behaviors (204,205).

Similarly, two studies by Kalantzi et al. (2023) and Walker et al. (2012) highlighted that negative attitudes and fatalistic beliefs about CMDs were significant barriers to effective prevention and management (206,207). These attitudes can lead to a lack of motivation to engage in healthy behaviors, as observed in this study.

Behavioral challenges in CMD management

The poor preventive behaviors observed in this study are in line with findings from other research. A study by Robinson et al. (2023) found that many individuals at increased risk for CMDs did not engage in regular physical activity or adhere to dietary recommendations (208). This lack of adherence was often due to a combination of factors, including time constraints, lack of access to resources, and low motivation (208,209).

In another study by Ganiyu et al. (2013), participants reported difficulty in maintaining healthy behaviors due to competing priorities and lack of support (209). This is consistent with the findings of this study, where a significant majority of participants exhibited poor preventive behaviors.

Impact of demographic factors on CMD awareness and behaviors

The influence of demographic factors such as age, gender, and education on CMD awareness and behaviors were indicated in many literatures (133,134,200). For example, a study by Ibarra-Sanchez et al. (2023) found that older adults and those with higher education levels were more likely to have better knowledge and engage in positive health behaviors (200). This aligns with the findings of this study, where older participants and those with tertiary education showed relatively better knowledge about CMDs.

Similarly, a study by Stefan Ek (2015) reported that women were more likely to have better knowledge and engage in healthier behaviors compared to men (133). This is consistent with the findings of this study, where females exhibited better knowledge and more positive attitudes towards CMDs.

Discrepancies in health behaviors among employed individuals

The finding that employed individuals displayed more negative attitudes and behaviors towards CMDs contrasts with some literature suggesting that employment is associated with better health outcomes. For instance, a study by Hoven et al. (2023) reported that employed individuals often have better access to healthcare resources and are more likely to engage in preventive behaviors (210).

However, other studies have shown that employment can also be associated with stress and time constraints, which can negatively impact health behaviors. Such as, a study by Huang et al. (2022) found that job stress and long working hours were associated with poor health behaviors, such as lack of physical activity and unhealthy eating (211). This is consistent with the findings of this study, where employed individuals exhibited more negative attitudes and behaviors towards CMDs.

5.2.2 Influenza vaccination

The low awareness and low uptake of influenza vaccination observed in this study mirrors findings from other research. Studies have shown that despite substantial awareness campaigns,

actual vaccination rates remain suboptimal due to factors such as vaccine hesitancy, misconceptions about vaccine efficacy, and fear of side effects (41,42,212).

Knowledge, awareness versus practice in influenza vaccination

Low vaccination rate of the influenza vaccine due to low awareness is a well-documented issue in public health. For example, a study by Sun et al. (2024) found that although a significant portion of the population was aware of the importance of the influenza vaccine, vaccination rates remained low due to various barriers (213).

In contrast, a study by Jiang et al. (2022) highlighted that high awareness of influenza vaccination did not necessarily translate into higher vaccination rates (214). This gap between knowledge and practice was attributed to factors such as fear of side effects, skepticism about vaccine efficacy, and logistical challenges.

Vaccine hesitancy

The issue of vaccine hesitancy observed in this study is consistent with findings from other research. A study by Nuwarda et al. (2022) identified vaccine hesitancy as a major barrier to achieving high vaccination rates (41). Factors contributing to vaccine hesitancy included concerns about vaccine safety, misinformation, and distrust of healthcare systems.

A study by Kumar et al. (2022) also found that vaccine hesitancy was influenced by psychological factors, such as risk perception and trust in health authorities (157). This reflects the findings of this study, where many participants were reluctant to vaccinate or revaccinate.

Role of healthcare professionals

The significant influence of healthcare professionals on vaccination decisions observed in this study is supported by existing literature. For example, a study by Aguolu et al. (2022) found that recommendations from healthcare professionals were one of the most important factors influencing vaccination decisions (215).

Similarly, a study by Guillari et al. (2021) reported that advice from healthcare providers significantly increased the likelihood of individuals getting vaccinated (171). This aligns with the findings of this study, where advice from healthcare professionals was a key determinant of vaccination practices.

Policy measures

The impact of policy measures on vaccination rates observed in this study is consistent with findings from other research. For example, a study by Maltezou et al. (2022) found that mandatory vaccination policies for HCW significantly increased vaccination rates.

Similarly, a study by Singh et al. (2020) reported that providing free or subsidized vaccines reduced financial barriers and increased vaccination rates (216). This is consistent with the findings of this study, where policy measures such as mandatory vaccination and subsidized vaccines were suggested to improve vaccination rates.

Community engagement

The importance of community engagement in promoting vaccination observed in this study is supported by existing literature. For example, a study by Kan and Zhang (2018) found that social support and peer influence were critical determinants of vaccination behaviors.

Similarly, a study by Xie et al. (2024) reported that community engagement and involvement of trusted community leaders significantly increased vaccination acceptance (217). This aligns with the findings of this study, where fostering social support networks and engaging community leaders were recommended to promote vaccination.

5.3 Public health implications

5.3.1 CMD awareness and preventive behaviors

Increased burden on healthcare systems

The significant gaps in knowledge and preventive behaviors regarding CMDs among the study population suggest a potential increase in the burden on healthcare systems (218). Individuals with poor knowledge and negative attitudes towards CMDs are less likely to engage in preventive behaviors, leading to higher rates of disease incidence and progression (219). This can result in increased healthcare costs due to the need for more intensive treatments and management of complications associated with CMDs (220). The strain on healthcare resources could be substantial, particularly in regions with already limited healthcare infrastructure, especially in Vietnam (16).

Inequities in health outcomes

The disparities in CMD awareness and behaviors among different demographic groups highlight existing health inequities (132,221). For instance, younger individuals, males, and those with lower education levels exhibited poorer knowledge and behaviors related to CMDs.

These inequities can lead to differential health outcomes, where certain groups are disproportionately affected by CMDs (222). Addressing these disparities is crucial for achieving health equity and ensuring that all population segments have access to the knowledge and resources needed to prevent and manage CMDs effectively.

Impact on workforce productivity

The poor preventive behaviors and low awareness of CMDs among employed individuals have significant implications for workforce productivity. CMDs can lead to increased absenteeism and presenteeism (working while sick), reducing overall productivity. Employees suffering from CMDs may require more frequent medical leave and may not perform at their optimal level when at work. This can have broader economic implications, affecting businesses and the economy as a whole (223–225). Promoting CMD awareness and preventive behaviors in the workplace is essential for maintaining a healthy and productive workforce.

Challenges in public health messaging

The study's findings indicate that the awareness of CMDs, preventive behaviors remain suboptimal. This suggests that current public health messaging strategies may not be effectively translating awareness into action (226–228). Public health campaigns need to be re-evaluated to ensure they are not only informative but also motivational and capable of overcoming behavioral barriers. Understanding the underlying reasons for the disconnect between awareness and behavior is essential for developing more effective health communication strategies.

5.3.2 Influenza vaccination

Risk of influenza outbreaks

The low awareness and low uptake of the influenza vaccine poses a significant risk for influenza transmission (229). High vaccination coverage is critical for achieving herd immunity and preventing the spread of influenza (230,231). The reluctance to vaccinate, as observed in the study, can lead to higher susceptibility to influenza in the population, increasing the likelihood of outbreaks. This can have severe public health consequences, particularly for vulnerable populations such as the elderly, young children, and individuals with underlying health conditions.

Public confidence in vaccination programs

The consistency between low awareness and low uptake of the influenza vaccine highlights challenges in maintaining public confidence in vaccination programs. Vaccine hesitancy, driven by factors such as fear of side effects and misconceptions about vaccine efficacy, can undermine vaccination efforts (40,193,232). This issue is not limited to influenza but can also affect other vaccination programs, potentially leading to lower overall immunization rates and increased vulnerability to vaccine-preventable diseases.

Socioeconomic impact

The low vaccination rates can have broader socioeconomic impacts. Influenza can lead to significant morbidity and mortality, particularly among high-risk groups. This can result in increased healthcare costs and loss of productivity due to illness and absenteeism (233–235). Addressing the barriers to influenza vaccination uptake is crucial for minimizing the socioeconomic impact of influenza and ensuring the well-being of the population.

Role of healthcare providers

The significant influence of healthcare providers on vaccination decisions underscores the critical role they play in public health interventions. Healthcare providers are often the most trusted source of health information for patients. Their recommendations can significantly impact vaccination behaviors (165,168,236). Strengthening the role of healthcare providers in vaccination advocacy and ensuring they have the necessary training and resources to address patient concerns effectively can enhance vaccination uptake and overall public health outcomes.

Policy and structural barriers

The study highlights the importance of addressing policy and structural barriers to improve vaccination rates. Factors such as financial constraints, lack of access to healthcare services, and logistical challenges can hinder vaccination uptake. Implementing policies that provide free or subsidized vaccines, improving access to vaccination services, and reducing logistical barriers can significantly enhance vaccination coverage. Policymakers need to consider these factors when designing and implementing vaccination programs to ensure they are accessible and equitable (237–239).

5.4 Strengths and limitations

5.4.1 Strengths

The study provides a thorough examination of awareness, attitudes, and behaviors related to CMDs and influenza vaccination, offering a holistic view of the public's knowledge and practices. By analyzing data across various demographic groups (age, gender, education, employment status, and CMD status), the study identifies specific populations with the most significant knowledge gaps and behavioral issues, enabling targeted interventions. The inclusion of a diverse participant group ensures that the findings are more generalizable and reflective of the broader population. The study highlights the crucial role of healthcare providers in influencing vaccination decisions underscores the importance of provider-patient communication in public health strategies. By emphasizing preventive behaviors, the study aligns with public health goals aimed at reducing the incidence and severity of CMDs through early intervention and lifestyle changes. The study sheds light on significant health disparities, providing a basis for developing equity-focused health policies and programs. The findings offer concrete insights that can inform the design of more effective health promotion campaigns, community interventions, and policy measures to improve CMD management and vaccination rates. The study's insights into factors affecting health behaviors and vaccination uptake can guide policymakers in creating supportive environments and removing barriers to healthcare access. The identification of knowledge gaps and behavioral patterns lays the groundwork for further research to develop and test targeted interventions, ensuring ongoing improvements in public health.

5.4.2 Limitations

While this study provides valuable insights into CMD awareness, preventive behaviors, and influenza vaccination uptake, several limitations should be acknowledged:

The study relied on self-reported data, which is subject to recall bias and social desirability bias. Participants may have provided responses they perceived as socially acceptable or may have inaccurately recalled their behaviors or attitudes towards CMDs and influenza vaccination. The cross-sectional design of the study limits the ability to establish causal relationships between variables. Longitudinal studies would provide more robust evidence of the temporal relationships between CMD awareness, preventive behaviors, and vaccination uptake over time. The study may not have accounted for all potential confounding variables that could influence CMD awareness, attitudes, and behaviors, such as access to healthcare

services, socioeconomic status, or cultural factors. Failure to control for these variables may have biased the study results. Participants may have provided responses they believed were socially desirable, leading to an overestimation of positive health behaviors or an underreporting of negative behaviors. This bias may have influenced the accuracy of self-reported data on CMD awareness, attitudes, and behaviors.

5.5 Recommendations for future research

The findings from this study highlight several critical areas that warrant further investigation to enhance our understanding and address the issues related to CMD awareness, preventive behaviors, and influenza vaccination uptake. Future research should focus on the following areas to develop more effective interventions and public health strategies.

Further research should aim to explore the specific knowledge gaps related to CMDs in more detail. Understanding the particular aspects of CMDs that individuals are least informed about (e.g., risk factors, symptoms, management strategies) can help tailor educational programs more effectively. Studies should investigate how different demographic factors (e.g., age, gender, socioeconomic status) influence these knowledge gaps to create more targeted and impactful educational interventions.

Understanding the psychological and social determinants of health behaviors related to CMDs and influenza vaccination is crucial. Future research should employ qualitative methods, such as focus groups and in-depth interviews, to gain insights into the attitudes, beliefs, and perceptions that drive health behaviors. These studies can uncover the underlying reasons for negative attitudes and poor preventive behaviors, helping to develop more nuanced and effective behavior change interventions.

Longitudinal research is needed to understand the long-term effects of interventions aimed at improving CMD awareness and preventive behaviors. Such studies can provide valuable information on the sustainability of behavior changes and the long-term impact on health outcomes. Tracking individuals over time can also help identify the factors that contribute to the maintenance or relapse of healthy behaviors.

Further research should focus on understanding and addressing health disparities related to CMDs and influenza vaccination. Investigating the social determinants of health that contribute to inequities in CMD prevalence, knowledge, and behaviors can inform the development of equity-focused interventions. Studies should also explore how different cultural contexts and social environments influence health behaviors and outcomes, ensuring that interventions are culturally sensitive and inclusive.

Investigating the impact of policy changes on CMD awareness, preventive behaviors, and vaccination rates is essential. Future research should evaluate the effectiveness of policies such as mandatory vaccination for HCW, financial incentives for vaccination, and public health campaigns. These studies can provide evidence for policymakers to design and implement effective health policies.

5.6 Practical recommendations

5.6.1 CMD awareness and preventive behaviors

Develop comprehensive educational programs that specifically target younger individuals, males, and employed populations. These campaigns should focus on the importance of CMD prevention and management, emphasizing practical steps individuals can take to improve their health.

Educational content should cover the basics of CMDs, risk factors, symptoms, and the importance of early detection and management. It should also provide practical advice on healthy lifestyle choices, including diet, exercise, and smoking cessation.

Utilize various delivery methods, including traditional media (TV, radio), social media, community events, and healthcare settings, to reach a broad audience. Interactive tools, such as mobile apps and online platforms, can also engage younger populations more effectively.

Health workers should be trained to deliver educational sessions, conduct health screenings, and provide one-on-one counseling. These workers can also serve as a bridge between the community and healthcare services.

Introduce workplace health promotion programs that offer regular health screenings, educational workshops, and incentives for engaging in healthy behaviors. Employers could play a pivotal role in creating a supportive environment that encourages healthy lifestyle choices.

Organize regular health screenings and educational workshops on CMD prevention and management. Topics can include stress management, healthy eating, and physical activity.

5.6.2 Influenza vaccination

Develop targeted communication strategies to address vaccine hesitancy. This could include providing clear, evidence-based information about vaccine safety and efficacy, and addressing common misconceptions and fears.

Launch campaigns that address common myths and misconceptions about vaccines. Use testimonials from trusted figures, such as healthcare professionals and community leaders, to build trust.

Distribute educational materials in various formats, including brochures, videos, and social media posts, to explain the benefits and safety of vaccines.

Increase the involvement of healthcare professionals in advocating for influenza vaccination. Training healthcare providers to communicate effectively about the benefits of vaccination and addressing patient concerns can enhance vaccination rates.

Develop training programs for healthcare providers to improve their communication skills and knowledge about vaccines. This can help them address patient concerns more effectively.

Implement policy measures such as mandatory vaccination for HCW and providing free or subsidized vaccines to reduce financial barriers.

Chapter 6: Conclusion

The key findings reveal that a large majority of participants possess poor knowledge and negative attitudes toward CMDs, resulting in suboptimal preventive behaviors. Notably, younger individuals, males, and those with lower education levels are particularly affected. Similarly, the awareness of the influenza vaccine is low, leading to low vaccination rate. Interestingly, many participants unwilling to vaccinate despite that they are willing to advise the others to get vaccinated.

These findings highlight several critical public health implications, including an increased burden on healthcare systems, existing health inequities, and the potential for influenza outbreaks due to low vaccination rates. The significant role of healthcare providers in influencing health behaviors is also emphasized, indicating a need for better support and training for these professionals.

Addressing these issues requires multifaceted public health strategies that include targeted education programs, community-based interventions, workplace health programs, and the utilization of technology. Policy measures to reduce barriers to vaccination and enhance healthcare provider training are also crucial.

Further research is essential to explore specific knowledge gaps, behavioral determinants, and the long-term effects of interventions. By addressing these areas, it is possible to improve CMD awareness, preventive behaviors, and influenza vaccination rates, ultimately leading to better health outcomes and reduced healthcare burdens in Vietnam.

Chapter 7: New findings

Study 1: Awareness regarding cardiometabolic diseases

- **General knowledge regarding CMDs among Vietnamese population was low.**
  Only 10.95% of the population had good knowledge regarding CMDs. Female gender, having tertiary education or higher, having T2DM, and having both T2DM and HTN were found significantly associated with better knowledge regarding CMDs (OR [95%CI] = 2.80 [1.23 - 6.39], 3.29 [1.24 - 8.72], 10.61 [2.48 - 45.41], and 7.16 [2.28 - 22.41], respectively).

- **A significant proportion (73.88%) of the population had negative attitude toward CMDs' treatment and prevention.**
  Increasing age, being overweight or obese, and having HTN were found associated with better attitude toward CMDs (OR [95%CI] = 1.04 [1.02 - 1.06], 2.05 [1.14 - 3.69], 1.92 [1.02 - 3.61]). In opposite, higher educational attainment, such as having secondary education and having tertiary education or higher were found associated with more negative attitude toward CMDs (OR [95%CI] = 0.49 [0.28 - 0.86], 0.43 [0.21 - 0.90]).

- **Preventive behavior was notably poor.**
  Less than 5% (4.98%) of adults living in HCMC engaged in good preventive practice. Increasing age was the only factor associated with better preventive behavior (OR [95%CI] = 1.07 [1.02 - 1.12]).

- **General awareness regarding CMDs among Vietnamese population was poor.**
  Only 7.95% of the population showed good awareness. Female gender and having both T2DM and HTN were significantly associated with better awareness regarding CMDs (OR [95%CI] = 3.89 [1.28 - 11.80], 6.97 [1.96 - 24.80]).

Study 2: Knowledge, attitude and awareness regarding influenza vaccination

- **Knowledge regarding influenza vaccination should be improved among medical students and healthcare workers in Vietnam.**
  Only 36.58% of the population had appropriate knowledge. "Kinh" ethnicity, medical doctor and pharmacist were found associated with better knowledge regarding

influenza vaccination (OR [95%CI] = 1.67 [1.12–2.49], 2.45 [1.13–5.33], 2.11 [1.03–4.32], respectively).

- **Less than half of the population (42.39%) held positive attitude toward influenza vaccination.**
  Female gender and "Kinh" ethnicity expressed better attitude toward influenza vaccination (OR [95%CI] = 2.00 [1.29–3.10], 2.10 [1.41–3.11]).

- **Influenza vaccination rate among medical students and healthcare workers in Vietnam was found below WHO recommendation, with 40.51% were vaccinated.**
  Marital status (of not single), and medical worker had significantly higher vaccination rate (OR [95%CI] = 2.09 [1.20 - 3.64], 2.25 [1.04 - 4.87])

- **Healthcare providers were found to play a key role in influencing vaccination decisions.**
  Being advised by healthcare provider regarding influenza vaccine uptake were significantly associated with higher vaccination rate, willingness of getting vaccinated/revaccinated, and willingness to advice others to be vaccinated (OR [95%CI] = 2.92 [1.98 - 4.32], 3.11 [1.96 - 4.94], 2.25 [1.04 - 4.87], respectively).

- **Awareness regarding influenza vaccination was found poor among the healthcare personnels in Vietnam, with only 19.83% had good awareness.**
  "Kinh" ethnicity had significantly better awareness regarding influenza vaccination (OR [95%CI] = 2.14 [1.26 - 3.64]). However, having better awareness was found significantly associated with higher willingness of getting vaccinated/revaccinated, willingness to advice others to be vaccinated, and more believe in the mandatory influenza vaccination for medical students and healthcare workers (OR [95%CI] = 2.26 [1.36 - 3.76], 4.32 [1.31 - 14.26], 3.19 [1.99 - 5.13], respectively).

Chapter 8: Summary

This study investigated the awareness, attitudes, and behaviors related to cardiometabolic diseases and influenza vaccination among a diverse participant group using two cross-sectional studies. The aims of this study were 1) to assess the level of awareness, attitudes, and preventive behaviors concerning CMDs among a selected population in Ho Chi Minh City; 2) to evaluate the knowledge, attitudes, and practices regarding influenza vaccine uptake among medical students and healthcare workers in northern Vietnam; 3) to identify sociodemographic factors that influence awareness and preventive behaviors in both health contexts; 4) to provide evidence-based recommendations for improving health education and intervention programs targeting CMDs and influenza vaccination.

The first study focused on the general population in Ho Chi Minh City, aiming to evaluate their awareness, attitudes, and preventive behaviors concerning CMDs. The majority of participants demonstrated low awareness of CMDs, lacking sufficient knowledge about T2DM and CMDs in general. Most participants exhibited negative attitudes and engaged in poor preventive behaviors towards CMDs. Age, gender, educational level, employment status and CMD status were found associated with the knowledge, attitude, preventive behavior and awareness of the participants. Older participants (>55 years), females, and those with tertiary education displayed relatively better knowledge about CMDs. Younger individuals and males were more likely to have poor knowledge and negative behaviors. Those with CMDs, particularly with both T2DM and hypertension, showed better knowledge. However, employed individuals and those without CMDs exhibited poorer preventive behaviors and awareness. The study revealed significant health disparities, with younger individuals, males, and those with lower education levels showing poorer knowledge and behaviors. These inequities suggest the need for targeted interventions to address the specific needs of these groups.

The second study targeted medical students and healthcare workers in northern Vietnam, assessing their knowledge, attitudes, and practices regarding influenza vaccine uptake. Influenza vaccination rate was found low among the study population. Many participants were unwilling to vaccinate or revaccinate, though a large proportion were willing to advise others about vaccination. The advice of healthcare professionals was found significantly influenced vaccination decisions, underscoring the critical role of these providers in promoting vaccination. Age, gender, education level, employment status, and CMD status significantly impacted knowledge, attitudes, and behaviors towards CMDs and influenza vaccination. Ethnicity and personal beliefs about vaccination, including mandatory vaccination, also played a significant role in shaping attitudes and practices. These findings suggest several barriers prevent actual vaccination uptake, including personal beliefs, misconceptions about vaccine safety and efficacy, fear of side effects, and perceived lack of necessity. The data implies that addressing these barriers through targeted interventions could improve vaccination rates.

This study highlights critical gaps in CMD awareness and preventive behaviors and identifies significant barriers to influenza vaccination uptake. The findings underscore the necessity for comprehensive and targeted public health interventions to address these issues and improve health outcomes in Vietnam. The evidence provided by these studies can inform the development of more effective health education and intervention programs targeting CMDs and influenza vaccination, ultimately contributing to better public health.

References

1. Davidson PM, Reid C. Population screening an important step in identifying and increasing awareness of cardiovascular disease in developing countries. Heart Lung Circ. 2012 Feb;21(2):61–2.

2. Seidu BS, Osman H, Seidu S. Lifestyle or pharmacotherapy in cardio-metabolic disease prevention. Ther Adv Cardiovasc Dis. 2023 Jun 29;17:17539447231177175.

3. Zheng Y, Ley SH, Hu FB. Global aetiology and epidemiology of type 2 diabetes mellitus and its complications. Nat Rev Endocrinol. 2018 Feb;14(2):88–98.

4. O'Hearn M, Lauren BN, Wong JB, Kim DD, Mozaffarian D. Trends and Disparities in Cardiometabolic Health Among U.S. Adults, 1999-2018. J Am Coll Cardiol. 2022 Jul 12;80(2):138–51.

5. Rao G. Cardiometabolic Diseases, Risk Stratification, and Management. 2020 Nov 7;

6. Kones R, Rumana U. Cardiometabolic diseases of civilization: history and maturation of an evolving global threat. An update and call to action. Ann Med. 2017 May;49(3):260–74.

7. World Health Organization. Non communicable diseases [Internet]. [cited 2024 Jun 4]. Available from: https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases

8. Christensen DL, Bygbjerg IC, Meyrowitsch DW. [Global differences in causes and diagnostics of cardio-metabolic diseases]. Ugeskr Laeger. 2017 May 15;179(20):V11160815.

9. Hossain MdJ, Al-Mamun Md, Islam MdR. Diabetes mellitus, the fastest growing global public health concern: Early detection should be focused. Health Sci Rep. 2024 Mar 22;7(3):e2004.

10. Mohan V, Seedat YK, Pradeepa R. The Rising Burden of Diabetes and Hypertension in Southeast Asian and African Regions: Need for Effective Strategies for Prevention and Control in Primary Health Care Settings. Int J Hypertens. 2013;2013:409083.

11. Vu THL, Bui TTQ, Tran QB, Pham QN, Lai DT, Le TH, et al. Comorbidities of diabetes and hypertension in Vietnam: current burden, trends over time, and correlated factors. BMC Public Health. 2023 Dec 5;23(1):2419.

12. World Health Organization. The growing burden of diabetes in Viet Nam [Internet]. [cited 2024 Jun 4]. Available from: https://www.who.int/vietnam/news/feature-stories/detail/the-growing-burden-of-diabetes-in-viet-nam

13. Van DTT, Trijsburg L, Do HTP, Kurotani K, Feskens EJM, Talsma EF. Development of the Vietnamese Healthy Eating Index. J Nutr Sci. 2022 Jun 9;11:e45.

14. Nguyen-Anh D, Umberger WJ, Zeng D. Understanding Vietnamese Urban Consumers' Nutrition Label Use, Health Concerns, and Consumption of Food and Beverages with Added Sugars. Nutrients. 2020 Oct 29;12(11):3335.

15. Nguyen TT, Trevisan M. Vietnam a country in transition: health challenges. BMJ Nutr Prev Health. 2020 May 6;3(1):60–6.

16. Quan NK, Taylor-Robinson AW. Vietnam's Evolving Healthcare System: Notable Successes and Significant Challenges. Cureus. 15(6):e40414.

17. NCD Alliance. NCD Alliance. 2019 [cited 2024 Jun 5]. Vietnam Non-communicable Diseases Prevention and Control Alliance (NCDs-VN). Available from: https://ncdalliance.org/vietnam-non-communicable-diseases-prevention-and-control-alliance-ncds-vn

18. Anand VV, Goh RSJ, Nah B, Koh SWC, Lim J, Neo NWS, et al. General Public's knowledge, awareness, and perception of Cardiometabolic diseases: data from a Singapore study population. Front Med (Lausanne). 2023 Apr 24;10:1193829.

19. Lee J, Kim E, Lee WY, Rhee EJ, Kim HC. Changes in cardiovascular-related health behaviors after the end of social distancing: the 2023 Cardiovascular Disease Prevention Awareness Survey. CPP. 2024 Apr 5;6(2):57–64.

20. Koniak-Griffin D, Brecht ML. Awareness of Cardiovascular Disease and Preventive Behaviors among Overweight Immigrant Latinas. J Cardiovasc Nurs. 2015;30(5):447–55.

21. de Fougerolles TR, Baïssas T, Perquier G, Vitoux O, Crépey P, Bartelt-Hofer J, et al. Public health and economic benefits of seasonal influenza vaccination in risk groups in France, Italy, Spain and the UK: state of play and perspectives. BMC Public Health. 2024 May 3;24(1):1222.

22. Zhang Z, Tang S, Huang Z, Tan J, Wu X, Hong Q, et al. Mapping trends and hotspots in research on global influenza vaccine hesitancy: A bibliometric analysis. Health Sci Rep. 2024 Feb 6;7(2):e1820.

23. World Health Organization. Influenza (Seasonal) [Internet]. [cited 2024 Jun 5]. Available from: https://www.who.int/news-room/fact-sheets/detail/influenza-(seasonal)

24. CDC. Centers for Disease Control and Prevention. 2024 [cited 2024 Jun 5]. Key Facts About Influenza (Flu). Available from: https://www.cdc.gov/flu/about/keyfacts.htm

25. Hatzifoti C, Heath AW. Influenza in the Elderly. Microbiology and Aging. 2009;113–30.

26. Macias AE, McElhaney JE, Chaves SS, Nealon J, Nunes MC, Samson SI, et al. The disease burden of influenza beyond respiratory illness. Vaccine. 2021 Mar 15;39:A6–14.

27. Boktor SW, Hafner JW. Influenza. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 [cited 2024 Jun 6]. Available from: http://www.ncbi.nlm.nih.gov/books/NBK459363/

28. CDC. Influenza (Flu). 2024 [cited 2024 Oct 16]. People with Chronic Medical Conditions Continue to Account for The Majority of Flu Hospitalizations This Season. Available from: https://www.cdc.gov/flu/whats-new/2023-2024-higher-risk-hospitalizations.html

29. Skaarup KG, Modin D, Nielsen L, Jensen JUS, Biering-Sørensen T. Influenza and cardiovascular disease pathophysiology: strings attached. Eur Heart J Suppl. 2023 Feb 14;25(Suppl A):A5–11.

30. MacIntyre CR, Akhtar Z, Moa A. Influenza Vaccine — Low-Hanging Fruit for Prevention of Myocardial Infarction. NEJM Evidence. 2024 Jun 25;3(7):EVIDe2400178.

31. Chávez-Reyes J, Escárcega-González CE, Chavira-Suárez E, León-Buitimea A, Vázquez-León P, Morones-Ramírez JR, et al. Susceptibility for Some Infectious Diseases in Patients With Diabetes: The Key Role of Glycemia. Front Public Health. 2021 Feb 16;9:559595.

32. CDC. Diabetes. 2024 [cited 2024 Oct 16]. Your Immune System and Diabetes. Available from: https://www.cdc.gov/diabetes/diabetes-complications/diabetes-immune-system.html

33. Liu R, Liu X, Yang P, Du X, He L, Chen T, et al. Influenza-associated cardiovascular mortality in older adults in Beijing, China: a population-based time-series study. BMJ Open. 2020 Nov 19;10(11):e042487.

34. Tosh PK, Jacobson RM, Poland GA. Influenza Vaccines: From Surveillance Through Production to Protection. Mayo Clin Proc. 2010 Mar;85(3):257–73.

35. Barkhordarian M, Behbood A, Ranjbar M, Rahimian Z, Prasad A. Overview of the cardio-metabolic impact of the COVID-19 pandemic. Endocrine. 2023 Jun 1;80(3):477–90.

36. Kim CW, Aronow WS, Frishman WH. Coronavirus Disease 2019 and Cardiometabolic Disease. Cardiology in Review. 2022 Jun;30(3):123.

37. Protecting Vulnerable Patients from Influenza During the COVID-19 Pandemic - PMC [Internet]. [cited 2024 Oct 16]. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8270221/

38. Ha NT, Nguyen TTM, Nguyen TX, Tran PD, Nguyen HM, Ha VT, et al. A case study of an influenza vaccination program for health care workers in Vietnam. BMC Health Services Research. 2020 Aug 24;20(1):785.

39. Nguyen TTM, Lafond KE, Nguyen TX, Tran PD, Nguyen HM, Ha VTC, et al. Acceptability of seasonal influenza vaccines among health care workers in Vietnam in 2017. Vaccine. 2020 Feb 18;38(8):2045–50.

40. Jamison AM, Quinn SC, Freimuth VS. “You don’t trust a government vaccine”: Narratives of institutional trust and influenza vaccination among African American and white adults. Social Science & Medicine. 2019 Jan 1;221:87–94.

41. Nuwarda RF, Ramzan I, Weekes L, Kayser V. Vaccine Hesitancy: Contemporary Issues and Historical Background. Vaccines (Basel). 2022 Sep 22;10(10):1595.

42. World Health Organization. Vaccine hesitancy: A growing challenge for immunization programmes [Internet]. [cited 2024 Jun 5]. Available from: https://www.who.int/news/item/18-08-2015-vaccine-hesitancy-a-growing-challenge-for-immunization-programmes

43. Jaiyeoba O, Villers M, Soper DE, Korte J, Salgado CD. Association between health care workers' knowledge of influenza vaccine and vaccine uptake. American Journal of Infection Control. 2014 Jan 1;42(1):69–70.

44. CDC. Prevention Strategies for Seasonal Influenza in Healthcare Settings | CDC [Internet]. 2023 [cited 2024 Jun 5]. Available from: https://www.cdc.gov/flu/professionals/infectioncontrol/healthcaresettings.htm

45. Dini G, Toletone A, Sticchi L, Orsi A, Bragazzi NL, Durando P. Influenza vaccination in healthcare workers: A comprehensive critical appraisal of the literature. Hum Vaccin Immunother. 2017 Oct 20;14(3):772–89.

46. Herman B, Rosychuk RJ, Bailey T, Lake R, Yonge O, Marrie TJ. Medical Students and Pandemic Influenza. Emerg Infect Dis. 2007 Nov;13(11):1781–3.

47. Kałucka S, Głowacka A, Dziankowska-Zaborszczyk E, Grzegorczyk-Karolak I. Knowledge, Beliefs and Attitudes towards the Influenza Vaccine among Future Healthcare Workers in Poland. Int J Environ Res Public Health. 2021 Feb;18(4):2105.

48. Strouthou E, Karageorgos SA, Christaki E, Agouridis AP, Tsioutis C. Medical students' attitudes and perceptions of influenza and SARS-CoV-2 vaccination in Cyprus. Germs. 2022 Jun 30;12(2):180–94.

49. Awad S, Abdo N, Yusef D, Jawarneh A, Babaa A, Alwady D, et al. Knowledge, attitudes and practices related to influenza illness and vaccination in children: Role of awareness campaigns in changing parents' attitudes toward influenza vaccination in Jordan. Vaccine. 2019 May 31;37(25):3303–9.

50. CDC. Centers for Disease Control and Prevention. 2024 [cited 2024 Jun 6]. Studies Suggest Influenza Infection Raises Risk of Heart Attack. Available from: https://www.cdc.gov/flu/spotlights/2023-2024/flu-heart-study.htm

51. Kwong Jeffrey C., Schwartz Kevin L., Campitelli Michael A., Chung Hannah, Crowcroft Natasha S., Karnauchow Timothy, et al. Acute Myocardial Infarction after Laboratory-Confirmed Influenza Infection. New England Journal of Medicine. 2018 Jan 25;378(4):345–53.

52. Omidi F, Zangiabadian M, Shahidi Bonjar AH, Nasiri MJ, Sarmastzadeh T. Influenza vaccination and major cardiovascular risk: a systematic review and meta-analysis of clinical trials studies. Sci Rep. 2023 Nov 19;13(1):20235.

53. Son PT, Quang NN, Viet NL, Khai PG, Wall S, Weinehall L, et al. Prevalence, awareness, treatment and control of hypertension in Vietnam-results from a national survey. J Hum Hypertens. 2012 Apr;26(4):268–80.

54. National Academies of Sciences E, Education D of B and SS and, Statistics C on N, Population C on, Disparities C on RMMR and S, Becker T, et al. Cardiometabolic Diseases. In: High and Rising Mortality Rates Among Working-Age Adults [Internet]. National Academies Press (US); 2021 [cited 2024 Jun 6]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK571925/

55. Mengome MFA, Kono HN, Bivigou EA, M'bondoukwe NP, Ngomo JMN, Ditombi BM, et al. Prevalence of cardiometabolic risk factors according to urbanization level, gender and age, in apparently healthy adults living in Gabon, Central Africa. PLoS One. 2024 Apr 5;19(4):e0285907.

56. International Diabetes Federation. International Diabetes Federation. [cited 2024 Jun 6]. Facts & figures. Available from: https://idf.org/about-diabetes/diabetes-facts-figures/

57. Saeedi P, Petersohn I, Salpea P, Malanda B, Karuranga S, Unwin N, et al. Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas, 9th edition. Diabetes Res Clin Pract. 2019 Nov;157:107843.

58. Mills KT, Stefanescu A, He J. The global epidemiology of hypertension. Nat Rev Nephrol. 2020 Apr;16(4):223–37.

59. World Health Organization. Cardiovascular diseases [Internet]. [cited 2024 Jun 6]. Available from: https://www.who.int/health-topics/cardiovascular-diseases

60. Mensah GA, Roth GA, Fuster V. The Global Burden of Cardiovascular Diseases and Risk Factors: 2020 and Beyond. J Am Coll Cardiol. 2019 Nov 19;74(20):2529–32.

61. Di Cesare M, Perel P, Taylor S, Kabudula C, Bixby H, Gaziano TA, et al. The Heart of the World. Glob Heart. 19(1):11.

62. Elsheikh E, AlKhudair AM, AlGanem SN, AlDandan HR, AlGhareeb AH, AlSalman MA, et al. Perception of Heart Attack Risk Factors and Their Complications Among the Adult Population in the Eastern Region of Saudi Arabia. Cureus. 15(12):e49860.

63. Roth GA, Mensah GA, Johnson CO, Addolorato G, Ammirati E, Baddour LM, et al. Global Burden of Cardiovascular Diseases and Risk Factors, 1990–2019. J Am Coll Cardiol. 2020 Dec 22;76(25):2982–3021.

64. Ghodeshwar GK, Dube A, Khobragade D. Impact of Lifestyle Modifications on Cardiovascular Health: A Narrative Review. Cureus. 15(7):e42616.

65. Galicia-Garcia U, Benito-Vicente A, Jebari S, Larrea-Sebal A, Siddiqi H, Uribe KB, et al. Pathophysiology of Type 2 Diabetes Mellitus. Int J Mol Sci. 2020 Aug 30;21(17):6275.

66. Chakraborty S, Verma A, Garg R, Singh J, Verma H. Cardiometabolic Risk Factors Associated With Type 2 Diabetes Mellitus: A Mechanistic Insight. Clin Med Insights Endocrinol Diabetes. 2023 Dec 25;16:11795514231220780.

67. Ma CX, Ma XN, Guan CH, Li YD, Mauricio D, Fu SB. Cardiovascular disease in type 2 diabetes mellitus: progress toward personalized management. Cardiovascular Diabetology. 2022 May 14;21(1):74.

68. Institute for Health Metrics and Evaluation. Global, regional, and national burden of diabetes from 1990 to 2021, with projections of prevalence to 2050 | Institute for Health Metrics and Evaluation [Internet]. [cited 2024 Jun 6]. Available from:

https://www.healthdata.org/research-analysis/library/global-regional-and-national-burden-diabetes-1990-2021-projections

69. Forray AI, Coman MA, Simonescu-Colan R, Mazga AI, Chereches RM, Borzan CM. The Global Burden of Type 2 Diabetes Attributable to Dietary Risks: Insights from the Global Burden of Disease Study 2019. Nutrients. 2023 Oct 30;15(21):4613.

70. Kushitor MK, Boatemaa S. The double burden of disease and the challenge of health access: Evidence from Access, Bottlenecks, Cost and Equity facility survey in Ghana. PLoS One. 2018 Mar 23;13(3):e0194677.

71. Martín-Timón I, Sevillano-Collantes C, Segura-Galindo A, del Cañizo-Gómez FJ. Type 2 diabetes and cardiovascular disease: Have all risk factors the same strength? World J Diabetes. 2014 Aug 15;5(4):444–70.

72. World Health Organization. First WHO report details devastating impact of hypertension and ways to stop it [Internet]. [cited 2024 Jun 6]. Available from: https://www.who.int/news/item/19-09-2023-first-who-report-details-devastating-impact-of-hypertension-and-ways-to-stop-it

73. World Health Organization. Hypertension [Internet]. [cited 2024 Jun 6]. Available from: https://www.who.int/news-room/fact-sheets/detail/hypertension

74. Unda Villafuerte F, Llobera Cànaves J, Lorente Montalvo P, Moreno Sancho ML, Oliver Oliver B, Bassante Flores P, et al. Effectiveness of a multifactorial intervention, consisting of self-management of antihypertensive medication, self-measurement of blood pressure, hypocaloric and low sodium diet, and physical exercise, in patients with uncontrolled hypertension taking 2 or more antihypertensive drugs. Medicine (Baltimore). 2020 Apr 24;99(17):e19769.

75. Elnaem MH, Mosaad M, Abdelaziz DH, Mansour NO, Usman A, Elrggal ME, et al. Disparities in Prevalence and Barriers to Hypertension Control: A Systematic Review. Int J Environ Res Public Health. 2022 Nov 6;19(21):14571.

76. Oparil S, Acelajado MC, Bakris GL, Berlowitz DR, Cífková R, Dominiczak AF, et al. Hypertension. Nat Rev Dis Primers. 2018 Mar 22;4:18014.

77. Iyer A, Ahmed MI, Filippatos G, Ekundayo OJ, Aban I, Love TE, et al. Uncontrolled Hypertension and Increased Risk for Incident Heart Failure in Older Adults with Hypertension: Findings from a Propensity-Matched Prospective Population Study. J Am Soc Hypertens. 2010;4(1):22–31.

78. Masenga SK, Kirabo A. Hypertensive heart disease: risk factors, complications and mechanisms. Front Cardiovasc Med. 2023 Jun 5;10:1205475.

79. Kowalski S, Goniewicz K, Moskal A, Al-Wathinani AM, Goniewicz M. Symptoms in Hypertensive Patients Presented to the Emergency Medical Service: A Comprehensive Retrospective Analysis in Clinical Settings. J Clin Med. 2023 Aug 24;12(17):5495.

80. Woolf SH, Schoomaker H. Life Expectancy and Mortality Rates in the United States, 1959-2017. JAMA. 2019 Nov 26;322(20):1996–2016.

81. Kim I. Contributions of the life expectancy gap reduction between urban and rural areas to the increase in overall life expectancy in South Korea from 2000 to 2019. Int J Equity Health. 2023 Jul 28;22:141.

82. Balakumar P, Maung-U K, Jagadeesh G. Prevalence and prevention of cardiovascular disease and diabetes mellitus. Pharmacol Res. 2016 Nov;113(Pt A):600–9.

83. Raleigh VS. Trends in life expectancy in EU and other OECD countries: Why are improvements slowing? [Internet]. Paris: OECD; 2019 Feb [cited 2024 Jun 6]. Available from: https://www.oecd-ilibrary.org/social-issues-migration-health/trends-in-life-expectancy-in-eu-and-other-oecd-countries_223159ab-en

84. Colozza D, Wang YC, Avendano M. Does urbanisation lead to unhealthy diets? Longitudinal evidence from Indonesia. Health & Place. 2023 Sep 1;83:103091.

85. Casari S, Di Paola M, Banci E, Diallo S, Scarallo L, Renzo S, et al. Changing Dietary Habits: The Impact of Urbanization and Rising Socio-Economic Status in Families from Burkina Faso in Sub-Saharan Africa. Nutrients. 2022 Apr 24;14(9):1782.

86. Ren Y, Castro Campos B, Peng Y, Glauben T. Nutrition Transition with Accelerating Urbanization? Empirical Evidence from Rural China. Nutrients. 2021 Mar 12;13(3):921.

87. Valicente VM, Peng CH, Pacheco KN, Lin L, Kielb EI, Dawoodani E, et al. Ultraprocessed Foods and Obesity Risk: A Critical Review of Reported Mechanisms. Advances in Nutrition. 2023 Jul 1;14(4):718–38.

88. Lieb DC, Snow RE, DeBoer MD. Socioeconomic Factors in the Development of Childhood Obesity and Diabetes. Clin Sports Med. 2009 Jul;28(3):349–78.

89. Nardocci M, Polsky JY, Moubarac JC. Consumption of ultra-processed foods is associated with obesity, diabetes and hypertension in Canadian adults. Can J Public Health. 2020 Nov 10;112(3):421–9.

90. World Health Organization. WHO European Regional Obesity Report 2022 [Internet]. [cited 2024 Jun 6]. Available from: https://www.who.int/europe/publications/i/item/9789289057738

91. Yusuf S, Joseph P, Rangarajan S, Islam S, Mente A, Hystad P, et al. Modifiable risk factors, cardiovascular disease, and mortality in 155 722 individuals from 21 high-income, middle-income, and low-income countries (PURE): a prospective cohort study. Lancet. 2020 Mar 7;395(10226):795–808.

92. Bellou V, Belbasis L, Tzoulaki I, Evangelou E. Risk factors for type 2 diabetes mellitus: An exposure-wide umbrella review of meta-analyses. PLoS One. 2018;13(3):e0194127.

93. Reaven GM. Treatment of asymptomatic diabetes mellitus. Compr Ther. 1976 Nov;2(11):22–8.

94. Malone JI, Hansen BC. Does obesity cause type 2 diabetes mellitus (T2DM)? Or is it the opposite? Pediatr Diabetes. 2019 Feb;20(1):5–9.

95. European Commission. European Commission - European Commission. [cited 2024 Jun 6]. Healthy Lifestyle campaign. Available from: https://ec.europa.eu/commission/presscorner/detail/en/ip_21_4826

96. Khow YZ, Lim TLY, Ng JSP, Wu J, Tan CS, Chia KS, et al. Behavioral impact of national health campaigns on healthy lifestyle practices among young adults in Singapore: a cross-sectional study. BMC Public Health. 2021 Aug 30;21:1601.

97. Ridzuan AR bin, Karim RA, Marmaya NH, Razak NA, Khalid NKN, Yusof KNM. Public Awareness towards Healthy Lifestyle. International Journal of Academic Research in Business and Social Sciences. 2018 Nov 9;8(10):927–36.

98. DPT BF PT, Barkley E, RN KB, PhD JD. Epic Research. [cited 2024 Jun 6]. Cardiovascular Disease Rates in Young Adults Have More Than Doubled Since 2010. Available from: https://epicresearch.org/articles/cardiovascular-disease-rates-in-young-adults-have-more-than-doubled-since-2010

99. Andersson C, Vasan RS. Epidemiology of cardiovascular disease in young individuals. Nat Rev Cardiol. 2018 Apr;15(4):230–40.

100. Shi S, Huang H, Huang Y, Zhong VW, Feng N. Lifestyle Behaviors and Cardiometabolic Diseases by Race and Ethnicity and Social Risk Factors Among US Young Adults, 2011 to 2018. Journal of the American Heart Association. 2023 Sep 5;12(17):e028926.

101. Luengo-Fernandez R, Walli-Attaei M, Gray A, Torbica A, Maggioni AP, Huculeci R, et al. Economic burden of cardiovascular diseases in the European Union: a population-based cost study. European Heart Journal. 2023 Dec 1;44(45):4752–67.

102. Arocha Rodulfo JI. Approach to the cardiometabolic continuum. Narrative description. Clin Investig Arterioscler. 2021;33(3):158–67.

103. Gulanski BI, Butera NM, Krause-Steinrauf H, Lichtman JH, Harindhanavudhi T, Green JB, et al. Higher burden of cardiometabolic and socioeconomic risk factors in women with type 2 diabetes: an analysis of the Glycemic Reduction Approaches in Diabetes (GRADE) baseline cohort. BMJ Open Diabetes Res Care. 2023 Apr 24;11(2):e003159.

104. Brunner J, Fill Malfertheiner S, Brandstetter S, Seelbach-Göbel B, Apfelbacher C, Melter M, et al. Prevalences of cardiometabolic risk and lifestyle factors in young parents: evidence from a German birth cohort study. BMC Cardiovasc Disord. 2022 Nov 7;22:469.

105. Gaziano TA. Reducing the growing burden of cardiovascular disease in the developing world. Health Aff (Millwood). 2007;26(1):13–24.

106. Zheng Y, Zhou Z, Wu T, Zhong K, Hu H, Zhang H, et al. Association between composite lifestyle factors and cardiometabolic multimorbidity in Chongqing, China: A cross-sectional exploratory study in people over 45 years and older. Front Public Health. 2023 Feb 1;11:1118628.

107. Ndubuisi NE. Noncommunicable Diseases Prevention In Low- and Middle-Income Countries: An Overview of Health in All Policies (HiAP). Inquiry. 2021 Aug 23;58:0046958020927885.

108. Oleribe OO, Momoh J, Uzochukwu BS, Mbofana F, Adebiyi A, Barbera T, et al. Identifying Key Challenges Facing Healthcare Systems In Africa And Potential Solutions. Int J Gen Med. 2019 Nov 6;12:395–403.

109. Beaglehole R, Dal Poz MR. Public health workforce: challenges and policy issues. Hum Resour Health. 2003 Jul 17;1:4.

110. Al-Worafi YM. Healthcare Workforce Issues in Developing Countries: Public Health and Others. In: Al-Worafi YM, editor. Handbook of Medical and Health Sciences in Developing Countries : Education, Practice, and Research [Internet]. Cham: Springer International Publishing; 2023 [cited 2024 Jun 6]. p. 1–25. Available from: https://doi.org/10.1007/978-3-030-74786-2_215-1

111. Fanda RB, Probandari A, Yuniar Y, Hendarwan H, Trisnantoro L, Jongeneel N, et al. The availability of essential medicines in primary health centres in Indonesia: achievements and challenges across the archipelago. The Lancet Regional Health - Southeast Asia [Internet]. 2024 Mar 1 [cited 2024 Jun 6];22. Available from: https://www.thelancet.com/journals/lansea/article/PIIS2772-3682(23)00205-6/fulltext

112. Gizaw Z, Astale T, Kassie GM. What improves access to primary healthcare services in rural communities? A systematic review. BMC Prim Care. 2022 Dec 6;23:313.

113. Anticona Huaynate CF, Pajuelo Travezaño MJ, Correa M, Mayta Malpartida H, Oberhelman R, Murphy LL, et al. Diagnostics barriers and innovations in rural areas: insights from junior medical doctors on the frontlines of rural care in Peru. BMC Health Serv Res. 2015 Oct 5;15:454.

114. Badenbroek IF, Nielen MMJ, Hollander M, Stol DM, Drijkoningen AE, Kraaijenhagen RA, et al. Mapping non-response in a prevention program for cardiometabolic diseases in primary care: How to improve participation? Prev Med Rep. 2020 Apr 8;19:101092.

115. Mendis S. Global progress in prevention of cardiovascular disease. Cardiovasc Diagn Ther. 2017 Apr;7(Suppl 1):S32–8.

116. World Health Organization. Hospitals in Viet Nam [Internet]. [cited 2024 Jun 6]. Available from: https://www.who.int/vietnam/health-topics/hospitals

117. Le DC, Kubo T, Fujino Y, Pham TM, Matsuda S. Health Care System in Vietnam: Current Situation and Challenges. Asian Pacific Journal of Disease Management. 2010;4(2):23–30.

118. Ngo VK, Weiss B, Lam T, Dang T, Nguyen T, Nguyen MH. The Vietnam Multicomponent Collaborative Care for Depression Program: Development of Depression Care for Low- and Middle-Income Nations. J Cogn Psychother. 2014;28(3):156–67.

119. International Trade Administration. Vietnam - Healthcare [Internet]. 2024 [cited 2024 Jun 6]. Available from: https://www.trade.gov/country-commercial-guides/vietnam-healthcare

120. World Health Organization. Cardiovascular diseases (CVD) in Viet Nam [Internet]. [cited 2024 Jun 6]. Available from: https://www.who.int/vietnam/health-topics/cardiovascular-diseases

121. Nguyen RT, Meyer O, Chu J, Le V, Ho TV, Le A, et al. Social Determinants of Health, Cardiovascular Risk Factors, and Atherosclerotic Cardiovascular Disease in Individuals of Vietnamese Origin. Am J Cardiol. 2023 Feb 15;189:11–21.

122. Khue NT. Diabetes in Vietnam. Ann Glob Health. 2015;81(6):870–3.

123. Pham NM, Eggleston K. Prevalence and determinants of diabetes and prediabetes among Vietnamese adults. Diabetes Res Clin Pract. 2016 Mar;113:116–24.

124. Bui TV, Blizzard CL, Luong KN, Truong NLV, Tran BQ, Otahal P, et al. National survey of risk factors for non-communicable disease in Vietnam: prevalence estimates and an

assessment of their validity. BMC Public Health [Internet]. 2016 [cited 2024 Jun 6];16. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4902939/

125. Phan HD, Nguyen TNP, Bui PL, Pham TT, Doan TV, Nguyen DT, et al. Overweight and obesity among Vietnamese school-aged children: National prevalence estimates based on the World Health Organization and International Obesity Task Force definition. PLoS ONE [Internet]. 2020 [cited 2024 Jun 6];15(10). Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7549813/

126. UNICEF. Landscape analysis tool on overweight and obesity in children and adolescents | UNICEF [Internet]. [cited 2024 Jun 6]. Available from: https://www.unicef.org/documents/landscape-analysis-tool-overweight-and-obesity-children-and-adolescents

127. Tran TVA, Vu TQC, Tran QD, Nguyen DT, Phan NQ. The prevalence of obesity among school-aged children in Vietnam: A systematic review and meta-analysis. Human Nutrition & Metabolism. 2023 Mar 1;31:200184.

128. Van Minh H, Khuong DQL, Tran TA, Do HP, Watson F, Lobstein T. Childhood Overweight and Obesity in Vietnam: A Landscape Analysis of the Extent and Risk Factors. Inquiry. 2023 Feb 22;60:00469580231154651.

129. Stol DM, Hollander M, Damman OC, Nielen MMJ, Badenbroek IF, Schellevis FG, et al. Mismatch between self-perceived and calculated cardiometabolic disease risk among participants in a prevention program for cardiometabolic disease: a cross-sectional study. BMC Public Health. 2020 May 20;20(1):740.

130. Faghy MA, Yates J, Hills AP, Jayasinghe S, da Luz Goulart C, Arena R, et al. Cardiovascular disease prevention and management in the COVID-19 era and beyond: An international perspective. Prog Cardiovasc Dis. 2023;76:102–11.

131. Hocking A, Laurence C, Lorimer M. Patients' knowledge of their chronic disease - the influence of socio-demographic characteristics. Aust Fam Physician. 2013 Jun;42(6):411–6.

132. Oates GR, Jackson BE, Partridge EE, Singh KP, Fouad MN, Bae S. Sociodemographic Patterns of Chronic Disease. Am J Prev Med. 2017 Jan;52(1 Suppl 1):S31–9.

133. Ek S. Gender differences in health information behaviour: a Finnish population-based survey. Health Promot Int. 2015 Sep;30(3):736–45.

134. Vlassoff C. Gender Differences in Determinants and Consequences of Health and Illness. J Health Popul Nutr. 2007 Mar;25(1):47–61.

135. Nguyen KT, Diep BTT, Nguyen VDK, Van Lam H, Tran KQ, Tran NQ. A cross-sectional study to evaluate diabetes management, control and complications in 1631 patients with type 2 diabetes mellitus in Vietnam (DiabCare Asia). Int J Diabetes Dev Ctries. 2020 Mar 1;40(1):70–9.

136. World Health Organization. Seasonal influenza vaccines: an overview for decision-makers [Internet]. World Health Organization; 2020 [cited 2024 Jun 6]. Available from: https://iris.who.int/handle/10665/336951

137. Kalarikkal SM, Jaishankar GB. Influenza Vaccine. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 [cited 2024 Jun 6]. Available from: http://www.ncbi.nlm.nih.gov/books/NBK537197/

138. Safiri S, Mahmoodpoor A, Kolahi AA, Nejadghaderi SA, Sullman MJM, Mansournia MA, et al. Global burden of lower respiratory infections during the last three decades. Frontiers in Public Health [Internet]. 2022 [cited 2024 Jun 6];10. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9869262/

139. Ashrafi-Asgarabad A, Bokaie S, Razmyar J, Akbarein H, Nejadghaderi SA, Carson-Chahhoud K, et al. The burden of lower respiratory infections and their underlying etiologies in the Middle East and North Africa region, 1990–2019: results from the Global Burden of Disease Study 2019. BMC Pulmonary Medicine [Internet]. 2023 [cited 2024 Jun 6];23. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9811697/

140. Yang FF, Yu SJ, Du WN, Wang HM, Yao XX, Xue DD, et al. Global morbidity and mortality of lower respiratory infections: A population -based study. Respiratory Medicine. 2022 Dec 1;205:107042.

141. World Health Organization. WHO Global Health Emergency Appeal 2022 regional summary: South-East Asia region [Internet]. [cited 2024 Jun 6]. Available from:

https://www.who.int/publications/m/item/who-global-health-emergency-appeal-2022-regional-summary-south-east-asia-region

142. Bj C, S C, T C, S D, Sr G, Qs H, et al. Influenza in the Asia-Pacific region: Findings and recommendations from the Global Influenza Initiative. Vaccine [Internet]. 2017 Feb 7 [cited 2024 Jun 6];35(6). Available from: https://pubmed.ncbi.nlm.nih.gov/28081970/

143. ECDC. Influenza virus characterisation - Summary Europe, March 2022 [Internet]. 2022 [cited 2024 Jun 6]. Available from: https://www.ecdc.europa.eu/en/publications-data/influenza-virus-characterisation-summary-europe-march-2022

144. Chon I, Saito R, Kyaw Y, Aye MM, Setk S, Phyu WW, et al. Whole-Genome Analysis of Influenza A(H3N2) and B/Victoria Viruses Detected in Myanmar during the COVID-19 Pandemic in 2021. Viruses. 2023 Feb 20;15(2):583.

145. Malik YA. IMPACT OF INFLUENZA IN SOUTH-EAST ASIA. International Journal of Infectious Diseases. 2023 May 1;130:S40–1.

146. Simmerman JM, Uyeki TM. The burden of influenza in East and South-East Asia: a review of the English language literature. Influenza Other Respir Viruses. 2008 May;2(3):81–92.

147. Havasi A, Visan S, Cainap C, Cainap SS, Mihaila AA, Pop LA. Influenza A, Influenza B, and SARS-CoV-2 Similarities and Differences – A Focus on Diagnosis. Frontiers in Microbiology [Internet]. 2022 [cited 2024 Jun 6];13. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9251468/

148. Fjelltveit EB, Cox RJ, Østensjø J, Blomberg B, Ebbesen MH, Langeland N, et al. Point-of-Care Influenza Testing Impacts Clinical Decision, Patient Flow, and Length of Stay in Hospitalized Adults. The Journal of Infectious Diseases. 2022 Jul 7;226(1):97.

149. World Health Organization. Made in Viet Nam vaccines: efforts to develop sustainable in-country manufacturing for seasonal and pandemic influenza vaccines: consultation held in Viet Nam, April - June 2016. 2017 [cited 2024 Jun 6]; Available from: https://iris.who.int/handle/10665/254184

150. Cheung YYH, Lau EHY, Yin G, Lin Y, Cowling BJ, Lam KF. Effectiveness of Vaccines and Antiviral Drugs in Preventing Severe and Fatal COVID-19, Hong Kong. Emerg Infect Dis. 2024 Jan;30(1):70–8.

151. Laughlin C, Schleif A, Heilman CA. Addressing viral resistance through vaccines. Future Virol. 2015;10(8):1011–22.

152. Ray R, Dos Santos G, Buck PO, Claeys C, Matias G, Innis BL, et al. A review of the value of quadrivalent influenza vaccines and their potential contribution to influenza control. Hum Vaccin Immunother. 2017 May 22;13(7):1640–52.

153. Hendriks J, Hutubessy RCW, Grohmann G, Torelli G, Friede M, Kieny MP. Quadrivalent influenza vaccines in low and middle income countries: Cost-effectiveness, affordability and availability. Vaccine. 2018 Jun 27;36(28):3993–7.

154. Beran J, Peeters M, Dewé W, Raupachová J, Hobzová L, Devaster JM. Immunogenicity and safety of quadrivalent versus trivalent inactivated influenza vaccine: a randomized, controlled trial in adults. BMC Infect Dis. 2013 May 20;13:224.

155. Nuwarda RF, Alharbi AA, Kayser V. An Overview of Influenza Viruses and Vaccines. Vaccines [Internet]. 2021 Sep [cited 2024 Jun 6];9(9). Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8473132/

156. Padmanabhan A, Abraham SV, Koul PA. Knowledge, attitude and practices towards seasonal influenza vaccination among healthcare workers. Lung India. 2022;39(5):437–42.

157. Kumar S, Shah Z, Garfield S. Causes of Vaccine Hesitancy in Adults for the Influenza and COVID-19 Vaccines: A Systematic Literature Review. Vaccines (Basel). 2022 Sep 13;10(9):1518.

158. Khanh NC, Fowlkes AL, Nghia ND, Duong TN, Tu NH, Tu TA, et al. Burden of Influenza-Associated Respiratory Hospitalizations, Vietnam, 2014–2016. Emerg Infect Dis. 2021 Oct;27(10):2648–57.

159. Thai PQ, Choisy M, Duong TN, Thiem VD, Yen NT, Hien NT, et al. Seasonality of absolute humidity explains seasonality of influenza-like illness in Vietnam. Epidemics. 2015 Dec;13:65–73.

160. Servadio JL, Thai PQ, Choisy M, Boni MF. Repeatability and timing of tropical influenza epidemics. PLoS Comput Biol. 2023 Jul 19;19(7):e1011317.

161. Loan TTT, Ha BTV, Mai LTQ, Thanh LT, Trang UTH, Hien PT, et al. Identification of seasonal influenza virus in the Northern Vietnam, 2013-2015. VNU Journal of Science: Natural Sciences and Technology [Internet]. 2017 Oct 10 [cited 2024 Jun 6];33(2S). Available from: https://js.vnu.edu.vn/NST/article/view/4598

162. Nguyen KQ, Nguyen LMA, Taylor-Robinson AW. Global "flu-ization" of COVID-19: A perspective from Vietnam. Front Public Health. 2022 Oct 3;10:987467.

163. World Health Organization. Influenza Update N° 416 [Internet]. [cited 2024 Jun 6]. Available from: https://www.who.int/publications/m/item/influenza-update-n-416

164. Bonacina F, Boëlle PY, Colizza V, Lopez O, Thomas M, Poletto C. Global patterns and drivers of influenza decline during the COVID-19 pandemic. Int J Infect Dis. 2023 Mar;128:132–9.

165. Lin C, Mullen J, Smith D, Kotarba M, Kaplan SJ, Tu P. Healthcare Providers' Vaccine Perceptions, Hesitancy, and Recommendation to Patients: A Systematic Review. Vaccines (Basel). 2021 Jul 1;9(7):713.

166. Nguyen TTT, Kasemsup V, Tiraphat S, Srithamrongsawat S, Chuakhamfoo NN. Acceptability and Willingness to Pay for Influenza Vaccination among Healthcare Professionals in Vietnam. APJHM. 2021 Dec 13;16(4):205–14.

167. Kamimura A, Trinh HN, Weaver S, Chernenko A, Nourian MM, Assasnik N, et al. Knowledge and Perceptions of Influenza Vaccinations Among College Students in Vietnam and the United States. J Prev Med Public Health. 2017 Jul;50(4):268–73.

168. Fernandes A, Wang D, Domachowske JB, Suryadevara M. Vaccine knowledge, attitudes, and recommendation practices among health care providers in New York State. Hum Vaccin Immunother. 19(1):2173914.

169. Rogers CJ, Bahr KO, Benjamin SM. Attitudes and barriers associated with seasonal influenza vaccination uptake among public health students; a cross-sectional study. BMC Public Health. 2018 Sep 20;18(1):1131.

170. Tieu Mai DT, Thuy PT. COVID-19 Vaccine Acceptance Among Healthcare Students in Vietnam, Based on Health Belief Model. SAGE Open Nurs. 2023 Sep 3;9:23779608231196662.

171. Guillari A, Polito F, Pucciarelli G, Serra N, Gargiulo G, Esposito MR, et al. Influenza vaccination and healthcare workers: barriers and predisposing factors. A literature review. Acta Biomed. 2021;92(Suppl 2):e2021004.

172. Jones CL, Jensen JD, Scherr CL, Brown NR, Christy K, Weaver J. The Health Belief Model as an Explanatory Framework in Communication Research: Exploring Parallel, Serial, and Moderated Mediation. Health Commun. 2015;30(6):566–76.

173. Conner M, Norman P. Health behaviour: Current issues and challenges. Psychol Health. 2017 Aug;32(8):895–906.

174. Peters RM, Templin TN. Theory of Planned Behavior, Self-Care Motivation, and Blood Pressure Self-Care. Res Theory Nurs Pract. 2010;24(3):172–86.

175. Bosnjak M, Ajzen I, Schmidt P. The Theory of Planned Behavior: Selected Recent Advances and Applications. Eur J Psychol. 2020 Aug 31;16(3):352–6.

176. Song J, Shin SY, Kim K, Son YJ, Kim J, Jang I. Self-care Behavior Based on Integrated Behavioral Model in Patients With Atrial Fibrillation: A Structural Equation Modeling Approach. West J Nurs Res. 2024 Feb;46(2):114–24.

177. Barajas MS, Bines D, Straussman J. Integrated Behavioral Health and Intervention Models. Pediatr Clin North Am. 2021 Jun;68(3):669–83.

178. Pourhoseingholi MA, Vahedi M, Rahimzadeh M. Sample size calculation in medical studies. Gastroenterol Hepatol Bed Bench. 2013;6(1):14–7.

179. Bs Lê Anh Tú [Internet]. 2012 [cited 2024 Jun 6]. Bs Lê Anh Tú. Available from: https://bsleanhtu.wordpress.com/

180. Walker L, Newall A, Heywood AE. Knowledge, attitudes and practices of Australian medical students towards influenza vaccination. Vaccine. 2016 Dec 7;34(50):6193–9.

181. International Diabetes Federation [Internet]. [cited 2024 Oct 21]. Resources Archive. Available from: https://idf.org/about-diabetes/resources/

182. Aminde LN, Takah N, Ngwasiri C, Noubiap JJ, Tindong M, Dzudie A, et al. Population awareness of cardiovascular disease and its risk factors in Buea, Cameroon. BMC Public Health. 2017 Jun 5;17(1):545.

183. Liu L, Liu YP, Wang J, An LW, Jiao JM. Use of a knowledge-attitude-behaviour education programme for Chinese adults undergoing maintenance haemodialysis: Randomized controlled trial. J Int Med Res. 2016 Jun;44(3):557–68.

184. Dauda Goni M, Hasan H, Naing NN, Wan-Arfah N, Zeiny Deris Z, Nor Arifin W, et al. Assessment of Knowledge, Attitude and Practice towards Prevention of Respiratory Tract Infections among Hajj and Umrah Pilgrims from Malaysia in 2018. Int J Environ Res Public Health. 2019 Nov 18;16(22):4569.

185. Biddle RE. How to Set Cutoff Scores for Knowledge Tests Used in Promotion, Training, Certification, and Licensing. Public Personnel Management. 1993 Mar 1;22(1):63–79.

186. Le NK, Turnbull N, Van Dam C, Khiewkhern S, Thiabrithi S. Impact of knowledge, attitude, and practices of Type 2 diabetic patients: A study in the locality in Vietnam. J Educ Health Promot. 2021;10:72.

187. Nguyen LH, Tran BX, Thi Nguyen HL, Le HT, Do HT, Kim Dang A, et al. Socio-Economic Disparities in Attitude and Preference for Menu Labels among Vietnamese Restaurant Customers. Int J Environ Res Public Health. 2018 Mar 6;15(3):460.

188. Vuong TN, Gallegos D, Ramsey R. Household food insecurity, diet, and weight status in a disadvantaged district of Ho Chi Minh City, Vietnam: a cross-sectional study. BMC Public Health. 2015 Mar 8;15:232.

189. Osokpo O, Riegel B. Cultural factors influencing self-care by persons with cardiovascular disease: An integrative review. Int J Nurs Stud. 2021 Apr;116:103383.

190. Rai SS, Syurina EV, Peters RMH, Putri AI, Zweekhorst MBM. Non-Communicable Diseases-Related Stigma: A Mixed-Methods Systematic Review. International Journal of Environmental Research and Public Health. 2020 Jan;17(18):6657.

191. Gowani A, Ahmed HI, Khalid W, Muqeet A, Abdullah S, Khoja S, et al. Facilitators and barriers to NCD prevention in Pakistanis–invincibility or inevitability: a qualitative research study. BMC Research Notes. 2016 May 23;9(1):282.

192. San Diego ERN, Merz EL. Diabetes knowledge, fatalism and type 2 diabetes-preventive behavior in an ethnically diverse sample of college students. Journal of American College Health. 2022 Mar 8;70(2):385–94.

193. Welch VL, Metcalf T, Macey R, Markus K, Sears AJ, Enstone A, et al. Understanding the Barriers and Attitudes toward Influenza Vaccine Uptake in the Adult General Population: A Rapid Review. Vaccines (Basel). 2023 Jan 13;11(1):180.

194. Tunisi GL, Ambrosi E, Zulianello G, Allegrini E, Provenzano D, Rizzello T, et al. To Get Vaccinated or Not? The Vaccination Decision-Making by Healthcare Professionals Working in Haematology: A Qualitative Study. Int J Environ Res Public Health. 2023 May 21;20(10):5901.

195. Sallis JF, Cerin E, Conway TL, Adams MA, Frank LD, Pratt M, et al. Physical activity in relation to urban environments in 14 cities worldwide: a cross-sectional study. Lancet. 2016 May 28;387(10034):2207–17.

196. Cutler DM, Lleras-Muney A. Understanding Differences in Health Behaviors by Education. J Health Econ. 2010 Jan;29(1):1–28.

197. Al Arawi WA, Al Shaman US, Albalawi WAM, Siddhachettiar PA, El-kannishy SMH, Bagalagel A, et al. Association of Demographic Variables with the Awareness of Type 2 Diabetes Mellitus Patients (T2DM) among the Northwest Population in Saudi Arabia. J Diabetes Res. 2020 Jul 12;2020:9408316.

198. Lee RLT, Chien WT, Tanida K, Takeuchi S, Rutja P, Kwok SWH, et al. The Association between Demographic Characteristics, Lifestyle Health Behaviours, and Quality of Life among Adolescents in Asia Pacific Region. International Journal of Environmental Research and Public Health. 2019 Jan;16(13):2324.

199. Raghupathi V, Raghupathi W. The influence of education on health: an empirical assessment of OECD countries for the period 1995–2015. Archives of Public Health. 2020 Apr 6;78(1):20.

200. Ibarra-Sanchez AS, Abelsen B, Chen G, Wisløff T. Educational patterns of health behaviors and body mass index: A longitudinal multiple correspondence analysis of a middle-aged general population, 2007–2016. PLOS ONE. 2023 Dec 1;18(12):e0295302.

201. Rahman M, Zaman MM, Islam JY, Chowdhury J, Ahsan HN, Rahman R, et al. Prevalence, treatment patterns, and risk factors of hypertension and pre-hypertension among Bangladeshi adults. J Hum Hypertens. 2018 May;32(5):334–48.

202. Communities for Healthy Hearts: Improving Hypertension Management and Control in Vietnam [Internet]. [cited 2024 Jun 5]. Available from: https://www.path.org/our-impact/resources/communities-for-healthy-hearts-improving-hypertension-management-and-control-in-vietnam/

203. Yusuf Mohamud MF, Omar Jeele MO. Knowledge, attitude, and practice regarding lifestyle modification among type 2 diabetes patients with cardiovascular disease at a Tertiary Hospital in Somalia. Ann Med Surg (Lond). 2022 Jun 9;79:103883.

204. Disparities R on the P of HE and the E of H, Practice B on PH and PH, Medicine I of. Culture as a Social Determinant of Health. In: Leveraging Culture to Address Health Inequalities: Examples from Native Communities: Workshop Summary [Internet]. National Academies Press (US); 2013 [cited 2024 Jun 5]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK201298/

205. World Health Organization. Infodemics and misinformation negatively affect people's health behaviours, new WHO review finds [Internet]. [cited 2024 Jun 5]. Available from: https://www.who.int/europe/news/item/01-09-2022-infodemics-and-misinformation-negatively-affect-people-s-health-behaviours--new-who-review-finds

206. Kalantzi V, Kalafati IP, Belitsi V, Tsiampalis T, Koutsonasios I, Androutsos O, et al. Cardiometabolic Patient-Related Factors Influencing the Adherence to Lifestyle Changes and Overall Treatment: A Review of the Recent Literature. Life (Basel). 2023 May 10;13(5):1153.

207. Walker RJ, Smalls BL, Hernandez-Tejada MA, Campbell JA, Davis KS, Egede LE. Effect of Diabetes Fatalism on Medication Adherence and Self-Care Behaviors in Adults with Diabetes. Gen Hosp Psychiatry. 2012 Nov;34(6):598–603.

208. Robinson J, Nitschke E, Tovar A, Mattar L, Gottesman K, Hamlett P, et al. Nutrition and Physical Activity Interventions Provided by Nutrition and Exercise Practitioners for the General Population: An Evidence-Based Practice Guideline From the Academy of Nutrition and Dietetics and American Council on Exercise. J Acad Nutr Diet. 2023 Aug;123(8):1215-1237.e5.

209. Ganiyu AB, Mabuza LH, Malete NH, Govender I, Ogunbanjo GA. Non-adherence to diet and exercise recommendations amongst patients with type 2 diabetes mellitus attending Extension II Clinic in Botswana. Afr J Prim Health Care Fam Med. 2013 May 13;5(1):457.

210. Hoven H, Backhaus I, Gerő K, Kawachi I. Characteristics of employment history and self-perceived barriers to healthcare access. Eur J Public Health. 2023 Oct 19;33(6):1080–7.

211. Huang C, Xie X, Cheung SP, Zhou Y. Job Demands and Resources, Positive and Negative Affect, and Psychological Distress of Social Workers in China. Front Psychiatry. 2022 Jan 18;12:752382.

212. Mourad N, Mourad L, Hammoudi Halat D, Farah Z, Hendaus M, El Sayed Trad I, et al. Factors Affecting Influenza Vaccination Uptake and Attitudes among Lebanese University Students: The Impact of Vaccination Promotional Programs and COVID-19 Pandemic. Vaccines. 2023 May;11(5):949.

213. Sun G, Zhang L, Qiu Y, Jia Y, Wang Y, Xu H, et al. Changes of influenza vaccination rate and associated influencing factors after the COVID-19 pandemic in Shanghai, China. Hum Vaccin Immunother. 2024 Dec 31;20(1):2287294.

214. Jiang B, Wang Z, Jia M, Yan H, Su Z, Liu S, et al. Awareness, knowledge and attitude toward influenza vaccination in several population groups in China: A cross-sectional study. Front Public Health. 2022 Oct 13;10:950532.

215. Aguolu OG, Willebrand K, Elharake JA, Qureshi HM, Kiti MC, Liu CY, et al. Factors influencing the decision to receive seasonal influenza vaccination among US corporate non-healthcare workers. Hum Vaccin Immunother. 18(6):2122379.

216. Singh T, Taitel M, Loy D, Smith-Ray R. Estimating the Effect of a National Pharmacy-Led Influenza Vaccination Voucher Program on Morbidity, Mortality, and Costs. J Manag Care Spec Pharm. 2020 Jan;26(1):10.18553/jmcp.2020.26.1.42.

217. Xie YJ, Liao X, Lin M, Yang L, Cheung K, Zhang Q, et al. Community Engagement in Vaccination Promotion: Systematic Review and Meta-Analysis. JMIR Public Health Surveill. 2024 May 10;10:e49695.

218. Zhang C, Ling Z, Xiang L, Zhang Y, Li L, Yang S, et al. Association of accelerated aging with the incidence risk of Cardiometabolic diseases in people with severe mental illnesses: A prospective analysis in UK Biobank. Psychiatry Res. 2024 Apr 30;337:115930.

219. Herath HMM, Weerasinghe NP, Dias H, Weerarathna TP. Knowledge, attitude and practice related to diabetes mellitus among the general public in Galle district in Southern Sri Lanka: a pilot study. BMC Public Health. 2017 Jun 1;17:535.

220. Kumar A, Siddharth V, Singh SI, Narang R. Cost analysis of treating cardiovascular diseases in a super-specialty hospital. PLoS One. 2022 Jan 5;17(1):e0262190.

221. Crook ED, Peters M. Health disparities in chronic diseases: where the money is. Am J Med Sci. 2008 Apr;335(4):266–70.

222. Kugbey N, Oppong Asante K, Adulai K. Illness perception, diabetes knowledge and self-care practices among type-2 diabetes patients: a cross-sectional study. BMC Res Notes. 2017 Aug 10;10:381.

223. Fouad AM, Waheed A, Gamal A, Amer SA, Abdellah RF, Shebl FM. Effect of Chronic Diseases on Work Productivity: A Propensity Score Analysis. J Occup Environ Med. 2017 May;59(5):480–5.

224. Kondapura MB, Manjunatha N, Nagaraj AKM, Praharaj SK, Kumar CN, Math SB, et al. Work productivity (absenteeism and presenteeism) in persons with common mental

disorders: An observational study from South India. Indian J Psychiatry. 2023 Apr;65(4):412–8.

225. Yap JF, Moy FM, Wan Ahmad WA, Lim YC. Assessing the effect of cardiovascular disease on work productivity and financial loss among school teachers in Peninsular Malaysia: a nested case-control study. PeerJ. 2024 Feb 12;12:e16906.

226. Jacobs JC, Burke S, Rouse M, Sarma S, Zaric G. Cardiovascular Disease Risk Awareness and Its Association With Preventive Health Behaviors: Evidence From a Sample of Canadian Workplaces. J Occup Environ Med. 2016 May;58(5):459–65.

227. White S. Effectiveness of public health and education programs for creating awareness of and managing cardiovascular disease. Patient Intelligence. 2011 Feb 16;3:11–21.

228. Raphael D. Bridging the gap between knowledge and action on the societal determinants of cardiovascular disease: how one Canadian community effort hit – and hurdled – the lifestyle wall. Health Education. 2003 Jan 1;103(3):177–89.

229. Abalkhail MS, Alzahrany MS, Alghamdi KA, Alsoliman MA, Alzahrani MA, Almosned BS, et al. Uptake of influenza vaccination, awareness and its associated barriers among medical students of a University Hospital in Central Saudi Arabia. J Infect Public Health. 2017;10(5):644–8.

230. Plans-Rubió P. The vaccination coverage required to establish herd immunity against influenza viruses. Preventive Medicine. 2012 Jul 1;55(1):72–7.

231. Bullen M, Heriot GS, Jamrozik E. Herd immunity, vaccination and moral obligation. J Med Ethics. 2023 Sep;49(9):636–41.

232. Zou H, Huang Y, Chen T, Zhang L. Influenza vaccine hesitancy and influencing factors among university students in China: a multicenter cross-sectional survey. Ann Med. 55(1):2195206.

233. Lucyk K, Simmonds KA, Lorenzetti DL, Drews SJ, Svenson LW, Russell ML. The association between influenza vaccination and socioeconomic status in high income countries varies by the measure used: a systematic review. BMC Med Res Methodol. 2019 Jul 17;19:153.

234. Zanobini P, Lorini C, Caini S, Lastrucci V, Masocco M, Minardi V, et al. Health Literacy, Socioeconomic Status and Vaccination Uptake: A Study on Influenza Vaccination in a Population-Based Sample. Int J Environ Res Public Health. 2022 Jun 6;19(11):6925.

235. Watkinson RE, Williams R, Gillibrand S, Munford L, Sutton M. Evaluating socioeconomic inequalities in influenza vaccine uptake during the COVID-19 pandemic: A cohort study in Greater Manchester, England. PLoS Med. 2023 Sep 26;20(9):e1004289.

236. Dardas LA, Al-leimon O, Jaber AR, Saadeh M, Al-leimon A, Al-Hurani A, et al. Flu Shots Unveiled: A Global Systematic Review of Healthcare Providers' Uptake of, Perceptions, and Attitudes toward Influenza Vaccination. Vaccines. 2023 Dec;11(12):1760.

237. Cataldi JR, Kerns ME, O'Leary ST. Evidence-based strategies to increase vaccination uptake: a review. Curr Opin Pediatr. 2020 Feb;32(1):151–9.

238. Fayaz-Farkhad B, Jung H, Calabrese C, Albarracin D. State policies increase vaccination by shaping social norms. Sci Rep. 2023 Dec 1;13(1):21227.

239. Eiden AL, Barratt J, Nyaku MK. A review of factors influencing vaccination policies and programs for older adults globally. Hum Vaccin Immunother. 19(1):2157164.

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Appendices

Questionnaire used for the study regarding cardiometabolic diseases.

SURVEY FORM
KNWLEDGE – ATTITUDE - PRACTICE
REGARDING DIABETES – HYPERTENSION AND PREVENTIONS

A. SURVEY CODE
Survey period: .....…. / ….....… / 2019
City: ....
District: .....
Ward: .....

Do you agree to participate in the study? Yes ☐ No ☐

Day ..... Month ..... 20.....

(Signature, and full name)

B. QUESTIONNAIRE

1. ***General information of participant***

Nº	Question	Answer	Code
1	Full name	.....	
2	Gender	Male = 1 Female = 2	1 2
3	DOB	Day……../Month……./Year…..	
4	Ethnicity	Kinh = 1 Other *(Indicate : ……..)*	1 2
5	Occupation	Manual (Physical) work = 1 Intellectual work = 2 Student = 3 Unemployed (housewife, retired)= 4	1 2 3 4
6	Educational attainment	Illiterate = 1 Did not finished primary edication = 2 Finished Primary edication = 3 Finished Secondary education = 4 Vocational school = 5 College/University/Higher = 6	1 2 3 4 5 6
7	Marrital status	Married = 1 Single = 2 Divorced = 3	1 2 3

		Widowed = 4	4
8	Have you ever diagnosed with any chronic condition?	Obese = 1 Hypertension = 2 Type 2 diabetes = 3 Other = 99	1 2 3 99

2. Anthropometric measurements

Height: ……. m *Weight: ……. Kg*

BMI: ……. kg/m² *Blood pressure: ……. mmHg*

Pulse: ……. /mint *Fasting blood glucose: ……. mmol/L*

3. ***Lifestyle behavior of the participant***

3.1. Diet

Nº	Question	Answer	Code
9	What type of fat (lipid) do you usually consume? *(Multiple choices)*	Animal fat = 1 Vegetable fat = 2 Fried food = 3 Fast food = 4 Other (……)	1 2 3 4 99
10	What type of carbohydrate do you usually consume *(Multiple choices)*	Rice, wheat noodle, rice noodle = 1 Bread of any kind = 2 Potato, sweet potato, corn = 3 Other (……)	1 2 3 99
11	What type of protein do you usually consume *(Multiple choices)*	Lean meat (without fat) = 1 Poultry (without skin) = 2 Fish, sea food = 3 Tofu and soy-base product = 4 Eggs (more than 4/week) = 5 Other (……)	1 2 3 4 5 99
12	Do you usually consume soft drinks or sweetened beverages? *(i.e.: coca / pepsi / fanta / 7-up / sprite, boba tea…)*	Yes = 1 No = 2	1 2
13	Do you drink 2 litter or more of water (still, no sugar) per day?	Yes = 1 No = 2	1 2

3.2. Behaviors associate with good/bad health outcomes

14	Do you smoke?	Yes = 1 Quitted = 2 Never = 3	1 2 3
15	Smoking frequency	Everyday = 1	1

		Occasionally = 2	2
16	When did you quit smoking?	Few days ago = 1 Less than a month = 2 Less than a year = 3 1 year or longer = 4	1 2 3 4
17	Do you drink alcohol?	Yes = 1 No = 2	1 2
18	Alcohol consumption frequency	Everyday = 1 > 4 times/week = 2 < 4 times/week = 3 Few times /month = 4 Never = 5	1 2 3 4 5
19	When was the last time you got your blood pressure check by professional?	Within 6 months = 1 Within 6 months to a year = 2 1 to 5 years = 3 More than 5 years = 4	1 2 3 4
20	Do you take any anti-hypertensive medication?	Yes = 1 No = 2	1 2
21	When was the last time you got your blood glucose check by professional?	Within 6 months = 1 Within 6 months to a year = 2 1 to 5 years = 3 More than 5 years = 4	1 2 3 4
22	Do you take any anti-diabetes medication?	Yes = 1 No = 2	1 2

3.3. ***Physical activity***

Nº	Question	Answer	Code
23	Do you practice any of the following behaviors as habit? *(Multiple choices)*	Walking = 1 Jogging = 2 Gardening = 3 Sport *(soccer, badminton,...)* Cycling = 5 No physical activity = 6 Other (……)	1 2 3 4 5 6 99
24	How long do you practice the chosen activity per day?	..... min/day	
25	Why don't you practice in any physical activity?	Don't have time = 1 Not necessary = 2 I'm a physical worker = 3 Other (……)	1 2 3 99

4. Knowledge of Type 2 Diabetes, its prevention and treatment

4.1. Knowledge of Type 2 Diabetes

Nº	Question	Answer	Code
26	What is T2DM? *(Multiple choices)*	Don't know = 88 Higher blood glucose than normal = 1 Urinate glucose = 2 Overweight = 3 Other (……)	88 1 2 3 99
27	Do you know any symptoms of T2DM? *(Multiple choices)*	Don't know = 88 Excessive thirst = 1 Frequent urination = 2 Sudden weight loss = 3 Blurry vision = 4 Longer healing of cut/wound = 5 Tiredness = 6 Other (……)	88 1 2 3 4 5 6 99
28	Is T2DM dangerous in your opinion?	Don't know = 88 Yes = 1 No = 2	88 1 2
29	If yes, how dangerous? *(Multiple choices)*	Can be fatal = 1 Many complications and disabilities = 2 Other (……)	1 2 99
30	Do you know any complications of T2DM?	Yes = 1 No = 2	1 2
31	If yes, which complication do you know? *(Multiple choices)*	Don't know = 88 Hypertension = 1 Neurological complications = 2 Vision impair = 3 Cardiovascular complications = 4 Kidney complications = 5 Amputation = 6 No complication = 7 Other (……)	88 1 2 3 4 5 6 7 99
32	Almost every T2DM case has complication?	True = 1 False = 2	1 2

4.2. ***Knowledge of T2DM risk factors***

33	Do you know the risk factors of T2DM?	Yes = 1 No = 2	1 2
34	If yes, which risk factor do you know? *(Multiple choices)*	Family history of T2DM = 1 Age >45 = 2 Overweight/Obesity = 3 Hypertension = 4 Dyslipidemia = 5	1 2 3 4 5

		Diagnosed with pre-diabetes = 6 History of Fetal Macrosomia = 7 History of gestational diabetes = 8 Stress = 9 Physical inactivity = 10 Over eating = 11 Other (……)	6 7 8 9 10 11 99
35	Do you know what is Pre-diabetes?	Yes = 1 No = 2	1 2
36	If yes, what is it? *(Multiple choices)*	Higher blood glucose than normal but not yet diabetes = 1 Have higher risk to develop T2DM = 2 Other (……)	1 2 99
37	Do you know the risk factors of Pre-diabetes?	Yes = 1 No = 2	1 2
38	If yes, which risk factor do you know? *(Multiple choices)*	Family history of T2DM = 1 Age >45 = 2 Overweight/Obesity = 3 Hypertension = 4 Dyslipidemia = 5 Diagnosed with pre-diabetes = 6 History of Fetal Macrosomia = 7 Stress = 8 Physical inactivity = 9 Over eating = 10 Other (……)	1 2 3 4 5 6 7 8 9 10 99
39	Risk of T2DM is increased with age	True = 1 False = 2	1 2
40	Overweight/obesity is related to T2DM	True = 1 False = 2	1 2

4.3. ***Knowledge of T2DM prevention***

41	Can T2DM be cured?	Yes = 1 No = 2 Don't know = 88	1 2 88
42	Do you know any treatment of T2DM?	Yes = 1 No = 2	1 2
43	If yes, which treatment do you know? *(Multiple choices)*	By medication = 1 Proper diet = 2 Regular physical activity = 3 Other (……)	1 2 3 99
44	Which medication treatment do you know? *(Multiple choices)*	Insulin injection = 1 Tablets = 2 Traditional medicine = 3 Other (……)	1 2 3 99

45	What is a proper diet for T2DM patients? *(Multiple choices)*	Avoid sweet and sweetened products = 1 Avoid fatty and fast food = 2 Consume high fiber food = 3 Have more regular but smaller meals = 4 Avoid alcohol = 5 Other (……)	1 2 3 4 5 99
46	What is a proper physical activity for T2DM patients? *(Multiple choices)*	Increase physical activity = 1 Regular exercise = 2 Exercise as doctor recommendation = 3 Avoid sedentary lifestyle = 4 *(long time siting on TV, computer, etc.)* Other (……)	1 2 3 4 99
47	Can T2DM be prevented?	Yes = 1 No = 2	1 2
48	If yes, how? *(Multiple choices)*	Proper diet = 1 Physically active = 2 Regular check-up = 3 Other (……)	1 2 3 99

5. Knowledge of Hypertension, its prevention and treatments

5.1. Knowledge of HTN

Nº	Question	Answer	Code
49	What is the normal Blood pressure?	120/80 mmHg = 1 Don't know = 2	1 2
50	Is HTN dangerous?	Don't know = 88 Yes = 1 No = 2	88 1 2
51	If yes, how dangerous? *(Multiple choices)*	Can be fatal = 1 Many complications and disabilities = 2 Other (……)	1 2 99
52	Do you know any symptoms of HTN?	Yes = 1 No = 2	1 2
53	If yes, which symptom do you know? *(Multiple choices)*	Headache = 1 Breathlessness = 2 Dizzy = 3 Chest pain = 4 Heart palpitations =5 Other (……)	1 2 3 4 5 99
54	Do you know any complication of HTN?	Yes = 1 No = 2	1 2

55	If yes, which complication do you know? *(Multiple choices)*	Don't know = 88 Heart attack / Stoke = 1 Aneurysm = 2 Hear failure = 3 Vision impaired/loss = 4 T2DM = 5 Memory decline = 6 No complication = 7 Other (……)	88 1 2 3 4 5 6 7 99
56	Almost every HTN case has complication?	True = 1 False = 2	1 2

5.2. ***Knowledge of HTN risk factors***

57	Do you know any risk factors of HTN?	Yes = 1 No = 2	1 2
58	If yes, which risk factor do you know? *(Multiple choices)*	Family history of HTN = 1 Age > 45 = 2 Overweight/Obesity = 3 Diagnosed with pre-HTN= 4 Stress = 5 Physically inactive= 6 Other (……)	1 2 3 4 5 6 99
59	If your parent(s) has HTN, you will have HTN.	True = 1 False = 2	1 2
60	Risk of HTN is increased with age.	True = 1 False = 2	1 2
61	Overweight/obesity is related to HTN.	True = 1 False = 2	1 2

5.3. ***Knowledge of treatment and prevention of HTN***

62	HTN can be cured?	Yes = 1 No = 2 Don't know = 88	1 2 88
63	Do you know any treatment of T2DM?	Yes = 1 No = 2	1 2
64	If yes, which treatment do you know? *(Multiple choices)*	By medication = 1 Proper diet = 2 Regular physical activity = 3 Other (……)	1 2 3 99
65	Which medication treatment do you know? *(Multiple choices)*	Yes = 1 No = 2	1 2
66	What is a proper diet for T2DM patients? *(Multiple choices)*	Decrease salt intake = 1 More balanced meal portion = 2 Avoid alcohol = 3	1 2 3 4

		Regular exercise = 4 Maintain proper body weight= 5 Avoid smoking = 6 Other (……)	5 6 99
67	What is a proper physical activity for T2DM patients? *(Multiple choices)*	Increase physical activity = 1 Regular exercise = 2 Exercise as doctor recommendation = 3 Avoid sedentary lifestyle = 4 *(long time siting on TV, computer, etc.)* Other (……)	1 2 3 4 99

6. ***Attitude of the participant regarding T2DM, Hypertension and the complications***

Nº	Question	Respondent's point of view		
		Agree	Disagree	Neither
		1	2	3
68	T2DM/HTN is dangerous for our health and has many complications.			
69	Afraid if diagnosed with T2DM/HTN.			
70	Treatment and prevention of T2DM/HTN is not needed.			
71	The most important of T2DM/HTN treatment is following doctor's instruction.			
72	Lifestyle and diet changing won't help in treatment of T2DM/HTN.			
73	The most important prevention of T2DM/HTN is using medication.			
74	Prevention of T2DM/HTN is the responsibility of the community.			
75	T2DM/HTN is dangerous for our health and has many complications.			

7. Media factors affecting knowledge - attitudes - practices of the participant

Nº	Question	Answer	Code
76	Did you hear/see any information of prevention of T2DM on any kind of media?	Yes = 1 Never = 2	1 2

77	If yes, where is it? *(Multiple choices)*	TV=1 Radio=2 Newspaper=3 Fliers, posters=4 Medical staffs=5 Friends, relatives=6 Other (……)	1 2 3 4 5 6 99
78	Do you want to receive information on T2DM and prevention? *(Multiple choices)*	Yes = 1 No = 2	1 2
79	If yes, where do you want to receive this information from?	TV=1 Radio=2 Newspaper=3 Fliers, posters=4 Medical staffs=5 Friends, relatives=6 Other (……)	1 2 3 4 5 6 99

Interviewer
(Signature with full name)

Questionnaire used for the study regarding influenza vaccination

Link: https://forms.gle/eQXXsZVmMgJqt7GV9

Demographic and enrolment characteristics of participants (Single choice)

1. Age
2. Gender
3. Student enrollment: national/international
4. Country of birth
5. Language spoken at home
6. Living arrangement: On/off campus
7. Year of study

Knowledge about influenza: (Correct/Incorrect)

8. Influenza is a highly contagious virus

Knowledge about policy (Correct/Incorrect)

9. Pregnant women should receive the influenza vaccine
10. It is recommended that I have the influenza vaccine every year

Knowledge about risk (Correct/Incorrect)

11. I am at risk of influenza during my clinical placements
12. Healthy older adults (>65 years) do not need the influenza vaccine as they rarely get sick from influenza
13. During clinical placement I am at risk of transmitting influenza to colleagues
14. During clinical placement I am at risk of transmitting influenza to my household contacts
15. During clinical placement I am at risk of transmitting influenza to patients
16. Influenza vaccination is important to protect the patients I see
17. Health Care Workers are a source of infection for their patients

Knowledge about vaccine (Correct/Incorrect)

18. There is a risk of getting influenza from the influenza vaccine
19. There is a risk of getting an influenza-like illness from the influenza vaccine
20. The influenza vaccine is safe
21. Serious adverse events from the influenza vaccine are very rare

22. Influenza vaccination reduces the risk of patients becoming seriously ill from influenza and its complications
23. The influenza vaccine is contraindicated in people with egg allergies
24. The influenza vaccine is effective in the prevention of influenza

Motivators for receipt of any prior influenza vaccine: (MCQ)

a. Self-protection
b. Vaccine was provided for free
c. Convenient access
d. Protection for my patient
e. Protection for my friends and family
f. Moral and ethical reasons
g. Compliance with national guidelines
h. My doctor suggested it
i. I always get vaccinated
j. To set an example

Beliefs about access (Agree/Disagree)

25. It is too costly to get the influenza vaccine each year
26. I don't have the time to make an appointment to get my yearly influenza vaccine

Beliefs about policy (Agree/Disagree)

27. Doctors should always be up to date with seasonal influenza vaccinations
28. Influenza vaccination should be compulsory for medical students
29. Influenza vaccination should be compulsory for medical students
30. It is the duty of a Health Care Worker to prevent transmission of influenza to patients

Beliefs about vaccine (Agree/Disagree)

31. As a medical student, annual influenza vaccination is important to me
32. As a medical student, annual influenza vaccination is important to me
33. The risk of adverse events outweigh the benefits of the influenza vaccine
34. The influenza vaccine is not worth the trouble
35. Vaccines are not important for Health Care Workers

Practices

36. What other vaccinations have you received?
37. Do you know that in order to be protected properly you need to get revaccinated for several vaccines?
    a. Yes, I am aware it and doing it properly.
    b. Yes, I am aware of it, but I am not sure if I have full vaccination.
    c. No, this is the first time I hear about that.
    d. No, there is no need because vaccination is always life-long protection

38. Do you advise your relatives, friends, colleagues etc. to get vaccinated?
    a. Yes
    b. No
    c. Never thought about that

39. Do you think that a more specific vaccination program should be available to pregnant women (e.g. seasonal flu, mumps, rubella)?
    a. Yes, because that way the fetus will be protected against inborn anomalies and fewer miscarriages will occur
    b. No, because a specific programme is not safe to a pregnant woman or the fetus
    c. No, because the vaccine is not effective for the pregnant woman or the fetus.
    d. No, because everyone should have the right to choose.

40. What is your opinion about the seasonal flu vaccine?
    a. It is an almost 100% protection against seasonal flu.
    b. It is not useful because the seasonal flu virus mutates constantly and there is a different type every year.
    c. It won't necessary prevent you from contracting the seasonal flu, but the disease will be less serious.
    d. Vaccines in general are not effective and the seasonal flu vaccine is not an exception.

41. How often do you get vaccinated against seasonal flu?
    a. Every other season.
    b. Every season.

c. I have never been vaccinated against seasonal flu.
d. I haven only been vaccinated once.
e. Not regularly.

42. Do you think that a vaccine against seasonal flu should be mandatory for medical staff (attending doctors, nurses etc.)?
    a. No, because everyone should have the right to choose.
    b. No, because those vaccines are not effective.
    c. No, because those vaccines are not safe.
    d. Yes, because medical staff has a greater chance to get infected and then spread the spread the virus.

43. Do you think that a vaccine against seasonal flu B should be mandatory for medical students?
    a. No, because everyone should have the right to choose.
    b. No, because these vaccines are not safe.
    c. No, because those vaccines are not effective.
    d. Yes, because medical students rotate through different departments in a hospital and can spread the virus.

Publication list

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Doctoral School: Kálmán Laki Doctoral School

List of publications related to the dissertation

1. **Nguyen, M. C.**, Nguyen, A. T. V., Nguyet To, M., Ghanem, A. S., Szőllősi, G. J., Móré, M., Nagy, A. C.: Association Between Influenza Vaccine Uptake and Health Awareness: A Cross-Sectional Questionnaire-Based Study Among Medical students and Healthcare Workers in Northern Vietnam.
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2. **Nguyen, M. C.**, Santoso, C. M. A., Vu, D. T. H., Szőllősi, G. J., Bata, R., Zsuga, J., Nagy, A. C.: Awareness Related to Cardiometabolic Diseases: a Cross-Sectional Study in Southern Vietnam.
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List of other publications

3. Ulambayar, B., Ghanem, A. S., **Nguyen, M. C.**, Vargáné Faludi, E., Móré, M., Nagy, A. C.: Evaluation of cardiovascular disease risk in patients with type 2 Diabetes Mellitus using clinical laboratory markers.
   J Clin Med. 13, 1-14, 2024.
   DOI: http://dx.doi.org/10.3390/jcm13123561
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4. Varga, E., Ghanem, A. S., Faludi, E., **Nguyen, M. C.**, Kovács, N., Nagy, A. C.: Medical comorbidities and other factors associated with migraine among individuals with diabetes mellitus in Hungary: a cross- sectional study using European Health Interview Surveys 2009-2019.
   Front Endocrinol (Lausanne). 15, 2024.
   DOI: http://dx.doi.org/10.3389/fendo.2024.1379127
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5. Ghanem, A. S., **Nguyen, M. C.**, Mansour, Y., Fábián, G., Rusinné Fedor, A., Nagy, A. C., Móré, M.: Investigating the Association between Sociodemographic Factors and Chronic Disease Risk in Adults Aged 50 and above in the Hungarian Population.
Healthcare. 11, 1-24, 2023.
DOI: http://dx.doi.org/10.3390/healthcare11131940
IF: 2.4

6. Szőllősi, G. J., **Nguyen, M. C.**, Santoso, C. M. A., Zsuga, J., Nagy, A. C., Kardos, L.: An Exploratory Assessment of Factors with Which Influenza Vaccine Uptake Is Associated in Hungarian Adults 65 Years Old and Older: findings from European Health Interview Surveys.
Int. J. Environ. Res. Public Health. 19 (12), 1-12, 2022.
DOI: http://dx.doi.org/10.3390/ijerph19127545

7. Szőllősi, G. J., **Nguyen, M. C.**, Pataki, J., Santoso, C. M. A., Nagy, A. C., Kardos, L.: Influenza Vaccination Coverage and Its Predictors among Self-Reported Diabetic Patients - Findings from the Hungarian Implementation of the European Health Interview Survey.
Int. J. Environ. Res. Public Health. 19 (23), 1-11, 2022.
DOI: http://dx.doi.org/10.3390/ijerph192316289

8. Santoso, C. M. A., Bramantoro, T., **Nguyen, M. C.**, Nagy, A. C.: Lifestyle and psychosocial correlates of oral hygiene practice among Indonesian adolescents.
Eur. J. Oral. Sci. 129 (1), 1-10, 2021.
DOI: http://dx.doi.org/10.1111/eos.12755
IF: 2.16

9. Santoso, C. M. A., Bramantoro, T., **Nguyen, M. C.**, Bagoly, Z., Nagy, A. C.: Factors Affecting Dental Service Utilisation in Indonesia: a Population-Based Multilevel Analysis.
Int. J. Environ. Res. Public Health. 17 (15), 1-11, 2020.
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