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Non-communicable disease (NCD) awareness and risk factor prevalence among university students and other communities in Bangladesh

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INDEPENDENT UNIVERSITY, BANGLADESH (IUB)

School of Pharmacy & Public Health (SPPH)
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Project Report

Non-Communicable Disease (NCD) Awareness and Risk Factor Prevalence Among University Students and Other Communities in Bangladesh

A Project Report Submitted in Partial Fulfilment of the Requirements for the Degree of Bachelor of Pharmacy

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Submission Date: 23 September, 2026

DECLARATION

This is to state that the project Report "**Non-Communicable Disease (NCD) Awareness and Risk Factor Prevalence Among University Students and Other Communities in Bangladesh**" is an original work which has been executed by us under the guidance of Seagufta Afrin, PhD, Assistant Professor of Department of Pharmacy, School of Pharmacy & Public Health (SPPH), Independent University, Bangladesh (IUB).

The work presented in this report has not been submitted, either wholly or partly, to any other institution for the award of any degree or academic qualification. Sources of information for the preparation of this report have been properly identified and cited.

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Approval of Project Instructor

Yeamin Howlader (ID: 2120482) and Farhana Azizah Arif (ID: 2130375) of the Department of Pharmacy, School of Pharmacy & Public Health (SPPH), Independent University, Bangladesh (IUB) have prepared a project report titled "Non-Communicable Disease (NCD) Awareness and Risk Factor Prevalence Among University Students and Other Communities in Bangladesh" under my supervision.

To my knowledge, this project is their original work and prepared accordingly to the academic requirements of Bachelor of Pharmacy course. Hence, it is recommended that this report be submitted to fulfill the degree requirement for Bachelor of Pharmacy.

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Yeamin Howlader
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Abstract

Background: Unhealthy diet, physical inactivity, smoking, lack of sleep, sedentary lifestyle, psychological stress are all modifiable lifestyle factors which are strongly associated with non-communicable diseases (NCDs). These behaviors may occur at a critical period in young adults' lives, such as university.

Objectives: To measure NCD knowledge, lifestyle-related risk behaviors, health characteristics and factors related to NCD knowledge among university students and other adult community members in 2026.

The design of the study was quantitative, cross-sectional, and was conducted with a structured questionnaire online. A total of 312 answers were received, from which 301 complete and consented answers were analyzed. The assessment of NCD knowledge was based on 13 True/False/Don't Know (TFDK) questions yielding a total knowledge score of 0–13. Analyses were descriptive statistics, Chi-square tests, group comparisons and multiple linear regression.

Results: The overall level of knowledge about NCDs was good, with a mean knowledge score of around 10.02 out of 13. However, some unhealthy lifestyle patterns were noted. About 63.5% of respondents reported moderate-to-vigorous physical activity on fewer than 3 days per week; 60.5% reported 5 or more hours of leisure screen time each day; and, among valid sleep-duration responses, 68.6% reported less than 7 hours of sleep per night. Academic stress was reported as often or always by 69.1% of respondents. Current daily or occasional tobacco use was reported by 22.6%, with a much higher proportion among males. In multivariable analysis, older age, studying in Pharmacy, and having a family history of NCDs were independently associated with higher NCD knowledge.

Conclusion: The overall awareness of NCDs was reasonably good, but there was still a high prevalence of important lifestyle related risk behaviors among the respondents. The results revealed a gap between knowledge and healthy lifestyle practice, and the importance of providing targeted health education, behavioral interventions and preventive programs in the other community and the university.

Keywords: Non-communicable diseases, lifestyle, University Students, Knowledge about non-communicable diseases, Physical activity, Smoking, Sleep, Academic stress, Bangladesh.

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List of Abbreviations

Abbreviation	Full Form
BMI	Body Mass Index
CI	Confidence Interval
CVD	Cardiovascular Disease
IUB	Independent University, Bangladesh
KR-20	Kuder-Richardson Formula 20

HC-3	Heteroskedasticity-Consistent 3
NCD	Non-Communicable Disease
SPPH	School of Pharmacy & Public Health
SSB	Sugar-Sweetened Beverage
VIF	Variance Inflation Factor
WHO	World Health Organization
SE	Standard Error

CHAPTER 1: INTRODUCTION

1.1 Background of the Study

Non-communicable diseases (NCDs) are an important public health issue globally. NCDs do not always manifest themselves quickly, and often have a complex combination of behavioural, physiological, environmental and genetic risk factors. Cardiovascular diseases, cancer, chronic respiratory diseases and diabetes account for a large proportion of NCD burden in the world. About 41 million people die yearly from NCDs, which account for over 74% of all deaths globally; and approximately 77% of global NCD deaths are recorded in LMICs (World Health Organization, 2023).

Many modifiable behaviors contribute to a significant amount of the NCD risk. Avoidance of healthy eating patterns, smoking, excessive alcohol consumption, physical inactivity, high levels of sodium and fat, and low consumption of fruits and vegetables, can all be associated with metabolic abnormalities like overweight and obesity, high blood pressure, elevated blood glucose, and abnormal blood lipid levels (Islam et al., 2025). Early prevention is therefore important, as these risk factors may persist into later life.

There are certain groups that stand out in this respect, such as students at universities. When students transition to university, they often experience changes in living environments, dietary habits and, physical activities. All these changes may be linked to poor lifestyle habits such as inactivity, poor nutrition, smoking etc. that could lead to the development of NCDs. As expressed by Islam et al. (2025), the developmental stage could be a time when students in the university are especially vulnerable to behavioural risk factors for NCDs, which might continue in adulthood. Likewise, Cicekli and Gokce Eskin (2025) reported that the major risk factors for behaviors are likely to appear during adolescence and early adulthood and can carry-over later in life, leading to a higher risk of cardiovascular disease, diabetes, cancer or other chronic diseases.

Globally, there are numerous examples of students being University enrolled with more than one NCD risk behaviour. Cicekli and Gokce Eskin (2025) concluded in their study of 485 students at the university that 89.2% of the subjects were not physically active, 70.5% didn't consume sufficient amounts of vegetables, 58.9% did not consume sufficient amounts of fruits, 44.5% consumed alcohol, 41.1% consumed sugar-sweetened beverages,

and 25.2% smoked tobacco. The most important findings were that 51.2% of the participants had 4 or more NCD risk factors simultaneously (Cicekli & Gokce Eskin, 2025). This implies that a cluster of behaviors should be taken into account for NCD prevention in the young adult population as opposed to a single risk factor.

There is similar evidence from Bangladesh. Islam et al. (2025) has made a study that was cross-sectional in nature of the study, which involved 460 undergraduate and postgraduate students, across various universities in Bangladesh. Of the respondents, 10% were current smokers; 50.9% were not physically active enough and 82.4% said they were not eating enough fruits and vegetables (fewer than 5 servings per day). Furthermore, 38.5% of them were found to be overweight or obese, 24.1% had hypertension, 8.0% had elevated blood glucose and 10.2% had elevated blood cholesterol (Islam et al., 2025).

Of particular interest is the levels of multiple risk factors among university students in Bangladesh. Only 5.2% of the sample of university students in the study were reported to be free from the selected NCD risk factors, which translates to about 95% of the students being at risk of at least one NCD risk factor. The average number of risk factors for NCDs was about two per person. The clustering is important because if more than one behavioral and metabolic risk exists simultaneously it could further increase the risk of cardiovascular diseases, diabetes, chronic respiratory diseases and cancers in the future.

Knowledge of the behavioral risk factors is relevant and important, but so is knowledge about NCDs, and behavior in everyday life. Students might be aware that smoking, not exercising, eating too much salt, eating too few meals, not eating enough fruit or vegetables, not getting enough sleep and being overweight are all bad things to do, but could still do one or more of these things. Knowledge alone is not sufficient to make for healthy behavior, however. Academic stress, limited time, peer influence, restricted access to good food, limited access to exercise facilities and other environmental/social factors could impact students' ability to lead healthy lives.

The focus of past studies has largely been on the prevalence, distribution and clustering of behavioral and metabolic NCD risk factors. Islam et al. (2025), for example, conducted a study on smoking, alcohol intake, physical activity, intake of fruits and vegetables, overweight/obesity, blood pressure, blood glucose and cholesterol in university students of Bangladesh. Cicekli and Gokce Eskin (2025) studied physical inactivity, intake of fruits

and vegetables, alcohol, smoking, overweight/obesity and sugar-sweetened beverages, and studied the co-occurrence of these factors.

This adds to this, as the current study also includes examination of NCD knowledge, family and personal health history, sleep, sedentary and screen behavior, academic stress, substance use and awareness of NCD prevention programs, as well as examination of lifestyle related risk behaviors. Combining the assessment of these factors can contribute to a more holistic understanding of the vulnerability of university students and young adults to NCDs.

1.2 Statement of the Problem

The age of the students in the University is regarded as a relatively healthy group of students, because the majority of these students are young adults. But, there is emerging evidence that already in university, behavioral risk factors associated with NCDs are pervasive. These risks are especially worrying due to the fact that the effects of such behaviors can only become clinically manifest many years later.

Islam et al. (2025) determined that over half of the university students in Bangladesh were not getting enough physical activity, over four-fifths of them consuming less than enough fruits and vegetables and more than one-third overweight or obese. Moreover, only 5.2 % of them did not have any of the NCD risk factors measured in that study. This suggests that the risk of NCDs starts to accrue early in life, before that is usually when the disease is diagnosed.

Other university populations support evidence to the problem. The study carried out by Cicekli and Gokce Eskin (2025) revealed that more than half of the students had four or more lifestyle-related NCD risk factors, with the least common factor being the lack of physical activity, which was reported by 89.2% of the students. The results show that unhealthy behaviors tend to co-occur and not occur in isolation.

But just knowing the percentage of children that engage in such behaviors is not enough. Good knowledge, however, does not always lead to good practices, and the level of students' knowledge of the most important risk factors for NCDs, as well as gender/demographic and education differences in knowledge, also plays a role in effective prevention. Academic stress, poor sleep, excessive screen time, smoking, poor eating and

low levels of physical activity can lead students to have a disconnect between knowledge and practice.

Therefore, an integrated assessment is needed that would consider the knowledge of NCDs, lifestyles, health history, psychosocial and environmental barriers, and awareness of NCD prevention. The information can be used to identify gaps in knowledge and/or behaviours that are amenable to change to be addressed through health education and/or university-based interventions.

1.3 Rationale of the Study

The college years are some of the formative years in one's life and the time to develop lifelong habits. Early life behaviors can persist and impact the risk of developing NCDs later in life (Cicekli & Gokce Eskin, 2025). Therefore, the early signs of an unhealthy pattern is an opportunity to prevent a clinical disease.

Previous research indicates that interventions in universities are significant. Islam et al. (2025) revealed that low physical activity, low intake of fruits and vegetables and overweight/obesity are prevalent among the university students and therefore appropriate health promoting measures need to be put in place. Likewise, Cicekli and Gokce Eskin (2025) advocated for the need to encourage physical activity, ensure students have access to low-cost healthy food and educate them on healthy lifestyles.

The present study is therefore relevant as it addresses some aspects of NCD prevention in the same population. It also seeks to reveal lifestyle attributable risk behavior and the level of knowledge about NCDs among students and if there is any difference in the knowledge based on demographic, academic and health related factors. The study also takes into account factors that can prevent healthy eating or physical activity, such as peer pressure, lack of time for being physically active or healthy food, or lack of adequate information.

The results could be useful for universities, healthcare practitioners, pharmacists, health educators and health policy makers to pinpoint where a preventive education and lifestyle intervention is needed.

1.4 Research Objectives

General Objective

To assess knowledge and lifestyle related risk behaviors and associated factors of Non-communicable diseases among the university students or young adults.

Specific Objectives

The study aims are:

1. To assess the knowledge of the main risk factors of NCDs and preventive measures among the respondents of the study.
2. To measure the prevalence of risk behaviors for major non-communicable diseases (NCDs): unhealthy diet, physical inactivity, sedentary and screen behaviors, tobacco use, poor sleep patterns and academic stress.
3. To compare the knowledge of NCDs and selected risk factors/behaviors across socio-demographic and academic factors (age, gender, year of study, academic faculty).
4. To measure health-related and contextual factors that impact on the prevention of NCDs, such as being diagnosed with a chronic condition, family history of chronic conditions, perceived lifestyle barriers and national NCD-prevention programs.
5. To identify socio-demographic, academic and health-related factors independently associated with the overall NCD knowledge score.

1.5 Research Questions

The study will answer the following questions:

1. What is the level of knowledge of participants on the risk factors and prevention of NCD?
2. What are the main risk habits that are associated with the lifestyle of the participants in relation to diet, physical activity, sedentary behavior, tobacco use, sleep and academic stress?
3. Is there a difference in NCD knowledge and selected lifestyle risk behavior between the age, gender, academic faculty and year of study of the participants?

4. Are there health-related and contextual issues among participants such as chronic illness, family history of NCDs, barriers to healthy living and awareness of NCD prevention programmes?
5. What socio-demographic, academic and health-related factors are independently linked to the NCD knowledge score of the participants?

1.6 Significance of the study

This study will most likely be contributing to the prevention of NCD in many ways. In the first instance it provides information on how well young adults are aware of the known risk factors and prevention strategies for NCDs. Specific misconceptions could be used to inform the planning of more targeted health-education programs.

Second, a review of behavioral factors (such as diet, physical activity, smoking, screen time, sleep and stress) will give a more complete picture of the "modifiable" risk factors in early adulthood. This is important because it has been demonstrated previously that the majority of students at universities have more than one NCD risk factor (Cicekli & Gokce Eskin, 2025).

Thirdly, assessing the demographic and academic differences can help to identify the groups of students that might benefit from more specific intervention. Similarly, family history information and perceived barriers, as well as knowledge of prevention programs, can be useful in designing interventions other than knowledge.

Finally, the outcomes can guide the creation of university health services, pharmacists, public health professionals, and the relevant authorities on preventive strategies that will encourage physical activity, healthy eating, sleeping, and quitting smoking, as well as stress, anxiety, and awareness of NCD prevention.

1.7 Scope of the Study

The study notes the predominant finding of the survey, which targeted the attitudes of university students and young adults. It emphasizes socio-demographic and school characteristics, personal and family health history, knowledge about NCDs, diet, physical activity, sedentary and screen behaviors, tobacco use, energy drinks, sleep, academic stress,

mental-health related behavior, perceived barriers in adopting healthy lifestyles and awareness of NCD-prevention programs.

The study is mainly on modifiable risk factors and knowledge about preventable NCDs and not on the clinical diagnosis of any specific NCD. The majority of the variables are self-reported, meaning that the study is not measuring clinical outcomes, but rather, reporting on knowledge and behavior.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Non-communicable diseases (NCDs), such as cardiovascular diseases, diabetes, cancers and chronic respiratory diseases, are a major public-health challenge around the world, particularly cardiovascular diseases. The clinical presentation of these diseases is usually later in life, but many of the behavioral and metabolic risk factors for these diseases are clinical in adolescence and in early adulthood. University is often a time of transition and change to a different diet, more physical activity, changes in sleep patterns, stress, smoking and drinking, and changes in screen time and other lifestyle behaviors and is an important time to think about NCD prevention.

University students are particularly engaged in this context since they make a transition from the family to the university and are provided with more opportunities in this setting to get involved in food experiences, activities, habits and decisions for their health. Islam et al. (2025) suggested that poor nutrient intake, smoking, sedentary lifestyle, excessive alcohol consumption, high levels of salt and fat consumption, and low fruit and vegetable intake could contribute to metabolic abnormalities, such as hypertension, hyperglycaemia, obesity and dyslipidaemia. Many of these risk factors are also preventable and early recognition and prevention are crucial, particularly in young adults.

One of the important lessons learned from the recent studies is that although awareness of NCDs is a necessary condition for healthy behaviors, it is not sufficient. Pupils might be aware of the harmful effects of smoking, lack of physical activity, poor diet or lack of sleep or obesity and continue to engage in these habits because of the requirements of the curriculum, peer pressure, convenience, accommodation, food availability, stress and other environmental factors. There is now a growing body of recent research that takes into account the interplay of multiple risk factors, their sociodemographic correlates, awareness and behavior.

2.2 NCD Knowledge and Modifiable Risk Factors among University Students

The leading modifiable risk factors for NCDs among young adults are physical inactivity, poor nutrition, smoking, excessive alcohol consumption, overweight/obesity, too much salt and sugar-sweetened beverages, and sitting for too long. More recent studies also highlighted the role of sleep, screen time, psychological stress and the interplay of multiple unhealthy habits in an individual. Sedentary behaviour has also been examined as a distinct lifestyle domain among college students (Carpenter et al., 2021).

Statistics from a worldwide study of a large multinational population shows just how big the problem is. Pengpid and Peltzer (2021) sampled 18,017 university students from 24 different countries in Africa, Asia and America. The most common behavioral risk factor was poor consumption of fruits/vegetables (80.5%). The prevalence of physical inactivity, overweight or obesity, current tobacco use and heavy alcohol consumption were 38.2%, 23.1%, 11.8% and 10.5% respectively. The average number of behavioral risk factors for students was 1.6 and 15.9% of students had 3 or more risk factors. Males were more likely to have more behavioral risk factors than females.

Peltzer and Pengpid (2018) conducted a survey of 8,806 university students in nine ASEAN nations, and reported similar distresses. 27.5% of the male students were overweight or obese, 39.0% were not active enough in physical activity, 6.9% had used tobacco and 10.1% had done binge drinking. These proportions were 16.9%, 53.0%, 2.5% and 4.2% of females, respectively. Additionally, 62.7% of males and 58.2% of females didn't steer clear of foods high in fat and cholesterol. Importantly, being unaware of the risk was correlated with tobacco use and binge drinking, and less positive health beliefs about health behavior was correlated with several risky behaviors. This is an example of the power of awareness and beliefs to influence behavior and although knowledge is not always sufficient to mitigate risk from NCDs.

The current study also reveals a lack of knowledge about the NCDs among the young adults in Saudi Arabia. Rahamathulla and Sha (2020) conducted a study on 374 female university students having a mean age of 20.6 years. They found that 64.7% were physically inactive, 52.4% viewed TV for more than two hours per day and 14% consumed sufficient amounts of fruit and 6.8% consumed sufficient amounts of vegetables. Over 11 servings of junk

food a week was reported for 37.1% of children and 25.9% were overweight and 5.1% were severely obese. Most importantly, 56.2% stated that they were not aware of the NCDs, and 33.7% of them said they felt that the NCDs were “unpreventable”. Around 51.1% were not aware that sedentary lifestyle was a risk factor for an NCD and 60.8% were not aware that stress was a contributor to NCDs.

Among the studies done on association of knowledge and behavior, the study that was conducted in the south-West Nigeria is of special interest. Owopetu, Adebayo and Popoola conducted a study that analyzed 1200 undergraduates in the University and found that 48.3% of the population had poor knowledge of the risk factors of NCDs. At the same time, 68.3%, 70.6%, 51.3% and 3.1% of them were not in an unhealthy diet, physically inactive, alcoholic and smoker respectively. Overall, 99.3% reported ≥1 behavioral risk factors for NCDs. Frequent unhealthful behaviors were noted in both public and private university students; students in the public university had better knowledge than did those in the private university. The study, therefore, shows that there is a possible gap between what is known and what is done, with awareness of the risk of NCDs does not necessarily lead to preventive behaviors.

All these studies indicate that students at university are likely to be at risk for more than one modifiable NCD. Poor food consumption and lack of physical activity are frequently found in all countries and smoking, alcohol consumption, overweight and physical inactivity are highly related to social, cultural and institutional context. Global adolescent evidence likewise shows that multiple lifestyle risks commonly cluster within the same individual (Uddin et al., 2020).

2.3 Empirical Evidence from Bangladesh and Recent International Studies

In Bangladesh, the vulnerability of students at the university level is already high for NCDs. In one of the earlier large studies conducted by Hossain et al. (2018) the WHO STEPwise approach was applied to 1,140 university students in Bangladesh. They identified that 29.2% of them were overweight/obese based on the Asian BMI cut-off (≥23 kg/m2) and approximately 65% were not physically active at all. The study also revealed significant links between individual and family history of NCD to obesity, and asthma, with family history of NCDs being associated with an increased risk of heart disease. Authors also

concluded that both lifestyle and familial factors were important determinants of the risk for NCD in young university students.

Later, Nowsheen et al. (2021) conducted their study on 388 post-graduate students from the University of Dhaka, North South University and Bangladesh University of Health sciences. They discovered that 89.7% of them were not consuming at least five servings of fruits and vegetables a day. Eleven percent (11.3%) were current smokers and there was a significant difference between males (24.6%) and females (0.9%). Alcohol use was low in the final three months of life in comparison to other countries (3.1%). Approximately 10.8% were obese, 27.3% overweight and 19.9% had low levels of physical activity. Self-reported hypertension and diabetes were found among 7.5% and 2.3%, respectively. Comparable university-based evidence has also documented a high prevalence of NCD risk factors in nursing students (Monteiro et al., 2023).

This is particularly important in the case of the same risk factors placed in the same study. 94.3% of participants reported having one or more NCDs risk factors, around half of them had two or more and 15.5% had three or more. Male students also were more likely to have multiple risk factors. More boys (63%) were at risk for more than one factor and more boys (27.5%) were at risk for more than three factors than girls (47.9% and 6%, respectively).

After the outbreak of the COVID-19, the risk factors for NCD among the students and staff of University of Dhaka was then studied by Amin et al. (2024). They found that the average age of the participants was 22.34 years and they had a high metabolic risk burden. Approximately 50.37% of the children were obese/overweight, 13.45% had hyperglycemia, and 11.98% had hypertension. The participants with very short sleep duration had a higher prevalence of hypertension, overweight/obesity and elevated blood glucose, highlighting the importance of sleep in addition to the traditional NCD risk behaviors.

Recent WHO STEPS Evidence from Bangladeshi University Students

The study of Islam et al. (2025) is very important for this present study because of the recent evidence from multi universities of Bangladesh. They carried out a cross-sectional study in 460 students from various universities in Bangladesh with a validated Bengali version of WHO STEPS questionnaire. The majority of the subjects were males (63.7%) and most of the subjects were 21-25 years old.

There were significant behavior and metabolic risk identified in the study. Ten percent reported that they currently smoked and 2.8 percent currently drank alcohol. The majority of participants (50.9%) was low physical activity (less than 600 MET-minutes/week). Additionally, 82.4% consumed less than 5 servings of fruits and vegetables daily. Metabolic risks: 38.5% overweight or obese, 24.1% had high blood pressure, 8.0% had high blood sugar and 10.2% had high cholesterol.

Gender differences were also apparent. Male students significantly outnumbered female students in terms of smoking prevalence (15.4% vs. 0.6%) while female students significantly outnumbered male students in terms of low physical activity (64.7% vs. 43.0%). Taking this into account, the study proposes that the distribution of the various components of NCD risk could vary between male and female university students.

The analysis was modified to bring some evidence of impacting of the social context of students. Male students were more likely to smoke and drink alcohol and female students were more likely to be low active and high blood pressure. The odds of alcohol consumption were significantly lower for students living with family, friends or in a mess (AOR = 0.174; 95% CI: 0.051–0.594) as compared to students residing in residential halls. The overall odds ratio was 2.290 (95% CI: 1.230-4.264) for low levels of physical activity in ever married students versus unmarried students.

The most important of these was the risk focus. About 95% of students had at least one modifiable NCD risk factor, 5.2% were free from all the studied risk factors and the average number of risk factors that each student had was about 2. Just 5.2% of students had zero modifiable NCD risk factor and the average number of modifiable NCD risk factors per student was ~ 2. The significance of these results is that NCD risk should not be looked at as individual behavior as multiple risks may exist in an individual population of a University.

Co-occurrence of NCD Risk Factors

The second study that has been recently reviewed by Cicekli and Gokce Eskin (2025) also endorses this clustering. For analytical cross section, 485 university students (mainly the students of Nutrition and Dietetics aged 18-25 years) were studied. The mean age of the participants was 21.21 years and 86.6% were female. These researchers looked at physical

inactivity, fruit and vegetable consumption, smoking, drinking alcohol, overweight/obesity, and sugar-sweetened beverage consumption.

There was a high prevalence of individual lifestyle risks. The percentages of people who did not engage in enough physical activity, low vegetable intake, low fruit intake, alcohol intake, sugar-sweetened beverage intake, smoking tobacco, or overweight/obesity were 89.2%, 70.5%, 58.9%, 44.5%, 41.1%, 25.2%, and 14.9%, respectively.

More significantly, the study was able to illustrate the interaction of such factors. 51.2% indicated that they had four or more lifestyle related NCD risk factors. 28.9 percent of children had four of the risk factors, 22.6 percent had three and 18.3 percent had two of them. 0.9% had not been found to have a risk factor.

The odds of having 4 or more risk factors were about 2 times higher for students attending private universities as compared to students attending public universities (aOR = 2.01; 95% CI: 1.20-3.35). The odds were more than 3 times as high for students residing in student houses as for those living with their families (aOR = 3.57; 95% CI: 1.96–6.50), and also increased for those residing in dormitory (aOR = 2.47; 95% CI: 1.34–4.56). Eating out preferring fast food was associated with over two times the odds of having 4 or more risk factors (aOR = 2.53; 95% CI: 1.62–3.96).

This evidence is significant because it points to the fact that in addition to the personal knowledge and intent, environmental factors like living conditions, food environment, university context, and behavior are also relevant in influencing NCD risk. The authors also noted that students living away from the home may not have access to cooking facilities and/or time at home. They discussed ensuring that healthy food is available easily and providing supportive physical activity options at universities.

Cicekli and Gokce Eskin pointed out, however, that causality was not established as a result of their cross-sectional design, self-reported behaviors were subject to recall and social-desirability bias, and the purposive sampling method, the high percentage of female participants and the limited sample of universities limited generalizability.

The Bangladeshi and international results are very alike and show the very high prevalence of unhealthy behaviours even in the young and apparently healthy university population.

There is high variation in prevalence across settings, however. For example, Nowsheen et al. (2021) reported about 20% physical inactivity among postgraduate students, Islam et al. (2025) reported 50.9%, and Cicekli and Gokce Eskin (2025) reported 89.2%. The differences could be related to differences in the study population, instruments measuring behaviours and the cut-off points. In fact, Cicekli and Gokce Eskin noted there is no uniform definition of risk factors and the risk factor thresholds applied in each study carried out, which makes it difficult to compare risk factors across studies.

2.4 Research Gap and Relevance to the Present Study

Research Gap and Relevance of the Present Study.

There is literature that suggests university students are often linked to potentially modifiable risk factors for NCDs such as poor diet, physical inactivity, sedentary lifestyle, smoking, overweight and obesity, and lack of consumption of fruits and vegetables. In the meantime, several studies have been conducted in Bangladesh which have also confirmed that several risks are usually combined. The importance of NCD prevention is increasing from early life (before middle and older adulthood); see more robust studies (e.g., Hossain et al., 2018).

In the first instance, the literature in Bangladesh has paid more attention to behavioural and metabolic risk factors, while limited research has investigated the knowledge of NCDs together with actual NCD behaviours. These two dimensions must be considered as a whole from different data from different countries. For example, Owopetu et al. (2020) reported they had a significant number of the students with fair knowledge, and almost all participants still had one or more behavioural risk factors. Rahamathulla and Sha noticed, however, that there was low awareness and high prevalence of unhealthy behaviour.

Second, previous studies have tended to be focused on the standard blood pressure, glucose and cholesterol, tobacco, alcohol, physical activity, diet and obesity variables in the WHO STEPS. There was less emphasis on other more diverse behaviors associated with the lifestyle of current students including consumption of sugar sweetened and energy drinks, mental health related behaviors, perceived barriers to lifestyle changes and sleep.

Third, there's no reason why some students would know more or have more positive behaviors than others, given their prevalence in the risk factors. Earlier studies have

suggested gender, faculty or academic background, living arrangements, family history and other factors as possible differentiating factors. Hossain et al. (2018) demonstrated the significance of family disease history, while Islam et al. (2025) and Cicekli and Gokce Eskin (2025) demonstrated the importance of demographic and environmental differences in behavioural risk. This will help in using a multivariable analysis to understand which factors are independently associated with NCD outcomes.

Relatively fewer studies have examined NCD knowledge alongside lifestyle behaviors, perceived barriers and awareness of prevention programs among university students in Bangladesh. These factors are what you want to measure because if you only enhance factual learning, it may not make much difference if there are time limitations, unhealthy food settings on campus, peer influence, stress, and lack of opportunity to exercise.

Hence, the present study attempts to fill the above mentioned gaps by investigating knowledge of NCDs, socio-demographic and health factors, dietary habits, physical activity, sedentary behavior, smoking status, sleep, academic stress, selected substance-related behaviors and perceived barriers to healthy behaviors, and awareness of NCD-prevention activities. It also delves into the factors independently associated with the knowledge of NCDs and provides a broader understanding of knowledge and behaviors at risk among the study population.

2.5 Chapter Summary

The literature reviewed substantiates the importance of the young group of university students in early prevention of NCDs. This evidence from around the world indicates that physical inactivity, unhealthy diet, smoking, excessive drinking and overweight/obesity are all very common and are often associated. It could be inferred from the studies that the same is true of the students of higher education in Bangladesh.

The recent evidence is particularly worrying. Islam et al. (2025) reported in Bangladeshi university sample, 5.2% were NCD free and Cicekli and Gokce Eskin (2025) reported that over half of them had four or more lifestyle risk factors.

In the literature, risk is also seen as NOT being one behavior. Factors such as knowledge, academic background, social life, family history, housing, nutrition, exercise, smoking, sleep, screen time and environmental factors may all impact the health of students.

CHAPTER 3: METHODOLOGY

3.1 Research Design

The design used for this study was a cross-sectional quantitative design aimed at determining the knowledge, lifestyle behaviors and risk factors associated with non-communicable diseases (NCDs). A structured, self-administered online questionnaire was used to gather data. The design was suitable for the description of prevalence of NCD-related knowledge and behavioral risk factors as well as the testing of associations between respondents' characteristics and NCD knowledge.

3.2 Study Population and Sampling

The survey was conducted with the 18+ years old university students and other community members who volunteered to participate. The participants came from various levels and fields of study such as Pharmacy, Business, Science, Engineering, Medicine, Arts/Humanities and other disciplines.

The method of sampling was non-probability voluntary response, which was done by distributing the questionnaire online. All responses received during the data collection period were screened for eligibility.

There were 312 answers. Those who agreed to the eligibility statement that they were university students or members of the community 18 years old or older and selected "Yes" for voluntary participation were included in the analysis. Finally, 301 respondents were included in the analysis, and 11 responses were not included.

3.3 Data Collection Period and Instrument

A structured questionnaire was used to collect data in Google Forms from 3 May to 15 September 2026.

The questionnaire consisted of the following main sections:

1. Socio-demographic and health data such as age, sex, year of study, faculty, height, weight, presence of any chronic disease, and the family history of NCDs.

2. Knowledge about NCDs, made up of 13 statements about the major NCD risk factors and prevention strategies.
3. Factors related to lifestyle and behavior such as fruit and vegetable consumption, junk food intake, salt intake, breakfast habits, consumption of energy drinks, smoking, consumption of soft drinks with added sugar, physical activity, sitting time, screen time, sleep, and academic stress.
4. Perceived barriers and preventive awareness, such as mental-health help-seeking, narcotic dependence, smoking, perceived difficulty in maintaining healthy behaviors, peer influence, time constraints, availability of healthy food and exercise facilities, national NCD prevention programs.

The respondents volunteered for this, and filled in the questionnaire independently.

3.4 Measurement of NCD Knowledge

The 13 True/False/Don't know items provided were used to measure NCD knowledge. The correct answer received +1 score and the incorrect answer or “Don't Know” received 0. The scores were added together to give a total knowledge score (0–13), with higher scores indicating higher knowledge about NCDs.

The statements that NCDs can be transmitted from person to person, smoking doesn't affect anything else except the lungs, alcohol doesn't have anything to do with the development of NCDs, and there are NCD risk factors that cannot be changed were responses indicated as False. The other nine knowledge statements were answered as True.

The 13 items on the knowledge scale showed satisfactory internal consistency (Kuder-Richardson-20 (KR-20) = 0.85).

Google Forms score variables were not included as there were no values present for these variables in the exported data set, and a questionnaire scoring key was not provided.

3.5 Operational Definition of Selected Lifestyle Risk Factors

Selected behavioral variables were clustered into meaningful categories for descriptive analysis using the categories available in the questionnaire.

Current smoking was defined as reporting tobacco use either daily or occasionally. Poor sleep quality was considered as sleep < 7 hours per night. Moderate to vigorous physical activity for less than 3 days per week was considered to be relatively low physical activity. Prolonged sitting (7+ hours/day) and leisure screen time (5+ hours/day) were used as markers of long sedentary time.

The presence of junk food and sugar-sweetened beverages at least three times a week was considered frequent consumption. Academic stress that was reported as "Often" or "Always" was considered to be high academic stress.

3.6 Data Management and Cleaning

The purpose of the Score, Feedback, total-score and blank unnamed columns created by Google Forms was found to contain no valuable analytic data and were therefore not included.

Where clear spelling and/or formatting variations were found in categorical responses (e.g., the names of the faculties and the nature of the response), these were standardized. Additional checks for duplicate responses were made by duplicate email/user information and by using timestamps; no duplicate records were found when checked among the 301 respondents included.

There was a fair amount of variation in the units and format for height and weight responses, including feet and inches, centimeters and numerical values without labels. As a result, these variables were not included in the main regression model nor were they used to compute BMI to prevent the problem of potential measurement error.

No personal identifiers, such as email addresses were used in statistical analyses.

3.7 Statistical Analysis

Data analysis was performed using Microsoft Excel.

The data characteristics of the respondents were summarized using descriptive statistics. Categorical variables were expressed as frequency and percentages, and the mean and standard deviation, median, and range were calculated for the NCD knowledge score.

To test associations between categorical variables, a Chi-square test of independence was used, such as for gender and smoking status. The Mann–Whitney U test was used for two-group comparisons of NCD knowledge scores, including gender and diagnosed chronic-illness status. The Kruskal–Wallis test was used for comparisons across variables with more than two groups, including age group, year of study, academic faculty, family history of NCDs, and national NCD-program awareness.

Multiple linear regression analysis was performed to determine the factors independently associated with NCD knowledge. The total NCD knowledge score was used as the dependent variable. The following independent variables were used:

- gender;
- age group;
- year of study;
- academic faculty;
- diagnosed chronic illness;
- family history of NCDs.

Because of the small number of respondents in the older age categories, respondents aged 28 years and above were combined into a single category for regression analysis.

Male gender, age 19–22 years, first year of study, Business faculty, absence of diagnosed chronic illness, and absence of family history of NCDs were used as the respective reference categories.

Regression assumptions were examined before interpretation. Multi collinearity was assessed using the Variance Inflation Factor (VIF). Evidence of heteroskedasticity was identified in the residuals; therefore, HC3 heteroskedasticity-robust standard error, a statistical method used for regression coefficients, confidence intervals, and significance testing.

All statistical tests were two-sided, and a p-value of less than 0.05 was considered statistically significant.

3.8 Ethical Considerations

The study was conducted on a voluntary basis. Respondents were first asked to ensure that they were eligible and that they were volunteering. All those who refused to give consent were not included in the final analysis.

Confidentiality was ensured in the analysis by omitting sensitive data (e.g. email addresses) from the statistical procedures. Collected data were only used in the context of the study.

CHAPTER 4: RESULTS

4.1 Introduction

The results of the study titled “Lifestyle & Non-Communicable Diseases (NCDs) Related Knowledge and Risk Behaviours among University Students and the Other Community in 2026” are presented in this chapter. The study aimed to evaluate lifestyle behaviours, NCD-related knowledge, and associated risk factors among university students and other adult community members.

A structured questionnaire was administered through Google Forms to gather data on socio-demographic characteristics, diet, physical activity, sedentary behaviour, tobacco use, sleep, psychological well-being, family history of NCDs, and other health-related factors. A total of 312 submissions were received; after applying the eligibility and voluntary-consent criteria, 301 respondents were included in the final analysis.

Descriptive statistical methods were used in analyzing the collected data. The categorical variables are summarized in tables and using graphs as pie charts and bar charts and the frequencies and percentages are calculated. This chapter provides the description of study population and distribution of various lifestyle related NCD risk factors in the study participants.

4.2 Socio-demographic Characteristics of Study Participants

Socio-demographic characteristics are important background data about the study population. Styling lifestyle behaviors, health awareness and development of risk factors related to non-communicable diseases may be influenced by factors such as age, gender, academic background, and educational status.

4.2.1 Age Distribution of Study Participants

Participants were drawn from various age groups, encompassing both young adults and adult community members (19 years and older).

Of the 301 participants, the largest group was aged 23–27 years (169, 56.1%), followed by those aged 19–22 years (117, 38.9%).

Fewer respondents were in the older age groups: 9 participants (3.0%) were aged 28–32 years, 5 (1.7%) were aged 32–45 years, and 1 (0.3%) was aged 45–60 years.

The age distribution of the participants in the study (n = 301) is shown in the table below.

Table 1: Age distribution of study participants (n = 301)

Age Group	Frequency (n)	Percentage (%)
19–22 years	117	38.9
23–27 years	169	56.1
28–32 years	9	3.0
32–45 years	5	1.7
45–60 years	1	0.3
Total	**301**	**100.0**

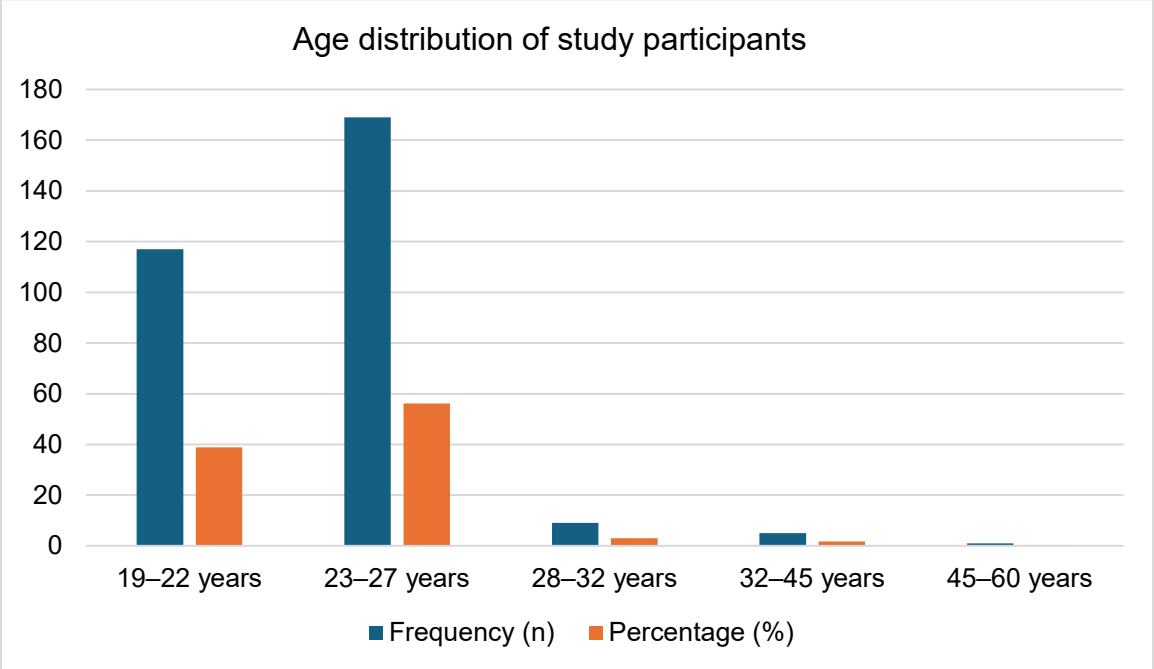


Figure 1: Age distribution of study participants

The age distribution of the study participants is illustrated in Figure 1.

The results show that most of the population studied was in the youthful age, almost all were in the university age group. These are important because lifestyle factors that develop in young people, such as their eating and drinking patterns, physical activity levels, sleep patterns and stress factors can have a huge impact on their future risk of NCDs.

Older participants are also included, which offer insights into lifestyle and health outside of the university. The overall youthfulness of the respondents, however, means that the results of this study reflect primarily the lifestyle attributes and health behaviors of young adults.

4.2.2 Gender Distribution of Study Participants

The gender distribution of the study participants is presented in Table 4 and Figure 2. Among the 301 participants, 183 (60.8%) were female and 118 (39.2%) were male.

Gender	Frequency (n)	Percentage (%)
Female	183	60.8
Male	118	39.2
Total	**301**	**100.0**

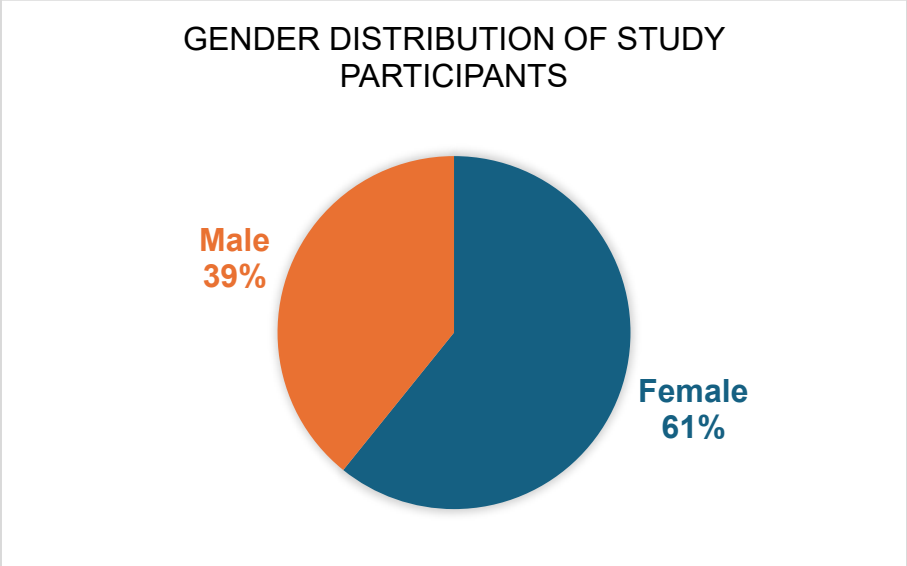


Figure 2: Gender distribution of study participants

The study population consisted of a higher proportion of female participants compared with male participants. This difference represents the distribution of respondents who participated in the survey.

4.2.3 Academic Background of Study Participants

The academic background of the participants is presented in Table 2 and Figure 3. Participants were recruited from different academic disciplines.

Table 2: Distribution of participants according to academic background (n = 301)

Academic Background	Frequency (n)	Percentage (%)
Pharmacy	111	36.9
Business	78	25.9
Science	38	12.6
Engineering	31	10.3
Arts/Humanities	22	7.3
Other	14	4.7
Medicine	7	2.3
Total	**301**	**100.0**

The highest proportion of participants were from Pharmacy (36.9%), followed by Business (25.9%) and Science (12.6%). Participants from different academic backgrounds allowed assessment of lifestyle and NCD-related factors across various educational groups.

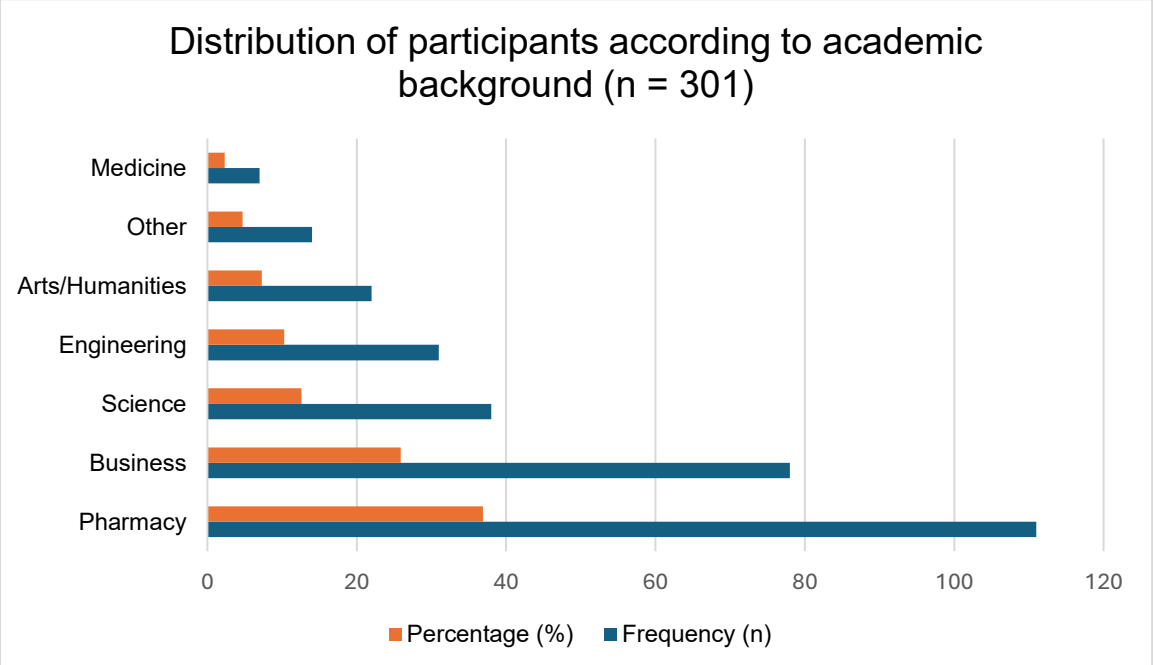


Figure 3: Distribution of participants according to academic background (n = 301)

4.2.4 Year of Study Distribution

Table 3: Distribution of participants according to year of study (n = 301)

Year of Study	Frequency (n)	Percentage (%)
1st	25	8.3
2nd	69	22.9
3rd	37	12.3
4th	67	22.3
5th+	26	8.6
Graduate	59	19.6
Postgraduate	18	6.0
Total	**301**	**100.0**

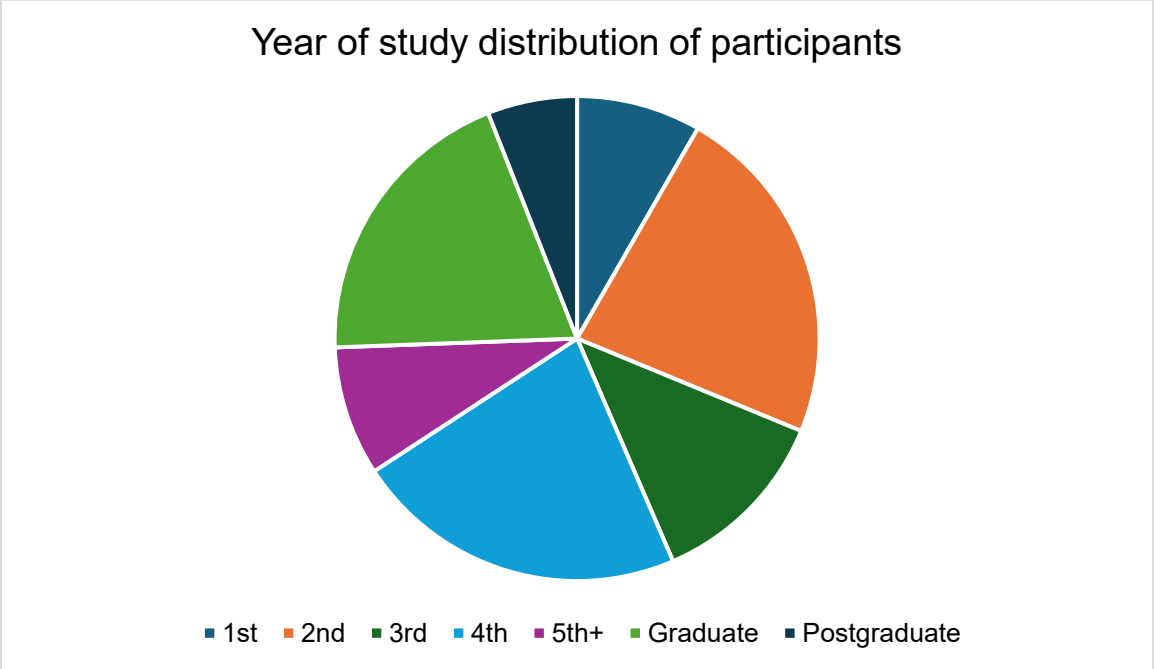


Figure 4: Year of study distribution of participants

Participants represented different academic stages, with the largest groups being second-year students (22.9%), fourth-year students (22.3%), and graduate-level participants (19.6%).

Table 4: Respondent Characteristics and Health Background

Variable	Category	n	%
Age	19-22	117	38.9
	23-27	169	56.1
	28-32	9	3.0
	32-45	5	1.7
	45-60	1	0.3
Gender	Female	183	60.8
	Male	118	39.2
Year of study	1st	25	8.3
	2nd	69	22.9
	3rd	37	12.3
	4th	67	22.3
	5th+	26	8.6
	Graduate	59	19.6
	Postgraduate	18	6.0
College/Faculty	Pharmacy	111	36.9
	Business	78	25.9
	Science	38	12.6
	Engineering	31	10.3
	Arts/Humanities	22	7.3
	Other	14	4.7
	Medicine	7	2.3
Diagnosed chronic illness	No	256	85.0
	Yes	45	15.0
Family history of NCDs	Yes	124	41.2
	No	111	36.9
	Unsure	66	21.9

More than half of the participants were aged 23–27 years (169, 56.1%), followed by those aged 19–22 years (117, 38.9%). These two groups comprised 95.0% of the analytical sample. In total, 183 (60.8%) of the respondents were female and 118 (39.2%) were male. The most represented study levels were second year (69, 22.9%), fourth year (67, 22.3%) and graduate level (59, 19.6%).

The largest faculty group was from Pharmacy (111, 36.9%) followed by the faculty recorded as “Business” (78, 25.9%). The vast majority of respondents stated that they had no diagnosed chronic illness (256, 85.0%) with 45 (15.0%) stating that they had a diagnosed

chronic illness. One hundred and twenty-four respondents (41.2%) had a positive family history, 111 (36.9%) had no family history and 66 (21.9%) were uncertain.

The height and weight were measured as free text answers. Responses to the question about weight were somewhat easy to interpret but responses to the question about height were given in incompatible unit conventions and in ambiguous shorthand. BMI is not calculated from these measurements, since one needs to know certain paired height and weight measurements to produce a BMI distribution.

4.3 Knowledge Regarding Non-Communicable Diseases

4.3.1 Knowledge Regarding Transmission of NCDs

Participants were asked whether non-communicable diseases can spread from person to person. The responses are presented in Table.

Table 5: Knowledge regarding transmission of NCDs (n = 301)

Response	Frequency (n)	Percentage (%)
False	204	67.8
True	56	18.6
Don't Know	41	13.6
Total	**301**	**100.0**

Most participants correctly identified that NCDs are not transmitted from person to person (67.8%). However, 18.6% responded incorrectly and 13.6% were unsure.

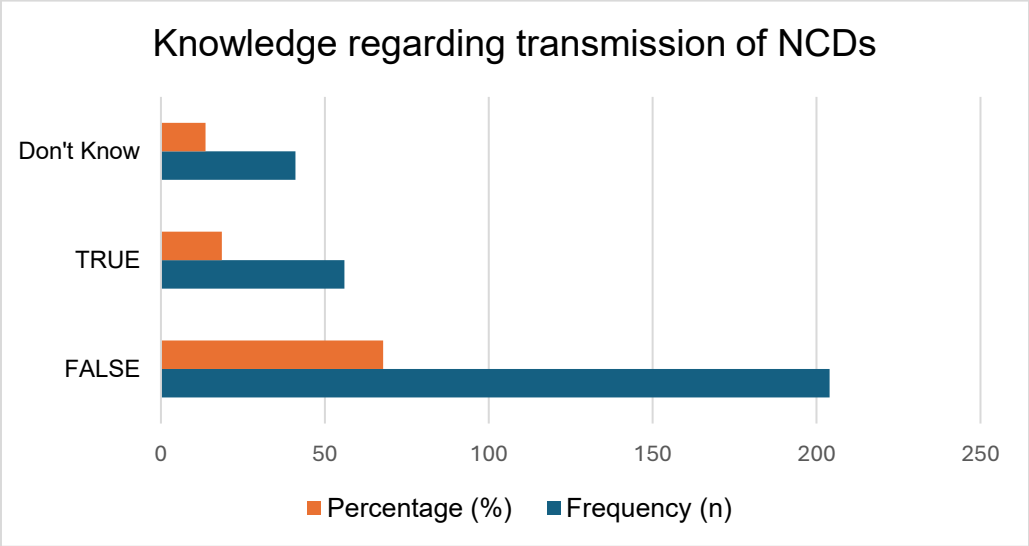


Figure 5: Knowledge regarding transmission of NCDs

4.3.2 Knowledge Regarding Physical Activity and Type 2 Diabetes

Table 6: Knowledge regarding physical activity and diabetes prevention (n = 301)

Response	Frequency (n)	Percentage (%)
True	259	86.0
Don't Know	26	8.6
False	16	5.3
Total	**301**	**100.0**

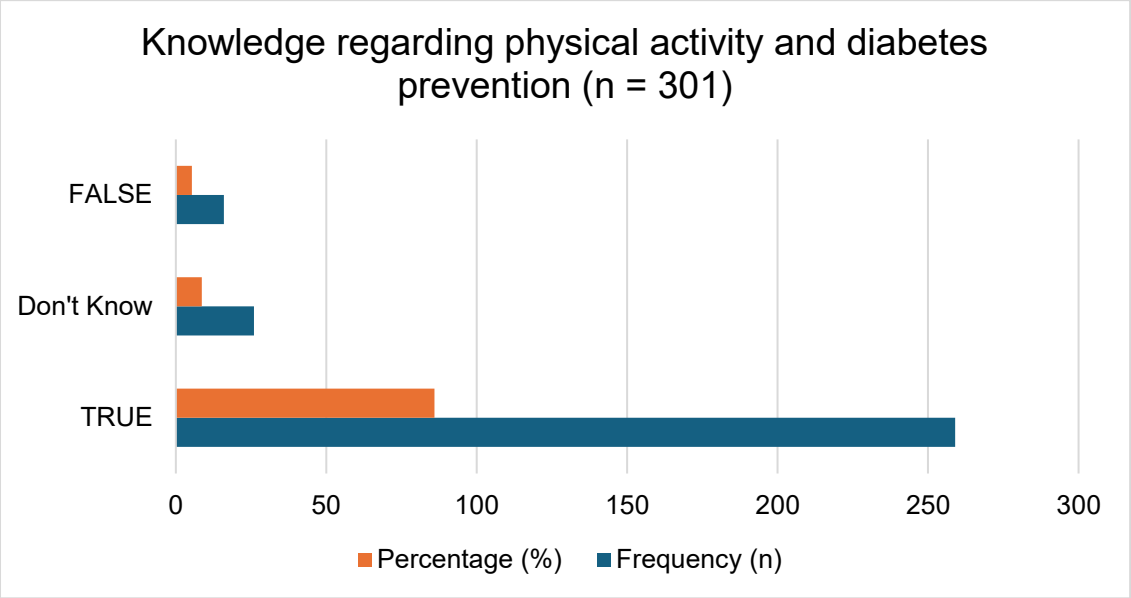


Figure 6: Knowledge regarding physical activity and diabetes prevention (n = 301)

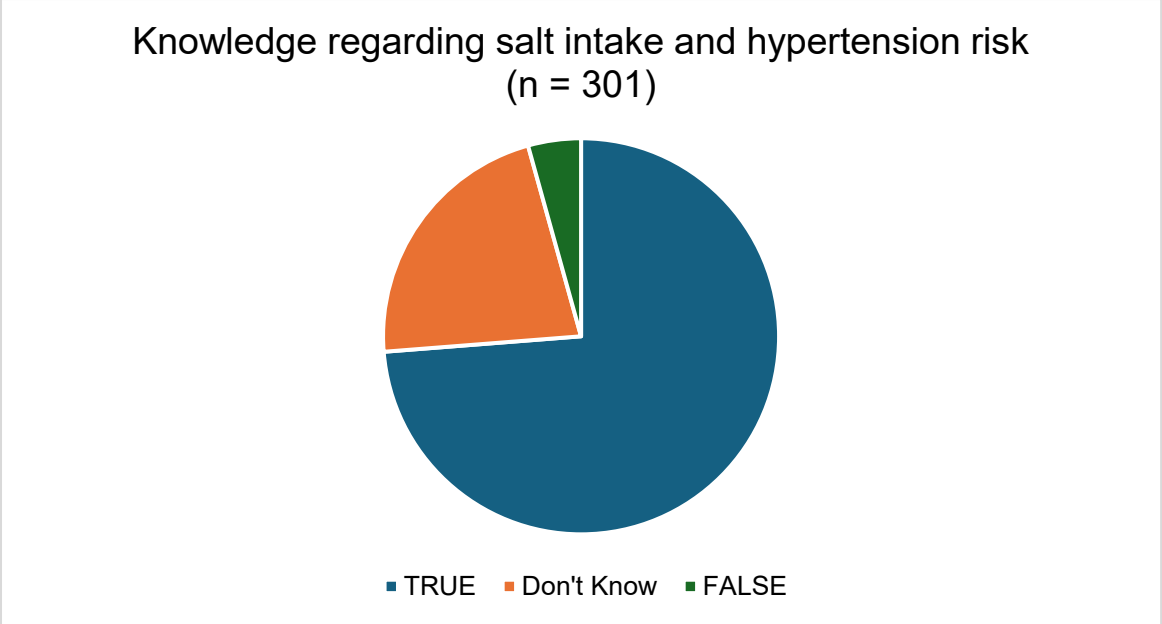
A majority of participants (86.0%) recognized that regular physical activity reduces the risk of type 2 diabetes.

4.3.3 Knowledge Regarding Salt Intake and Hypertension

Table 7: Knowledge regarding salt intake and hypertension risk (n = 301)

Response	Frequency (n)	Percentage (%)
True	222	73.8
Don't Know	66	21.9
False	13	4.3
Total	**301**	**100.0**

Most respondents (73.8%) correctly identified excessive salt intake as a risk factor for hypertension.



4.3.4 Knowledge Regarding Smoking and Cardiovascular Disease

Table 8: Knowledge regarding smoking effects on cardiovascular health (n = 301)

Response	Frequency (n)	Percentage (%)
False	256	85.0
True	29	9.6
Don't Know	16	5.3
Total	**301**	**100.0**

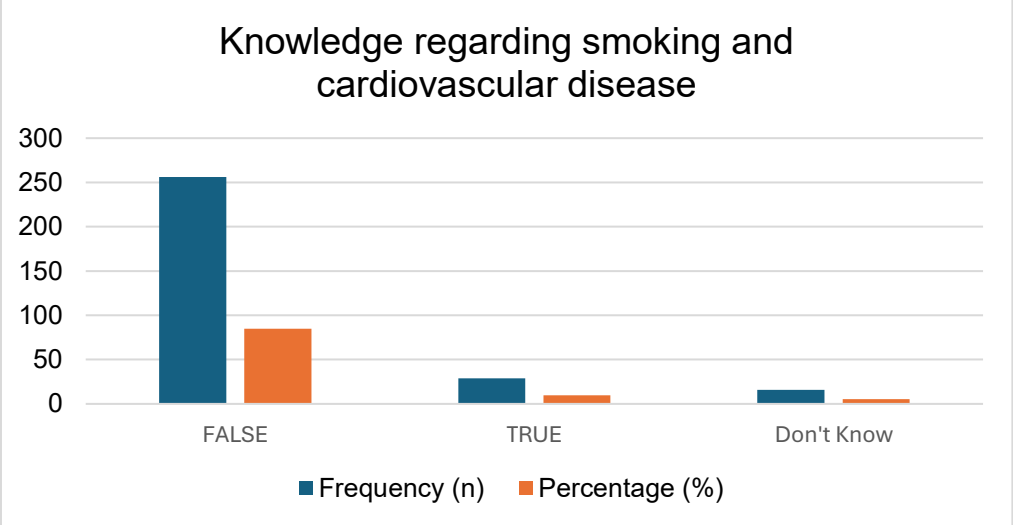


Figure 7: Knowledge regarding smoking and cardiovascular disease

Most participants (85.0%) correctly understood that smoking affects cardiovascular health and is not limited to lung-related problems.

Table 9: Responses to NCD knowledge statements (n = 301)

Knowledge statement	True n (%)	False n (%)	Don't Know n (%)	Correct answer	Correct n (%)
NCDs can spread from person to person	56 (18.6%)	204 (67.8%)	41 (13.6%)	False	204 (67.8%)
Regular physical activity reduces Type 2 diabetes risk	259 (86.0%)	16 (5.3%)	26 (8.6%)	True	259 (86.0%)
>5 g salt/day increases hypertension risk	222 (73.8%)	13 (4.3%)	66 (21.9%)	True	222 (73.8%)
Smoking only affects the lungs and not heart disease	29 (9.6%)	256 (85.0%)	16 (5.3%)	False	256 (85.0%)
Daily fruits/vegetables help prevent cardiovascular disease	262 (87.0%)	17 (5.6%)	22 (7.3%)	True	262 (87.0%)
Overweight/obesity is a risk factor for multiple NCDs	232 (77.1%)	19 (6.3%)	50 (16.6%)	True	232 (77.1%)
Alcohol has no relationship with NCD development	31 (10.3%)	213 (70.8%)	57 (18.9%)	False	213 (70.8%)
Stress/poor mental health can contribute to NCDs	247 (82.1%)	22 (7.3%)	32 (10.6%)	True	247 (82.1%)
Daily sugar-sweetened beverages increase Type 2 diabetes risk	258 (85.7%)	15 (5.0%)	28 (9.3%)	True	258 (85.7%)

<7 hours sleep/night is associated with increased NCD risk	222 (73.8%)	25 (8.3%)	54 (17.9%)	True	222 (73.8%)
Young-adult NCD risk factors cannot be changed	66 (21.9%)	153 (50.8%)	82 (27.2%)	False	153 (50.8%)
Air pollution can contribute to respiratory NCDs	240 (79.7%)	20 (6.6%)	41 (13.6%)	True	240 (79.7%)
Pharmacists can educate patients about NCD prevention	249 (82.7%)	12 (4.0%)	40 (13.3%)	True	249 (82.7%)

The overall mean derived knowledge score was 10.02 out of 13 (SD = 3.18), with a median of 11, an IQR of 9–13, and a range of 0–13 across the 13 knowledge statements. The Kuder–Richardson Formula 20 indicated good internal consistency for the binary knowledge scale (KR-20 = 0.850). A total of 77 respondents (25.6%) answered all 13 items correctly.

The highest correct-response proportions were found for the statements about daily consumption of fruit and vegetables, which help prevent cardiovascular disease (262, 87.0%), regular physical activity reduces Type 2 diabetes risk (259, 86.0%), and daily sugar sweetened beverage consumption increases Type 2 diabetes risk (258, 85.7%), and for the statement that smoking only affects the lungs and has no effect on heart disease, which was correctly rejected by 256 respondents (85.0%). The lowest correct response percentage was for the statement that risk factors for NCDs that are identified during early adulthood are immutable: 153 respondents (50.8%) answered correctly, 82 (27.2%) answered Don't Know, and 66 (21.9%) answered True.

Statistic	**Value**
Mean (SD)	10.02 (3.18)
Median (IQR)	11 (9–13)
Range	0–13
Perfect score (13/13)	77 (25.6%)
KR-20	0.850

Possible score: 0–13; one point per correct response.

4.4 Lifestyle, Behavioral, Psychosocial and Prevention-Related Findings

The questionnaire included dietary practices, activity and sedentary behavior, tobacco and energy-drink use, sleep, stress, mental-health help-seeking, substance dependence, health complaints, perceived barriers and awareness of national NCD prevention initiatives. The detailed distributions are presented below without collapsing the original response categories unless a derived summary is explicitly identified.

Table 10: Dietary and beverage-related behaviours (n = 301)

Measure	Response category	n	%
Fruit/vegetable servings per day	0-1	138	45.8
	1-3	138	45.8
	3-5	20	6.6
	5+	5	1.7
Junk food times per week	0-1	99	32.9
	1-3	128	42.5
	3-5	43	14.3
	5+	31	10.3
Extra salt after preparation	Never	110	36.5
	Rarely	76	25.2
	Sometimes	72	23.9
	Often	23	7.6
	Always	20	6.6
Breakfast times per week	0	18	6.0
	0-1	49	16.3
	1-3	69	22.9
	3-4	1	0.3
	3-5	58	19.3
	5+	106	35.2
Coffee/caffeinated beverages per day	0-1	143	47.5
	1-2	1	0.3
	2-3	115	38.2
	3-5	20	6.6
	5+	22	7.3
Sugar-sweetened beverages per week	0-1	135	44.9
	1-2	1	0.3
	2-3	88	29.2
	3-5	36	12.0
	5+	41	13.6

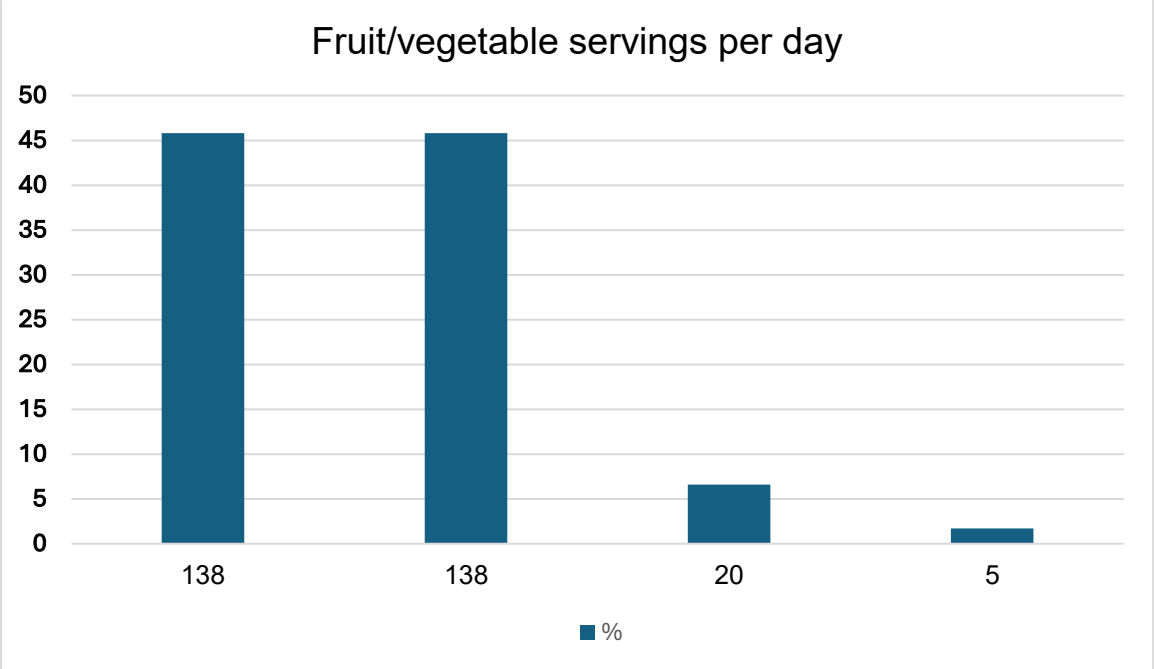


Figure 8: Fruit/vegetable servings per day

Fruit and vegetable intake were concentrated in the two lowest recorded categories: 138 respondents (45.8%) selected 0–1 serving per day and another 138 (45.8%) selected 1–3 servings. Junk food consumption was most commonly 1–3 times per week (128, 42.5%), while 74 respondents (24.6%) were in the 3–5 or 5+ times-per-week categories. Extra salt was reported as often or always by 43 respondents (14.3%). Sugar-sweetened beverage consumption of 3–5 or 5+ times per week was reported by 77 respondents (25.6%).

Measure	**Response category**	**n**	**%**
Moderate-to-vigorous activity days/week	0	77	25.6
	1-2	114	37.9
	3-4	72	23.9
	5-6	26	8.6
	7	12	4.0
Daily sitting time	<4 hours	51	16.9
	4-6 hours	117	38.9
	7-9 hours	97	32.2
	10+ hours	36	12.0
Leisure screen time/day	<2 hours	23	7.6
	2-4 hours	96	31.9

	5-7 hours	130	43.2
	8+ hours	52	17.3
Fitness tracker/app use	No	164	54.5
	Yes, occasionally	83	27.6
	Yes, regularly	54	17.9

A total of 191 respondents (63.5%) reported moderate-to-vigorous physical activity on only 0–2 days per week. Sitting for at least 7 hours per day was reported by 133 respondents (44.2%), and leisure screen time of 5 hours or more per day was reported by 182 respondents (60.5%). More than half of the sample (164, 54.5%) did not use a fitness tracker or activity-monitoring app.

Table 11: Tobacco use, cigarette quantity and energy-drink consumption

Measure	**Response category**	**n**	**% of 301**
Current tobacco use	Never	218	72.4
	Former Smoker	15	5.0
	Occasionally	25	8.3
	Daily	43	14.3
Cigarettes per day (if applicable)	0	224	74.4
	1-5	36	12.0
	6-10	17	5.6
	11-20	7	2.3
	20+	2	0.7
	Missing	15	5.0
Energy-drink consumption	Never	93	30.9
	Rarely	115	38.2
	Weekly	67	22.3
	Daily	26	8.6

Overall, 43 respondents (14.3%) reported daily tobacco use and 25 (8.3%) occasional use, giving 68 respondents (22.6%) who were current daily or occasional users. Fifteen respondents (5.0%) identified as former smokers and 218 (72.4%) reported never smoking. Energy drinks were consumed weekly by 67 respondents (22.3%) and daily by 26 (8.6%).

Table 12: Sleep, academic stress, mental-health help-seeking and related responses (n = 301)

Measure	Response category	n	%
Average sleep per night	<5 hours	34	11.3
	5-6 hours	169	56.1
	7-8 hours	89	29.6
	9+ hours	4	1.3
	X	5	1.7
Academic workload stress	Never	5	1.7
	Rarely	16	5.3
	Sometimes	72	23.9
	Often	92	30.6
	Always	116	38.5
Sought help for mental-health concerns	Never	108	35.9
	Rarely	41	13.6
	Sometimes	72	23.9
	Often	40	13.3
	Always	40	13.3
Dependent on smoking/other narcotics	No	261	86.7
	Yes	40	13.3
Ever visited a doctor's consultation	No	201	66.8
	Yes	100	33.2

Five sleep entries were recorded as “X” and were not interpretable as a duration. Among the remaining n=296 valid sleep-duration responses, 203 (68.6%) were in the <5-hour or 5–6-hour categories. Academic stress was reported as often by 92 respondents (30.6%) and always by 116 (38.5%); together, 208 respondents (69.1%) were in the often/always categories. Forty respondents (13.3%) reported dependence on smoking or another narcotic, and 100 (33.2%) reported having visited a doctor's consultation.

Table 13: Reported reasons for starting smoking or other narcotic use

Reason as recorded	n	% of answered item
Curiosity	19	30.6
From stress	19	30.6
Hostel or Friends gathering influence	11	17.7
Peer Pressure	7	11.3
Family/Social environment	6	9.7

Table 14: Reported physical complaints/disease categories among respondents who answered the multi-response item

Complaint category	Selections (n)	% of respondents answering item
Respiratory / Breathing	42	50.6
General Body Effects	31	37.3
Nervous System	28	33.7
Heart / Circulation	26	31.3
Heart/Lungs	24	28.9
Digestive	24	28.9
Muscles/Genera	12	14.5
Sexual/Hormonal	10	12.0
N/A	3	3.6

Among the 83 respondents who provided an answer to the multi-response physical-complaints item, respiratory/breathing complaints were selected most frequently (42 selections), followed by general body effects (31), nervous-system complaints (28), heart/circulation complaints (26), and heart/lung complaints (24). Because respondents could select more than one complaint, these values represent selections rather than mutually exclusive cases.

Table 15: Recorded scale responses for perceived barriers and concerns (n = 301)

Statement	1 n (%)	2 n (%)	3 n (%)	4 n (%)	5 n (%)
Lifestyle change is too difficult for busy students	46 (15.3%)	50 (16.6%)	115 (38.2%)	49 (16.3%)	41 (13.6%)
Worried about future NCD risk	47 (15.6%)	59 (19.6%)	90 (29.9%)	59 (19.6%)	46 (15.3%)
Peer influence makes healthy habits difficult	49 (16.3%)	63 (20.9%)	104 (34.6%)	47 (15.6%)	38 (12.6%)
Lack of time due to academic/work schedule	41 (13.6%)	100 (33.2%)	105 (34.9%)	55 (18.3%)	0 (0.0%)
Limited access to healthy/affordable food	51 (16.9%)	82 (27.2%)	95 (31.6%)	73 (24.3%)	0 (0.0%)
Limited access to sports/exercise spaces	63 (20.9%)	88 (29.2%)	91 (30.2%)	59 (19.6%)	0 (0.0%)

1n, 2n, 3n, 4n, 5n, represent the frequency count(n) and percentage (%) of participants who selected each rating on a 1 to 5 numerical Likert Scale.

Table 16: Awareness of national NCD prevention programs/campaigns (n = 301)

Response	n	%
No, not aware	119	39.5
Unsure	33	11.0
Yes, but limited awareness	94	31.2
Yes, I am well aware	55	18.3

Awareness of national NCD prevention programs or campaigns was limited. The largest group, 119 respondents (39.5%), selected “No, not aware.” Another 94 (31.2%) reported limited awareness, 33 (11.0%) were unsure, and 55 (18.3%) stated that they were well aware.

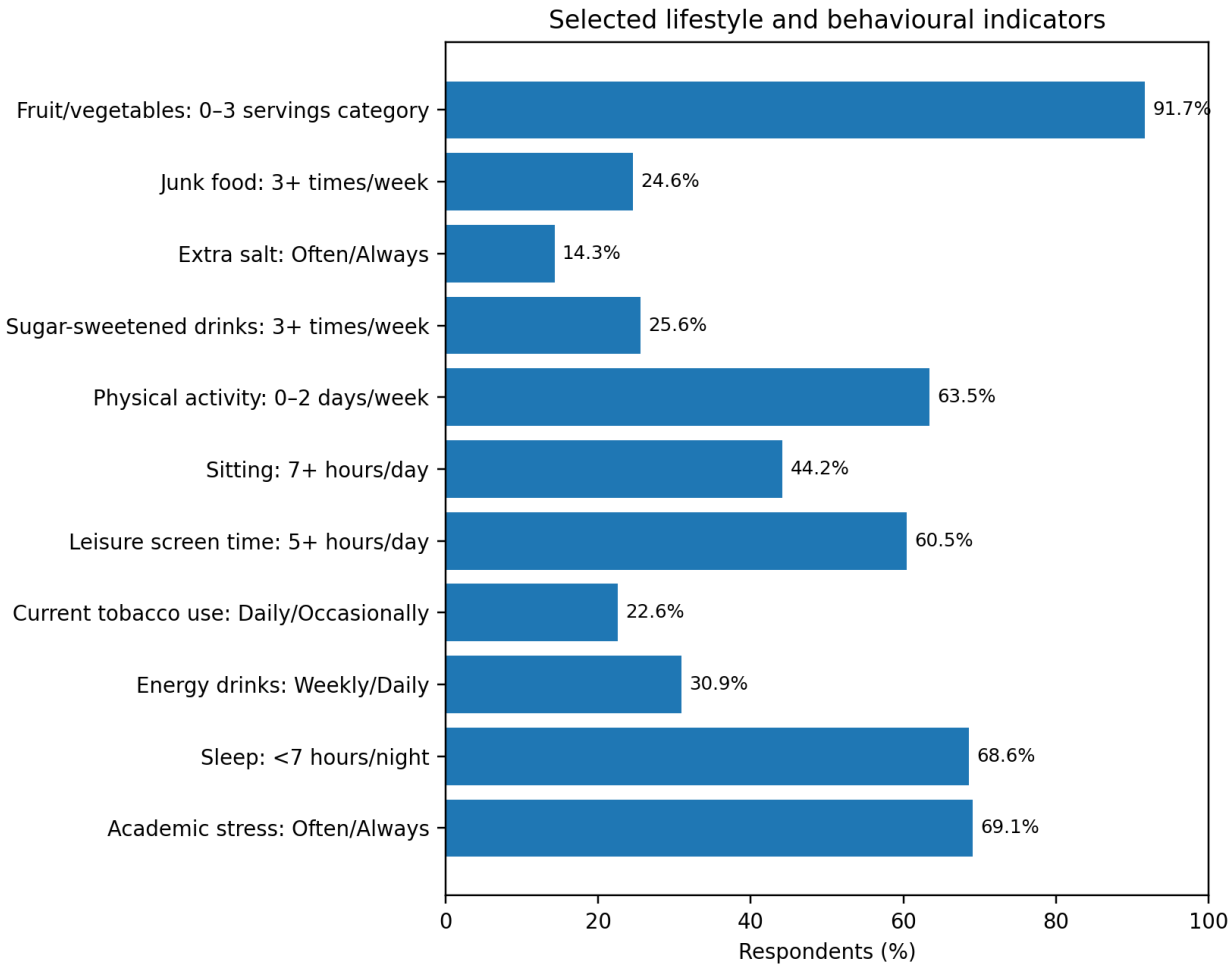


Figure 9: Selected lifestyle and behavioural indicators derived from the recorded categories

4.5 Inferential Analysis

Inferential analyses were used to examine whether the derived NCD knowledge score differed across key demographic and health-related groups and whether smoking status was associated with gender. Because the knowledge score was bounded (0–13) and showed clustering toward the upper end, non-parametric group comparisons were used for the bivariate analyses. A multivariable ordinary least-squares model with HC3 robust standard errors was then fitted to estimate adjusted associations with the knowledge score. The regression is interpreted as association rather than causation because the survey is cross-sectional.

Table 17: Bivariate associations with the derived NCD knowledge score

Grouping variable	Mean score by group	Test	Statistic	p-value
Gender	Female: 10.46 Male: 9.34	Mann–Whitney U	12912.50	0.004
Age group	**19-22**: 10.03 **23-27**: 9.98 **28-32**: 10.22 **32-45**: 10.80 **45-60**: 12.00	Kruskal–Wallis H	0.52	0.971
Year of study	1st: 9.64 2nd: 10.67 3rd: 10.35 4th: 9.64 5th+: 9.08 Graduate: 10.17 Postgraduate: 9.72	Kruskal–Wallis H	6.95	0.325
College/Faculty	Arts/Humanities: 9.27 Business: 8.88 Engineering: 9.39 Medicine: 10.86 Other: 10.57 Pharmacy: 10.99 Science: 10.13	Kruskal–Wallis H	34.39	<0.001
Diagnosed chronic illness	No: 10.08 Yes: 9.69	Mann–Whitney U	6571.50	0.127
Family history of NCDs	No: 9.30 Unsure: 9.08 Yes: 11.18	Kruskal–Wallis H	23.63	<0.001
National NCD program awareness	No, not aware: 9.71 Unsure: 9.61 Yes, I am well aware: 9.91 Yes, but limited awareness: 10.64	Kruskal–Wallis H	6.53	0.089

Knowledge scores differed significantly by gender (Mann–Whitney U=12912.5, p=0.0036), with females having a higher mean score (10.46) than males (9.34). Scores also differed significantly across college/faculty groups (H=34.39, p<0.001) and family-history groups (H=23.63, p<0.001). No statistically significant differences were observed across

age groups, year of study, chronic-illness status or national-program-awareness groups at the 0.05 level in the bivariate tests.

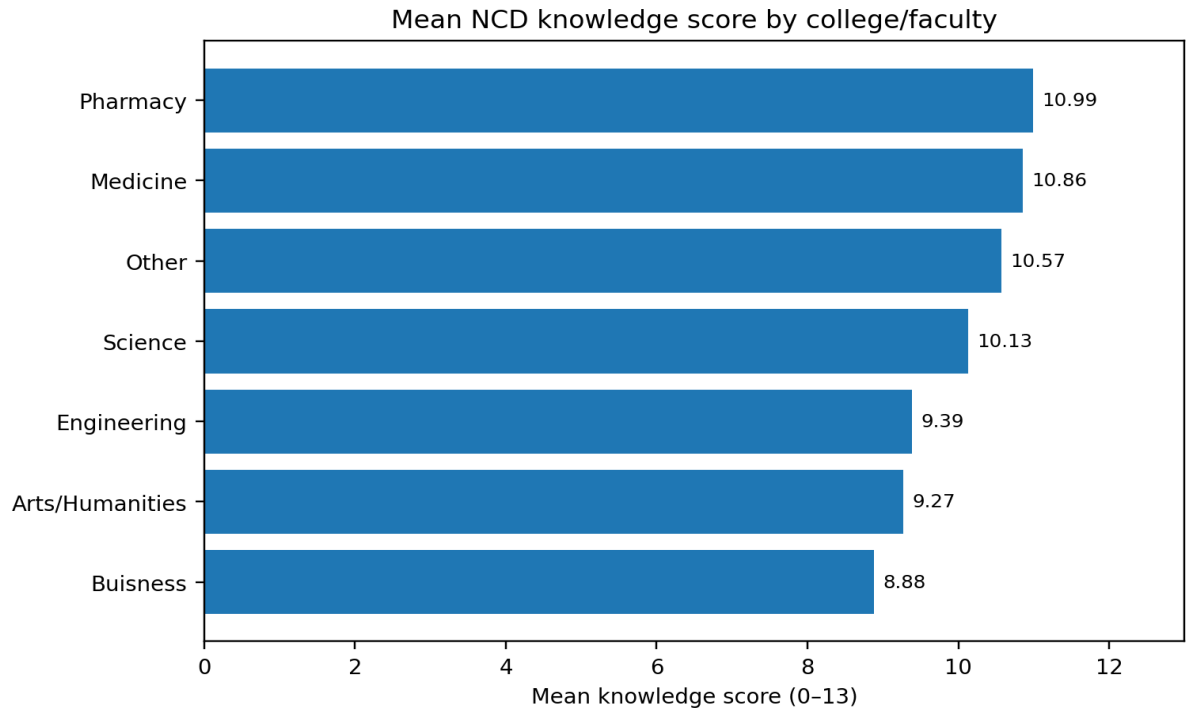


Figure 10: Mean NCD knowledge score by college/faculty

Table 18: Smoking status by gender

Gender	Smoking status	n	% within gender
Female	Never	166	90.7
	Former Smoker	2	1.1
	Occasionally	9	4.9
	Daily	6	3.3
Male	Never	52	44.1
	Former Smoker	13	11.0
	Occasionally	16	13.6
	Daily	37	31.4

Pearson chi-square: χ^2 (3) = 81.77, p<0.001; Cramer's V=0.521.

Smoking status was strongly associated with gender, χ^2 (3) = 81.77, p<0.001, with a Cramer's V of 0.521. Among male respondents, 37 of 118 (31.4%) reported daily smoking and 16 (13.6%) occasional smoking. Among female respondents, 6 of 183 (3.3%) reported daily smoking and 9 (4.9%) occasional smoking.

Table 19: Multivariable linear regression for the NCD knowledge score

Predictor	B	Robust SE	95% CI	p-value
Constant	7.628	0.845	5.971 to 9.285	<0.001
Female (ref: Male)	0.579	0.409	-0.223 to 1.381	0.157
Age 23–27 (ref: 19–22)	1.317	0.614	0.114 to 2.520	0.032
Age 28+ (ref: 19–22)	2.119	0.953	0.251 to 3.987	0.026
2nd year (ref: 1st)	1.043	0.779	-0.485 to 2.571	0.181
3rd year (ref: 1st)	0.095	0.853	-1.576 to 1.767	0.911
4th year (ref: 1st)	-1.002	0.931	-2.826 to 0.823	0.282
5th+ (ref: 1st)	-1.568	1.274	-4.066 to 0.929	0.218
Graduate (ref: 1st)	-0.229	1.037	-2.261 to 1.802	0.825
Postgraduate (ref: 1st)	-0.687	1.277	-3.189 to 1.816	0.591
Pharmacy (ref: Business)	1.790	0.500	0.810 to 2.770	<0.001
Science (ref: Business)	0.512	0.650	-0.762 to 1.785	0.431
Engineering (ref: Business)	0.263	0.689	-1.087 to 1.614	0.702
Arts/Humanities (ref: Business)	0.018	0.752	-1.455 to 1.491	0.981
Medicine (ref: Business)	1.457	1.567	-1.614 to 4.528	0.353
Other (ref: Business)	1.246	0.601	0.069 to 2.424	0.038
Chronic illness: Yes (ref: No)	-0.536	0.467	-1.451 to 0.379	0.251
Family history: Yes (ref: No)	1.551	0.395	0.777 to 2.326	<0.001
Family history: Unsure (ref: No)	-0.056	0.567	-1.167 to 1.055	0.921

Model n=301; R^2=0.200; adjusted R^2=0.149; overall model p<0.001. Age was collapsed to 19–22, 23–27 and 28+ only for regression stability; the original age categories remain unchanged in the descriptive tables.

The adjusted linear model explained approximately 20.0% of the variance in the knowledge score (R^2=0.200; adjusted R^2=0.149; overall p<0.001). Relative to respondents aged 19–22 years, the 23–27 group had an adjusted score 1.32 points higher (p=0.032) and the combined 28+ group had a score 2.12 points higher (p=0.026). Relative to the "Business" category, Pharmacy respondents had an adjusted score 1.79 points higher (p<0.001), and respondents in "Other" had a score 1.25 points higher (p=0.038). Respondents reporting a family history of NCDs had an adjusted score 1.55 points higher than those reporting no family history (p<0.001). Other coefficients in the model were not statistically significant at the 0.05 level.

Table 20: Binary logistic regression for current tobacco use

Predictor	Adjusted OR	95% CI	p-value
Constant	0.237	0.048 to 1.172	0.077
Female (ref: Male)	0.104	0.051 to 0.212	<0.001
Age 23–27 (ref: 19–22)	2.340	1.145 to 4.783	0.020
Age 28+ (ref: 19–22)	13.909	3.384 to 57.173	<0.001
Family history: Yes (ref: No)	1.052	0.484 to 2.289	0.898
Family history: Unsure (ref: No)	2.077	0.943 to 4.578	0.070
Knowledge score (per 1 point)	0.924	0.838 to 1.018	0.111
Academic stress (per category increase)	1.331	0.953 to 1.860	0.094

Outcome: Daily/Occasionally=1 versus Never/Former Smoker=0. Model n=301; McFadden pseudo-R^2=0.247; likelihood-ratio p<0.001. Academic stress was coded ordinally from Never=1 to Always=5.

In the adjusted smoking model, female respondents had substantially lower odds of current daily/occasional tobacco use than male respondents (AOR=0.104, 95% CI 0.051–0.212, p<0.001). Compared with those aged 19–22 years, respondents aged 23–27 years had higher adjusted odds of current smoking (AOR=2.34, p=0.020); the 28+ group also showed higher odds (AOR=13.91, p<0.001), although this estimate should be interpreted cautiously because only 15 respondents were aged 28 years or older. Knowledge score and academic-stress level were not statistically significant at the 0.05 level after adjustment.

4.6 Chapter Summary

The 301 respondents who were eligible and consented to participation in the study were predominantly young adults (19-27 years), with a higher percentage of female respondents, and a significant number from the Pharmacy category and category “Business.” General knowledge on NCDs was generally good: The mean derived score was 10.02/13 and the knowledge items were highly internally consistent. However, the item-level analysis showed some key gaps, including a lack of information on the modifiable nature of NCD risk factors identified in young adulthood.

There were some behaviours highlighted in the behavioural profile that could be of concern for NCD risk. A total of 191 respondents (63.5%) reported 0–2 days of physical activity per week, 182 (60.5%) reported 5 hours or more of leisure screen time, and 208 (69.1%)

reported often or always experiencing academic stress. Among the 296 respondents with valid sleep-duration responses, 203 (68.6%) reported sleeping less than 7 hours. Sixty-eight respondents (22.6%) reported daily or occasional tobacco use, with a marked gender difference. Awareness of national NCD prevention programs was also limited, with 55 respondents (18.3%) stating that they were well aware of such programs.

The inferential findings suggested that there was a significant difference in knowledge scores among the different gender and among the faculties and family history of NCDs. The new knowledge model showed that age group, Pharmacy membership and reported family history were all independently related to higher knowledge scores. There was a strong gender association with current smoking that was additionally substantiated by a logistic model. Temporal or causal relationships should not be inferred from this result.

CHAPTER 5: DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The chapter covers the key results of the study in relation to the objectives and previous studies. The study evaluated awareness about non-communicable diseases (NCDs), lifestyle related risk behaviors, health characteristics, barriers to adopting healthy behaviors and awareness of NCD prevention services among those that responded. It also analyzed whether there were independent associations between socio-demographic and health-related characteristics and knowledge of NCDs.

After applying the eligibility and consent criteria, 301 respondents were included in the final analysis. In general, the results showed that the general level of knowledge about NCDs among the participants is relatively good, but there were still significant proportions of the lifestyle risk behaviours that could be changed. This indicates a clear knowledge-behaviour gap between awareness of NCD prevention and actual health-related behaviour.

5.2 Discussion of Major Findings

5.2.1 Socio-demographic and Health Characteristics

Most of these respondents were young adults with 56.1% aged between 23-27 years and 38.9% aged between 19-22 years. Of the analytical sample, 60.8% were females. Pharmacy students were the largest academic group followed by the students of Business and Science/Engineering.

In terms of the health background, 15.0% of the people indicated that they are suffering from a diagnosed chronic disease and 41.2% indicated that their family members have a chronic disease. It is relevant to note the relatively high family history reported as these could influence an individual's awareness and understanding of NCDs.

This finding is similar to the previous studies in Bangladesh. Hossain et al. (2018) found that family disease history and lifestyle factors were important factors in predicting the risk of NCD in university students. Islam et al. (2025) also noted that university students could be already carrying several risk factors for NCDs by the time they reach their student years.

5.2.2 Knowledge Regarding NCDs

Overall, a good level of NCD-related knowledge was observed among the respondents. The mean score for knowledge was 10.02 out of 13 (77.1% correct responses) and the median score was 11. The internal consistency of the knowledge scale was also good (KR-20 = 0.85).

Fruits and vegetables had some of the highest levels of knowledge, as well as physical activity to prevent Type 2 diabetes, the risks of sugar sweetened beverages, and the negative cardiovascular effects of smoking. Just over 4/5 of the population got correct responses to a number of the items.

But key gaps of knowledge were still identified. Just half of the respondents correctly identified that NCD risk factors identified in the young age can be modifiable. There was also some uncertainty about excessive salt intake, alcohol consumption, lack of sleep, and about the non-communicable nature of NCDs.

The results indicate that respondents had a fairly general understanding of the key risk factors of common NCDs and were less knowledgeable about risk modification and less salient behavioral risk factors. This is significant since it is only when a person understands that a behavior is dangerous that they will understand how it can be reduced over time.

Previous studies have also highlighted the importance of enhancing awareness of the risks of NCDs among university students. The university years are an important time as health behaviors established during these early years can continue into adulthood (Cicekli & Gokce Eskin, 2025).

5.2.3 Dietary Behavior

One aspect of concern was dietary behaviour. About 45.8% of respondents were in the lowest fruit-and-vegetable category (0–1 serving/day), and 91.7% reported no more than 3 servings/day. Also, 24.6% reported junk-food consumption 3 or more times per week, while 25.6% reported sugar-sweetened beverage consumption 3 or more times per week.

The results suggest that people's understanding of healthy food's protective role did not always lead them to accept the healthy eating practices. A significant number of

respondents were able to identify that fruit and vegetables are a way to prevent cardiovascular disease, but actual consumption was still relatively low. Similar concerns regarding dietary habits and metabolic NCD risk have been reported among university undergraduates (Olatona et al., 2018).

This is similar to the results of Islam et al. (2025) who found that around four-fifths of the university students studied in Bangladesh consumed insufficient amounts of fruits and vegetables. In the same way, Cicekli and Gokce Eskin (2025) reported low vegetable intake by 70.5% of the participants and low fruit intake by 58.9% of the participants. There is also evidence of poor consumption of fruits and vegetables among university students from several countries (Pengpid & Peltzer, 2021).

Results across studies suggest that unhealthy diet is not a specific problem within a particular institution or country, but a significant modifiable risk factor among university students.

5.2.4 Physical Activity and Sedentary Behavior

Another common trend was the lack of physical activity. 63.5% said they engaged in moderate to vigorous physical activity fewer than 3 days per week and 25.6% said they did not engage in any moderate to vigorous physical activity during the past week.

Meanwhile, sitting around was prevalent. Around 44.2% said that they sat for 7 or more hours a day and 60.5% for at least 5 hours of leisure screen time daily.

The results suggest that there is also low levels of physical activity and high levels of sedentary time among the study sample. The issue can no longer be termed "exercise participation" as it also involves extended sitting and leisure time viewing of screens.

This pattern is also reported from other locations. According to Islam et al. (2025), the physical activity levels of university students in Bangladesh were low, with over half reporting low levels. The most common lifestyle risk factor was found to be insufficient physical activity in the study of Cicekli and Gokce Eskin (2025), who reported that 89.2% of the subjects experienced this factor. They also noted that students with multiple concurrent NCD risk factors had higher levels of screen time.

The results thus confirm the importance of creating environments in the University which encourage the adoption of a physical activity routine, and minimize sitting time.

5.2.5 Tobacco Use

22.6% reported current or occasional smoking. A large gender gap was noted. About 44.9% of males but only 8.2% of females reported for current smoking and this binary current-use comparison was statistically significant (Yates-corrected $\chi^2(1) = 53.23$, $p < 0.001$).

This is an important group of male respondents for tobacco-related preventive interventions.

The current smoking rate was higher than the smoking rate reported by Islam et al. (2025) among the students of the universities of Bangladesh (10%). The present prevalence rates are more comparable with Cicekli and Gokce Eskin's (2025) results that found 25.2% of individuals to be current smokers of tobacco.

Variations between studies could be due to differences in the population studied, the definition of smoking, social environment, geographic location, or sampling methods.

It was also found that some of the respondents said that they were smokers or substance dependent and factors like stress, curiosity, peer pressure, family/social environment and influence of hostel/friendship group were cited as reasons to be initiated. The results indicate that tobacco consumption is not solely a personal decision, but can have social and psychological components.

5.2.6 Sleep and Academic Stress

The high prevalence of short sleep and academic stress was notable. Among the 296 valid sleep-duration responses, 203 (68.6%) were below 7 hours per night, while 208 of 301 respondents (69.1%) reported feeling stressed about academic workload often or always.

Both of these findings suggest that psychological and academic factors could be a significant aspect of NCD prevention among university students. While this cross-sectional study does not permit the causal relationship between academic stress and sleep duration to be determined, the concurrent high rate of the two suggests that this should be a target for researchers and practitioners.

The findings also confirm the need to push past the diet, and tobacco/exercise-only approach to NCD prevention programs for young adults. Comprehensive student-health interventions should also take into account sleep, stress management, mental health and academic load.

5.2.7 Awareness of NCD Prevention Programs

Although general knowledge on NCD risk factors was fairly high, there was limited awareness of organized prevention initiatives. Just 18.3% indicated that they were well informed about national programs to prevent NCDs. By contrast, 39.5% said they did not know about such programs and 31.2% said that they knew limited about them.

This discovery adds to the evidence of a general health knowledge gap, and a lack of involvement with formal public-health initiatives. Pupils might be aware of the negative impacts of smoking, poor diet and lack of exercise but not know what help is available for prevention at the national level or the national campaigns.

This finding is relevant for health authorities and universities. Prevention programmes used in secondary school might not reach young adults if they don't have a clear understanding of the programmes, or if the messages aren't delivered in a way that is relevant to the university context.

5.2.8 Knowledge and Socio-demographic Factors

The unadjusted analyses demonstrated differences in NCD knowledge across respondent groups. Female respondents had a higher average knowledge score than males, and knowledge also differed across academic faculties.

However, the multiple regression analysis provided a more specific picture. After simultaneous adjustment for the selected socio-demographic and health-related factors, **age, academic faculty and family history of NCDs emerged as the main independent factors associated with NCD knowledge**.

Respondents aged 23–27 years had an adjusted NCD knowledge score approximately 1.32 points higher than those aged 19–22 years, while respondents aged 28 years and above had a score approximately 2.12 points higher. This may suggest that greater age and accumulated exposure to health information are associated with stronger NCD knowledge.

Academic faculty was also significantly associated with knowledge. In particular, Pharmacy respondents had an adjusted score approximately 1.79 points higher than Business respondents after controlling for the other factors. This difference is consistent with greater exposure to health, disease, pharmacology, and prevention-related material within health-science education.

Family history showed another important independent association. Respondents with a family history of NCDs had an adjusted score approximately 1.55 points higher than those without such a history. Personal exposure to chronic disease within the family may increase interest in disease prevention, communication with healthcare professionals, and familiarity with NCD-related information.

The importance of family disease history has also been identified in earlier research among Bangladeshi university students (Hossain et al., 2018). Islam et al. (2025) similarly noted the relevance of demographic and lifestyle characteristics in understanding NCD risk among university populations.

In contrast, gender was no longer statistically significant after adjustment, despite the higher female knowledge score observed in the bivariate analysis. This suggests that part of the initial gender difference may have been explained by other characteristics, such as faculty distribution, age or family history.

Year of study, diagnosed chronic illness and overall awareness of national NCD programs also did not show statistically significant independent associations in the final model.

The regression model explained 20.0% of the total variation in NCD knowledge (R^2 = 0.200; adjusted R^2 = 0.149). This indicates that demographic, academic, and health-background variables explain part—but not all—of the differences in knowledge. Other unmeasured factors, such as health-information exposure, socioeconomic status, media use, health literacy, parental education, and individual interest in health, may also contribute.

5.3 Overall Interpretation of the Findings

The main result of the study is that a knowledge–behavior gap exists.

While the mean NCD knowledge score was high, multiple behaviors were also reported that increase long-term NCD risk. These ranged from not eating enough fruits and vegetables, not getting enough exercise, too much time in front of screens, smoking, not sleeping enough, regular school stress, eating junk food, and drinking sugar-sweetened beverages.

Hence, increasing knowledge does not necessarily lead to better behavior. Students might have many of the fundamentals of poor health and wellness habits, but have practical, environmental, social or psychological barriers to healthy behaviors.

The results of the questionnaire regarding the lack of time, influence of peers, access to healthy food and exercise facilities support this interpretation. Health education and environmental and behavioral support should therefore be used in combination to prevent NCDs among students of the university.

The authors reached the same conclusion as Cicekli and Gokce Eskin (2025) who proposed interventions in universities with the aim of providing more opportunities to engage in physical movement, offering health education, and providing affordable healthy food. Similarly, Islam et al. (2025) found that students in universities had modifiable NCD risks and need health-promoting interventions.

5.4 Implications of the Study

The results have a number of implications for student health promotion. First, the university student population should not be overlooked as a key population for initial prevention efforts – and that the preventive measures are primarily relevant to the older age group should not be assumed.

Secondly, interventions should be directed towards behaviors as well as knowledge. Health campaigns need to educate students on the importance of exercise, healthy food and good sleep hygiene, but also consider the circumstances that are impacting students' ability to put this knowledge into practice.

Third, interventions for prevention may require different interventions within subgroups. There is a high prevalence of smoking amongst males, suggesting a greater need for targeted tobacco-control activities, and the reduced level of knowledge about NCDs in

some non-health-related faculties, highlighting the need for health education beyond medical and pharmacy courses.

Lastly, the link between family history and knowledge indicates that those students who have no family history may need more exposure to the information about the prevention of chronic diseases before these risks become them.

5.5 Limitations of the Study

The results should be considered on the basis of some limitations.

First, the study was cross-sectional in design, therefore, associations found in the study cannot be used in establishing cause and effect relationships.

Second, the participation was done through an online voluntary response sampling method as opposed to probability sampling. As a result, the sample may not necessarily be representative of all students or young adults at the university.

Thirdly, the information provided was self-reported, and this may lead to recall bias or social-desirability bias, especially when asking about behaviors like smoking, diet, physical activity, stress, and substance use.

Fourth, there was some inconsistency in reporting height and weight. BMI was not included in the main analysis due to uncertainty around their standardization for each respondent. This did not allow overweight and obesity as metabolic NCD risk factors to be assessed.

Fifth, some academic subgroups were small, especially the students in medicine, when comparisons between faculties were possible, this was not done with the necessary precision.

Finally, the Knowledge score fields on exported Google Forms did not have an official scoring key, but the 13-item Knowledge score had good internal consistency. The knowledge score was thus built up based on the direction of the facts contained in each statement. Use of a formally validated scoring instrument, with an established scoring protocol, would be useful in future studies.

Similar self-reported measurements and limitations in representativeness have been recognized in past university-based NCD research. Islam et al. (2025), for instance, reported limitations due to representativeness and measures of self-reported health.

5.6 Recommendations

Based on the findings of the study, the following actions are recommended:

1. University-based NCD education programs should be strengthened, particularly for students outside health-related faculties, with emphasis on modifiable risk factors, salt intake, alcohol-related risk, adequate sleep and long-term risk reduction.
2. Universities should promote regular physical activity by improving access to exercise spaces, sports programs and opportunities for active participation within the academic schedule.
3. Greater attention should be given to the campus food environment, including the availability and affordability of fruits, vegetables and healthier meal options, while discouraging excessive consumption of junk food and sugar-sweetened beverages.
4. Tobacco-prevention and cessation interventions should receive priority, particularly among male students and groups in which smoking is socially reinforced.
5. Student-health programs should incorporate sleep health, stress management and mental-health support, as inadequate sleep and frequent academic stress were highly prevalent.
6. National and institutional NCD campaigns should improve their visibility among young adults through communication channels commonly used by university students.
7. Future research should employ larger and more representative samples, validated NCD knowledge instruments, standardized anthropometric measurements, and preferably longitudinal designs to examine how knowledge and risk behaviors change over time.

5.7 Conclusion

The study is a good illustration of the immediate relevance of NCD prevention to young adults. The level of NCD knowledge among the respondents was generally good with mean

score of 10.02/13 and some modifiable risk behaviors were also common among the respondents.

Some of these included low intakes of fruits and vegetables, lack of physical activity, excessive time spent on screens, smoking, and short sleep duration and academic stress. The pairing suggests that being aware of the risk for NCDs is not enough to result in healthier behavior.

The multivariable analysis further showed that older age, Pharmacy education and a family history of NCDs were independently associated with higher NCD knowledge. The results suggest that education exposure and education experience can have an impact on health knowledge, yet wider behavioral and environmental factors are also important.

NCD prevention should go beyond information-based approaches in university populations, and follow a holistic strategy including education, healthy settings in the university, behavioral support, tobacco prevention, physical activity, healthy diet, adequate sleep and management of stress. Early targeting in the university years could help decrease the buildup of modifiable risk factors and promote healthier patterns in adulthood.

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APPENDIX A

Survey Questionnaire

Instructions: Please select the response that best represents you. For knowledge statements, choose True, False, or Don't Know. Conditional questions should be answered only when applicable.

Screening and Consent

S1. I confirm I am a university student or belong to another community aged 18 years and above.

Response options: Agree / Disagree

S2. I agree to participate voluntarily.

Response options: Yes / No

Socio-demographic and Health Information

1. Age

Response options: 19–22 / 23–27 / 28–32 / 32–45 / 45–60

2. Gender

Response options: Male / Female

3. Year of study

Response options: 1st / 2nd / 3rd / 4th / 5th+ / Graduate / Postgraduate

4. College/Faculty

Response options: Pharmacy / Business / Science / Engineering / Arts/Humanities / Medicine / Other

5. Height

Response options: Free-response

6. Weight (kg)

Response options: Free-response

7. Do you have any diagnosed chronic illness (e.g., hypertension, diabetes mellitus, asthma)?

Response options: Yes / No

8. Family history of NCDs

Response options: Yes / No / Unsure

NCD Knowledge

9. Non-communicable diseases can spread from person to person

Response options: True / False / Don't Know

10. Regular physical activity reduces the risk of Type 2 Diabetes

Response options: True / False / Don't Know

11. Consuming more than 5 grams salt per day increases the risk of hypertension

Response options: True / False / Don't Know

12. Smoking only affects the lungs and has no impact on heart diseases

Response options: True / False / Don't Know

13. Eating fruits and vegetables daily helps prevent cardiovascular diseases

Response options: True / False / Don't Know

14. Being overweight or obese is a risk factor for multiple NCDs including cancer

Response options: True / False / Don't Know

15. Alcohol consumption has no relationship with the development of NCDs

Response options: True / False / Don't Know

16. Stress and poor mental health can contribute to the development of NCDs

Response options: True / False / Don't Know

17. Consuming sugar-sweetened beverages daily increases the risk of type 2 diabetes

Response options: True / False / Don't Know

18. Getting less than 7 hours of sleep per night is associated with increased NCD risk

Response options: True / False / Don't Know

19. Once NCD risk factors are established in young adulthood, they cannot be changed

Response options: True / False / Don't Know

20. Environmental factors like air pollution can contribute to respiratory NCDs

Response options: True / False / Don't Know

21. Pharmacists can play a role in educating patients about NCD prevention

Response options: True / False / Don't Know

Lifestyle and Behavioural Factors

22. How many servings of fruits and vegetables do you typically eat per day? (1 serving = 1 medium fruit or 1/2 cup vegetables)

Response options: 0–1 / 1–3 / 3–5 / 5+

23. How many times per week do you consume junk food? (chips, fried food, pizza, sugary drinks, fast food)

Response options: 0–1 / 1–3 / 3–5 / 5+

24. Do you add extra salt to your meals after they are prepared?

Response options: Never / Rarely / Sometimes / Often / Always

25. How many times per week do you eat breakfast?

Response options: Recorded categorical frequency

26. How many cups of coffee or caffeinated beverages do you consume per day?

Response options: Recorded categorical frequency

27. How many times per week do you consume sugar-sweetened beverages? (soda, sweetened tea/coffee, energy drinks)

Response options: Recorded categorical frequency

28. How many days per week do you engage in moderate-to-vigorous physical activity for at least 30 minutes?

Response options: 0 / 1–2 / 3–4 / 5–6 / 7 days

29. On a typical day, how many hours do you spend sitting (excluding sleeping)?

Response options: <4 / 4–6 / 7–9 / 10+ hours

30. On a typical day, how many hours do you spend on screen time (mobile phone, computer, TV) for leisure?

Response options: <2 / 2–4 / 5–7 / 8+ hours

31. Do you use a fitness tracker or app to monitor your physical activity?

Response options: No / Yes, occasionally / Yes, regularly

32. Do you currently smoke tobacco? (cigarettes, e-cigarettes, shisha, or other forms)

Response options: Never / Occasionally / Daily / Former smoker

33. How many cigarettes do you smoke per day? (if applicable)

Response options: 0 / 1–5 / 6–10 / 11–20 / 20+ *[Conditional item]*

34. How often do you consume energy drinks?

Response options: Never / Rarely / Weekly / Daily

35. On average, how many hours of sleep do you get per night?

Response options: <5 / 5–6 / 7–8 / 9+ hours

Psychosocial and Substance-use Factors

36. How often do you feel stressed about your academic workload?

Response options: Never / Rarely / Sometimes / Often / Always

37. In the past year, have you sought help for mental health concerns (anxiety, depression, stress)?

Response options: Never / Rarely / Sometimes / Often / Always

38. Are you dependent on smoking or any other narcotics?

Response options: Yes / No

39. If the answer is yes, how did you start?

Response options: Curiosity / From stress / Peer pressure / Hostel or friends gathering influence / Family/social environment

40. Continued use of cigarettes and other narcotics/drugs can cause general physical complaints. Which problems or related diseases have you faced?

Response options: Multiple-response item

41. Have you ever visited a doctor's consultation?

Response options: Yes / No

Perceived Barriers and Risk Perceptions

42. Making lifestyle changes (diet, exercise) is too difficult for busy students.

Response options: Numeric rating scale (1–5)

43. I am worried about my risk of developing an NCD later in life.

Response options: Numeric rating scale (1–5)

44. Peer influence makes it difficult to maintain healthy habits as a student.

Response options: Numeric rating scale (1–5)

45. Lack of time due to academic schedule/work schedule.

Response options: Numeric rating scale (1–5)

46. Limited access to healthy/affordable food options on/near campus.

Response options: Numeric rating scale (1–5)

47. Limited access to sports facilities or exercise spaces.

Response options: Numeric rating scale (1–5)

NCD Prevention Awareness

48. Are you aware of any national programs or campaigns in your country aimed at preventing NCDs?

Response options: No, not aware / Unsure / Yes, but limited awareness / Yes, I am well aware

APPENDIX B

Summary of Questionnaire Response Data

Sample derivation. A total of 312 submissions were available. Eleven records did not meet both the eligibility and voluntary-consent criteria and were excluded. The summary below therefore represents the final analytical sample of 301 respondents. Percentages use n = 301 unless a conditional-item denominator is stated.

Data handling note. Obvious spelling inconsistencies in category labels (e.g., "Business") were normalized for presentation. The single "Neven" entry was treated as "Never." Five "X" entries in sleep duration are shown as invalid entries rather than being assigned to a sleep category. For the six numeric perception/barrier items, the exported dataset contained scale values but not verbal endpoint labels; therefore, the recorded numeric values are reported without assigning labels such as agree/disagree.

Screening and Consent

Question / Item	Observed response distribution
S1. I confirm I am a university student or belong to another community aged 18 years and above.	Agree: 301 (100.0%)
S2. I agree to participate voluntarily.	Yes: 301 (100.0%)

Socio-demographic and Health Information

Question / Item	Observed response distribution
1. Age	19-22: 117 (38.9%); 23-27: 169 (56.1%); 28-32: 9 (3.0%); 32-45: 5 (1.7%); 45-60: 1 (0.3%)
2. Gender	Female: 183 (60.8%); Male: 118 (39.2%)
3. Year of study	1st: 25 (8.3%); 2nd: 69 (22.9%); 3rd: 37 (12.3%); 4th: 67 (22.3%); 5th+: 26 (8.6%); Graduate: 59 (19.6%); Postgraduate: 18 (6.0%)
4. College/Faculty	Pharmacy: 111 (36.9%); Business: 78 (25.9%); Science: 38 (12.6%); Engineering: 31 (10.3%); Arts/Humanities: 22 (7.3%); Medicine: 7 (2.3%); Other: 14 (4.7%)

5. Height	Free-response variable; not tabulated because height was entered in multiple non-standard units and formats.
6. Weight (kg)	Free-response variable; not tabulated because weight entries included mixed numeric/text formats.
7. Do you have any diagnosed chronic illness (e.g., hypertension, diabetes mellitus, asthma)?	No: 256 (85.0%); Yes: 45 (15.0%)
8. Family history of NCDs	No: 111 (36.9%); Yes: 124 (41.2%); Unsure: 66 (21.9%)

NCD Knowledge

Question / Item	**Observed response distribution**
9. Non-communicable diseases can spread from person to person	True: 56 (18.6%); False: 204 (67.8%); Don't Know: 41 (13.6%)
10. Regular physical activity reduces the risk of Type 2 Diabetes	True: 259 (86.0%); False: 16 (5.3%); Don't Know: 26 (8.6%)
11. Consuming more than 5 grams salt per day increases the risk of hypertension	True: 222 (73.8%); False: 13 (4.3%); Don't Know: 66 (21.9%)
12. Smoking only affects the lungs and has no impact on heart diseases	True: 29 (9.6%); False: 256 (85.0%); Don't Know: 16 (5.3%)
13. Eating fruits and vegetables daily helps prevent cardiovascular diseases	True: 262 (87.0%); False: 17 (5.6%); Don't Know: 22 (7.3%)
14. Being overweight or obese is a risk factor for multiple NCDs including cancer	True: 232 (77.1%); False: 19 (6.3%); Don't Know: 50 (16.6%)
15. Alcohol consumption has no relationship with the development of NCDs	True: 31 (10.3%); False: 213 (70.8%); Don't Know: 57 (18.9%)

16. Stress and poor mental health can contribute to the development of NCDs	True: 247 (82.1%); False: 22 (7.3%); Don't Know: 32 (10.6%)
17. Consuming sugar-sweetened beverages daily increases the risk of type 2 diabetes	True: 258 (85.7%); False: 15 (5.0%); Don't Know: 28 (9.3%)
18. Getting less than 7 hours of sleep per night is associated with increased NCD risk	True: 222 (73.8%); False: 25 (8.3%); Don't Know: 54 (17.9%)
19. Once NCD risk factors are established in young adulthood, they cannot be changed	True: 66 (21.9%); False: 153 (50.8%); Don't Know: 82 (27.2%)
20. Environmental factors like air pollution can contribute to respiratory NCDs	True: 240 (79.7%); False: 20 (6.6%); Don't Know: 41 (13.6%)
21. Pharmacists can play a role in educating patients about NCD prevention	True: 249 (82.7%); False: 12 (4.0%); Don't Know: 40 (13.3%)

Lifestyle and Behavioural Factors

Question / Item	**Observed response distribution**
22. How many servings of fruits and vegetables do you typically eat per day? (1 serving = 1 medium fruit or 1/2 cup vegetables)	0-1: 138 (45.8%); 1-3: 138 (45.8%); 3-5: 20 (6.6%); 5+: 5 (1.7%)
23. How many times per week do you consume junk food? (chips, fried food, pizza, sugary drinks, fast food)	0-1: 99 (32.9%); 1-3: 128 (42.5%); 3-5: 43 (14.3%); 5+: 31 (10.3%)
24. Do you add extra salt to your meals after they are prepared?	Never: 110 (36.5%); Rarely: 76 (25.2%); Sometimes: 72 (23.9%); Often: 23 (7.6%); Always: 20 (6.6%)

25. How many times per week do you eat breakfast?	0: 18 (6.0%); 0-1: 49 (16.3%); 1-3: 69 (22.9%); 3-4: 1 (0.3%); 3-5: 58 (19.3%); 5+: 106 (35.2%)
26. How many cups of coffee or caffeinated beverages do you consume per day?	0-1: 143 (47.5%); 1-2: 1 (0.3%); 1-3: 115 (38.2%); 3-5: 20 (6.6%); 5+: 22 (7.3%)
27. How many times per week do you consume sugar-sweetened beverages? (soda, sweetened tea/coffee, energy drinks)	0-1: 135 (44.9%); 1: 1 (0.3%); 1-3: 88 (29.2%); 3-5: 36 (12.0%); 5+: 41 (13.6%)
28. How many days per week do you engage in moderate-to-vigorous physical activity for at least 30 minutes?	0: 77 (25.6%); 1-2: 114 (37.9%); 3-4: 72 (23.9%); 5-6: 26 (8.6%); 7: 12 (4.0%)
29. On a typical day, how many hours do you spend sitting (excluding sleeping)?	<4 hours: 51 (16.9%); 4-6 hours: 117 (38.9%); 7-9 hours: 97 (32.2%); 10+ hours: 36 (12.0%)
30. On a typical day, how many hours do you spend on screen time (mobile phone, computer, TV) for leisure?	<2 hours: 23 (7.6%); 2-4 hours: 96 (31.9%); 5-7 hours: 130 (43.2%); 8+ hours: 52 (17.3%)
31. Do you use a fitness tracker or app to monitor your physical activity?	No: 164 (54.5%); Yes, occasionally: 83 (27.6%); Yes, regularly: 54 (17.9%)
32. Do you currently smoke tobacco? (cigarettes, e-cigarettes, shisha, or other forms)	Never: 218 (72.4%); Former Smoker: 15 (5.0%); Occasionally: 25 (8.3%); Daily: 43 (14.3%)
33. How many cigarettes do you smoke per day? (if applicable)	0: 224 (74.4%); 1-5: 36 (12.0%); 6-10: 17 (5.6%); 11-20: 7 (2.3%); 20+: 2 (0.7%); No response: 15 (5.0%)
34. How often do you consume energy drinks?	Never: 93 (30.9%); Rarely: 115 (38.2%); Weekly: 67 (22.3%); Daily: 26 (8.6%)
35. On average, how many hours of sleep do you get per night?	<5 hours: 34 (11.3%); 5-6 hours: 169 (56.1%); 7-8 hours: 89 (29.6%); 9+ hours: 4 (1.3%); Invalid entry (X): 5 (1.7%)

Psychosocial and Substance-use Factors

Question / Item	Observed response distribution
36. How often do you feel stressed about your academic workload?	Never: 5 (1.7%); Rarely: 16 (5.3%); Sometimes: 72 (23.9%); Often: 92 (30.6%); Always: 116 (38.5%)
37. In the past year, have you sought help for mental health concerns (anxiety, depression, stress)?	Never: 108 (35.9%); Rarely: 41 (13.6%); Sometimes: 72 (23.9%); Often: 40 (13.3%); Always: 40 (13.3%)
38. Are you dependent on smoking or any other narcotics?	No: 261 (86.7%); Yes: 40 (13.3%)
39. If the answer is yes, how did you start?	Curiosity: 19 (30.6% of 62 respondents to this item); From stress: 19 (30.6% of 62 respondents to this item); Hostel or Friends gathering influence: 11 (17.7% of 62 respondents to this item); Peer Pressure: 7 (11.3% of 62 respondents to this item); Family/Social environment: 6 (9.7% of 62 respondents to this item)
40. Continued use of cigarettes and other narcotics/drugs can cause general physical complaints. Which problems or related diseases have you faced?	Respiratory / Breathing: 42 (50.6% of 83 respondents to this multi-response item); General Body Effects: 31 (37.3% of 83 respondents to this multi-response item); Nervous System: 28 (33.7% of 83 respondents to this multi-response item); Heart / Circulation: 26 (31.3% of 83 respondents to this multi-response item); Heart/Lungs: 24 (28.9% of 83 respondents to this multi-response item); Digestive: 24 (28.9% of 83 respondents to this multi-response item); Muscles/Genera: 12 (14.5% of 83 respondents to this multi-response item); Sexual/Hormonal: 10 (12.0% of 83 respondents to this multi-response item)
41. Have you ever visited a doctor's consultation?	No: 201 (66.8%); Yes: 100 (33.2%)

Perceived Barriers and Risk Perceptions

Question / Item	Observed response distribution
42. Making lifestyle changes (diet, exercise) is too difficult for busy students.	1: 46 (15.3%); 2: 50 (16.6%); 3: 115 (38.2%); 4: 49 (16.3%); 5: 41 (13.6%)
43. I am worried about my risk of developing an NCD later in life.	1: 47 (15.6%); 2: 59 (19.6%); 3: 90 (29.9%); 4: 59 (19.6%); 5: 46 (15.3%)
44. Peer influence makes it difficult to maintain healthy habits as a student.	1: 49 (16.3%); 2: 63 (20.9%); 3: 104 (34.6%); 4: 47 (15.6%); 5: 38 (12.6%)
45. Lack of time due to academic schedule/work schedule.	1: 41 (13.6%); 2: 100 (33.2%); 3: 105 (34.9%); 4: 55 (18.3%)
46. Limited access to healthy/affordable food options on/near campus.	1: 51 (16.9%); 2: 82 (27.2%); 3: 95 (31.6%); 4: 73 (24.3%)
47. Limited access to sports facilities or exercise spaces.	1: 63 (20.9%); 2: 88 (29.2%); 3: 91 (30.2%); 4: 59 (19.6%)

NCD Prevention Awareness

Question / Item	Observed response distribution
48. Are you aware of any national programs or campaigns in your country aimed at preventing NCDs?	No, not aware: 119 (39.5%); Unsure: 33 (11.0%); Yes, but limited awareness: 94 (31.2%); Yes, I am well aware: 55 (18.3%)

Derived NCD Knowledge Score

Statistic	Result
Possible score range	0–13
Mean ± SD	10.02 ± 3.18
Median	11
Observed range	0–13
KR-20 internal consistency	0.85