Prevalence and Associated Risk Factors of Anxiety Among University Students of Bangladesh Residing in Urban Areas

By

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Bachelor of Pharmacy (Hon's.)

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Declaration

It is hereby declared that

1. The thesis submitted is my own original work while completing degree at Brac University.
2. The thesis does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The thesis does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. I have acknowledged all main sources of help.

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Approval

The project titled “Prevalence and Associated Risk Factors of Anxiety Among University Students in Bangladesh Residing in Urban Areas” submitted by Faiza Fairuz Muskan (20146036) of Spring, 2020 has been accepted as satisfactory in partial fulfillment of the requirement for the degree of Bachelor of Pharmacy, School of Pharmacy, on April 18, 2024.

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Ethical Statement

The research protocol was approved by the Research Ethics Committee (REC) of the University of Asia Pacific, Dhaka, Bangladesh (Ref: UAP/REC/2023/201-S). The guidelines stated in the Helsinki Declaration were followed in this study. The objectives of the study were clearly mentioned to all participants, and obtained their informed written consent before participation.

Abstract

Anxiety has the highest prevalence among many other mental health disorders worldwide. It is becoming more prevalent among people of all ages along with students. The objective of this study was to determine the prevalence and associated risk factors for anxiety among students in urban areas. A survey was conducted among 467 students based on GAD-7 scale. The prevalence of anxiety was 75% among the students in urban areas and the severity of anxiety was mild 50%, moderate 32%, and severe 18%. Along with this, the data also illustrated that anxiety among students had a significant association with gender, living status, chronic disease, smoking habit, and involvement in a relationship. The outcome emphasizes the severity of these mental health problems and can be used to address them in order to manage the problems.

Keyword: Anxiety; Prevalence; Chronic disease; Risk Factors; Students; Urban area.

Dedication

This work is dedicated to my mother and my seven best friends.

Acknowledgement

First and foremost, I express my utmost gratitude to the Almighty Allah for bestowing me with the mercy and strength that have supported me throughout my academic career. Secondly, I would like to express my gratitude to my supervisor, Professor & Dean Dr. Eva Rahman Kabir for her unwavering support, guidance, and encouragement throughout the journey of completing this project. Her expertise, patience, and insightful feedback have been invaluable in shaping my project and refining my ideas. I am profoundly thankful for her guidance and inspiration. I would also like to express my sincere and immense gratitude to Assistant Professor Dr. Md. Rabiul Islam for his valuable insights, critical evaluations and his guidance throughout the completion of my thesis. Lastly, I am grateful to my mother for her support and belief in my potential. I sincerely thank all for helping me complete my project.

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List of Acronyms

APA	American Psychological Association
ADAA	Anxiety and Depression Association of America
BMI	Body Mass Index
BAI	Beck Anxiety Inventory
CBT	Cognitive Behavioral Therapy
GAD-7	Generalized Anxiety Disorder -7
GABA	Gamma-Aminobutyric Acid
GM	Grey Matter
HCs	Healthy Controls
HAM-A	Hamilton Anxiety Rating Scale
MDD	Major Depressive Disorder
MRI	Magnetic Resonance Imaging
QoL	Quality of Life
STAI	State Trait Anxiety Inventory
STG	Superior Temporal Gyrus
WHO	World Health Organization
WM	White Matter

Chapter 1

Introduction

Mental health includes the psychological, emotional and social well-being of a person, important at every stage of life. The World Health Organization (WHO) has identified mental health as a fundamental part of public health. Mental health problems are major public health issues around the globe due to disease progression, increased prevalence and lack of treatment management (Yang et al., 2021). Around 10–20% of adolescents worldwide encounter mental health issues, and they have become the primary cause for building psychological barriers that includes risk-taking and even suicide (Yang et al., 2021). Despite having such severity, mental health issues among students are often overlooked. Due to a lack of understanding in society, diagnosing these issues might be difficult because there is no precise diagnosis technique. Among many other mental health problems anxiety is considered as one of the most prevalent psychological disorder. A study of Census Bureau's Household Pulse Survey done in 2023 shows that 49.9% people of age 18-24 suffer from anxiety and/or depression and people over age 25 has an anxiety rate of 38.0 % (*Latest Federal Data Show That Young People Are More Likely Than Older Adults to Be Experiencing Symptoms of Anxiety or Depression | KFF*, 2023). The World Health Organization estimated that in 2019, 301 million people worldwide were suffering from an anxiety disorder corresponding to a prevalence rate of 4% (WHO, 2023). Following the upsurge of the COVID 19 pandemic, anxiety and depression rates have increased significantly. The global prevalence of moderate to severe anxiety is 73%, while stress is 62.4% (Arusha & Biswas, 2020). In Bangladesh, depression, anxiety, and stress levels have been found to be as high as 54.3%, 64.8%, and 59.0% in the year of 2019 (Arusha & Biswas, 2020). Despite being a topic that in not addressed often, mental health challenges are progressively

posing a threat to countries with lower and middle-income levels, and Bangladesh is no exception (Moitra et al., 2023).

Following the onset of the COVID-19 pandemic, the mental well-being of students showed considerable variability. Many students faced challenges while passing through this period of time as well as various implications in their mental health. According to a new study published in The Lancet, the COVID-19 pandemic resulted in a significant increase in depressive and anxiety disorders worldwide in 2020, with an additional 53.2 million and 76.2 million cases of anxiety and major depressive disorders (MDD), respectively (Santomauro et al., 2021). Along with that, a study involving 162 undergraduate students shows elevated levels of mental health distress during this time period (Chen & Lucock, 2022). Depression was identified as a significant factor correlated with difficulties concentrating on academic tasks, unemployment concerns, and an increased anxiety levels among students (Chen & Lucock, 2022). Mental health issues are prevalent among students in Bangladeshi universities, yet it remains a subject that is not frequently discussed. Approximately 7 million individuals in Bangladesh experience anxiety and depression (Arusha & Biswas, 2020). The exact cause of anxiety is yet to be identified, but being a serious mental hazard, it causes various complications in both mental and physical health.

Such mental and physical conditions affect the students in academic result, their personal life along with their family and surroundings. Various factors, including academic and non-academic stressors, such as socioeconomic, environmental, and psychological elements, contribute to the challenges faced by these students (Basheti et al., 2023). Even in some cases the financial problem during higher education becomes a big enough issue to affect the mental health of the students. A study investigated the longitudinal connection between financial factors and mental health in students and discovered that elevated financial stress, such as the inability to meet financial obligations, predicted poor mental health and higher levels of

anxiety, depression, and stress (Richardson et al., 2016). Anxiety affects a student's emotional well-being, and it can make it difficult for them to focus on their academics. Students with anxiety disorders may also isolate themselves from social activities or friends, impacting their support system and overall mental health.

1.1 Anxiety

According to the American Psychological Association (APA), anxiety is termed as an emotion characterized by feelings of tension, worried thoughts, and physical changes like increased blood pressure (*Anxiety Disorders*, n.d.). Anxiety can be understood as the pathological counterpart to normal fear and it is characterized by abnormalities in mood, thoughts, behavior, and physiological activity. Anxiety disorders can manifest with a variety of symptoms. Typical symptoms of anxiety include restlessness, uncontrollable feelings of worry, increased irritability, difficulty concentrating, and difficulty in sleeping. However, the pathophysiology of anxiety is not exactly known. Several neurotransmitter systems have been implicated to have a role in one or several of the modulatory steps involved relating to anxiety. The most commonly considered are the serotonergic and noradrenergic neurotransmitter systems. It is thought that an under activation of the serotonergic system and an over activation of the noradrenergic systems causes anxiety (Adwas et al., 2020). These serotonergic and noradrenergic systems are often regulated by other pathways and neuronal circuits present in various regions of the brain, resulting in dysregulation of physiological arousal and the emotional experience of this arousal. Furthermore, corticosteroids may increase or decrease the activity of specific neural circuits, which results in not only stress-related behavior but also regulates how the brain processes the fear-inducing stimulus.

1.2 Types of Anxiety

According to the American Psychological Association (APA), anxiety can be further classified in different types. Generalized anxiety disorder (lifetime prevalence 6.2%), panic disorder with

or without agoraphobia (lifetime prevalence 5.2%), specific phobias, agoraphobia, social anxiety disorder (lifetime prevalence 13%), separation anxiety disorder, obsessive compulsive disorder, and selective mutism are the listed types of anxiety each with its own set of symptoms. (Mishra & Varma, 2023).

1.3 Anxiety in University Students in Urban Area

Anxiety among university students living in cities is a prevalent and concerning issue that can have a substantial impact on their academic performance and personal lives. This also triggers a cascade of other psychological issues such as depression, insomnia, social anxiety, and so on. The competitive nature of urban life, combined with the responsibilities of university education, frequently contribute to increased stress levels among students. Students' persistent drive to perform academically, financial burdens and the challenges of adjusting to a new environment, can significantly exacerbate anxiety symptoms. Furthermore, the urban lifestyle, which includes congested living conditions, traffic congestion, and a long commute to and from university, may worsen stress levels. Societal expectations, carrier uncertainty, and job market saturation can all contribute significantly to anxiety. Frequent exposure to technology and social media in urban areas can add to information overload, and students may compare themselves to their peers, causing anxiety which affects their mental health. Recognizing and resolving this issue is critical for universities and society so that students can have a safe and supportive environment.

1.4 Neurophysiology of Anxiety

The neuroimaging of amygdala has shown that, amygdala is activated in persons who are suffering from anxiety disorders. Generally, anxiety or disturbed mood and stressful behavior is regulated in the emotional center of the brain rather than the high cognitive sector. To be specific the orbitofrontal cortex is responsible for regulating mood and behavioral impulses. Inside the emotional center also known as the limbic system, it can be seen that, there is an

almond shaped structure, known as the amygdala. It resides by the hippocampus and interprets emotionally significant external stimuli and initiates the cascade of behavioral response (Šimić et al., 2021). The amygdala complex is divided into more than 13 subregions, each with its own neuronal morphology, connectivity, physiology, and expression of distinct molecular markers (Hu et al., 2022). An imbalance in excitation/inhibition (E/I) in synaptic transmission and neural circuits causes increased excitability of amygdala neurons, which has been linked to anxiety disorders (Hu et al., 2022). In addition, the amygdala is responsible for expressing a person's fear and aggression, as well as species-specific defense behavior which can be seen in Figure 1. It is also involved in keeping emotional and fear-related memories (Martin et al., 2009). The central nucleus that is present in the amygdala also receives responses from the hippocampus, thalamus and hypothalamus and thus express the stimuli of fear and aggression in human.

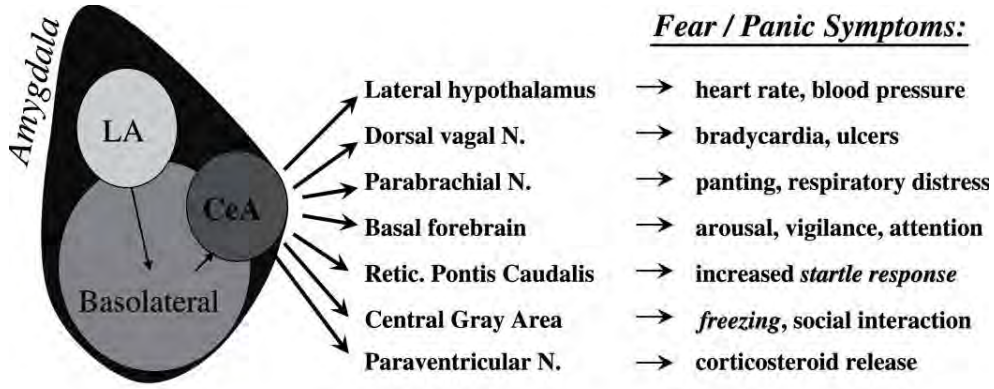

Figure 1: The Fear Response Arriving from Amygdala (Martin et al., 2009)

1.5 Causes of Anxiety

The exact cause of anxiety is yet to be established, despite its widespread prevalence and impact on millions of individuals worldwide. It occurs in various forms, types and intensities, impacting an individual physically, emotionally, and cognitively. Although the actual origin is unknown, the researchers have shed light on some of the reasons why anxiety may occur.

Excessive worry, or a tendency to be negative can all increase the risk of having anxiety. Low self-esteem and a lack of coping mechanisms may also contribute to anxiety.

Genetic Factors: A genetic predisposition to anxiety disorders, meaning that individuals with a family history of anxiety are more likely to experience it themselves. These genetic factors can also alter the brain chemistry and its response to fear and stimuli; thus, triggering anxiety.

Brain Chemistry and Structure: Anxiety disorders have been linked to an imbalance in neurotransmitters (serotonin, dopamine, and gamma-aminobutyric acid (GABA)). As the amygdala is crucial for mood regulation, anatomical abnormalities in the amygdala and hippocampus may lead to anxiety responses.

Environmental Factors: Stressful events, financial challenges, work pressure, or family issues, can all add to an individual's anxiety. These factors also include any previous traumatic experiences, accidents, and exposure to abuse. All of these can trigger anxiety disorders in individuals.

Drug Abuse and Misuse: Anxiety can occur as a result of drug abuse. Drug abuse in cases of insomnia and anxiety is caused by a lack of understanding about the proper use of drugs and the long-term consequences of using inappropriate drugs, which lead to dependence (Elsiana & Salman, 2022). As a result, the effects on health include trouble concentrating, decreased drug dose sensitivity and changes in behavior.

Medical Conditions: Chronic diseases, such as cardiovascular diseases, diabetes, and respiratory disorders, have been related to anxiety. A systematic review and meta-analysis done in 2018, found a 10% prevalence of anxiety among cancer patients and two-thirds of cancer patients with depression also experience clinically severe anxiety symptoms (Pitman et al., 2018). It also reports that, anxiety levels are higher in lung, gynecological, and hematological malignancies.

1.6 Effects of Anxiety

Anxiety can have effects on both mental and physical health. People suffering from persistent anxiety can undergo emotional distress, severe mood swings, irritability, restlessness, nervousness and an increased sense of fear and worry. Anxiety can cause a variety of physical symptoms, including muscle tension, headaches, digestive difficulties, and exhaustion. Anxiety has a significant impact on physical health; however, it can also affect cognitive processes such as concentration, memory, and decision-making. All these conditions make a person vulnerable and the person is less likely to be involve themselves in social gatherings. They may struggle to maintain personal relationships and may suffer as a result of failing to communicate effectively with others. Lifestyle modifications, counseling, and medication, if necessary, should be used as interventions in such cases.

1.7 Generalized Anxiety Disorder

According to Anxiety and Depression Association of America (ADAA), Generalized Anxiety Disorder (GAD) is defined by persistent and excessive worry about a different number of things (*Generalized Anxiety Disorder (GAD) | Anxiety and Depression Association of America, ADAA*, n.d.). While many individuals experience restlessness, uncontrollable feelings of worry, increased irritability, difficulty concentrating, and sleep issues on a regular basis, those with generalized anxiety disorder (GAD) experience these more frequently or at a higher level. Genetic studies suggests that a number of genes play a role in the development of generalized anxiety disorder (GAD), while much remains unexplained. GAD is defined as prolonged and excessive anxiety caused by persistent worry about nonspecific life events and daily matters such as health, finances, mortality, family, interpersonal connections, or work-related challenges, objects, and situations that last at least six months. A formal diagnosis of GAD requires persistent and consistent symptoms for at least six months. People having GAD finds it difficult to complete their daily work as the constant anxiety interferes in between. Symptoms

of GAD include feeling restless, wound up, or on edge, being easily fatigued, having difficulty concentrating, being irritable, having headaches, muscle aches, stomachaches, or unexplained pains, difficulty controlling feelings of worry, and having sleep problems, such as difficulty falling or remaining asleep (*Anxiety Disorders*, n.d.-b). Changes in the functional coherence of the amygdala and its processing of fear and anxiety have been associated with generalized anxiety disorder. Neurotransmitters, particularly the gamma-aminobutyric acid (GABA), have been recognized for their role in causing GAD by dysregulating amygdala activity in the brain. A GAD-7 score of 10 or higher is considered to indicate significant symptoms, and the GAD-7 has been used as both a diagnostic tool and a measurement for the severity of anxiety. Higher GAD-7 scores are correlated with increased functional impairment (Spitzer et al., 2006).

1.8 Neuroimaging of GAD

Research has found abnormalities or deficits in the ventrolateral and dorsolateral prefrontal cortex, anterior cingulate, posterior parietal areas, and amygdala in adults with generalized anxiety disorder (GAD) (Madonna et al., 2019). This means that it primarily affects the right hemisphere. However, the research was done in small sample sizes and also added people that are suffering from comorbid diseases. Alterations in gray matter (GM) and white matter (WM) volume was found by researchers in a number of structural MRI studies involving GAD patients as depicted in Figure 2 (Madonna et al., 2019). Researchers also discovered that GAD patients had significantly higher superior temporal gyrus (STG) and amygdala sizes, particularly in the right hemisphere, compared to healthy controls (HCs) (Madonna et al., 2019). In contrast, another study reported higher GM volumes in the right precuneus and precentral gyrus, as well as decreased GM volumes in the orbitofrontal cortex and posterior cingulate, in a sample of GAD adolescent (Madonna et al., 2019).

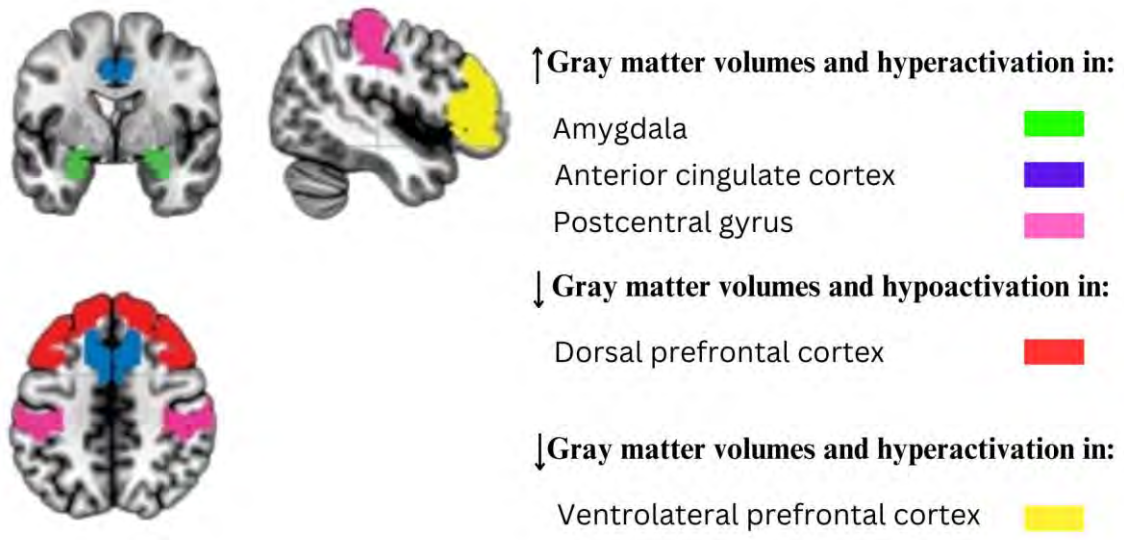

Figure 2: Neural Regions Which Are Consistently Found Altered in GAD in Structural and Functional MRI Studies (Madonna et al., 2019)

1.9 Measures in Anxiety Research

Anxiety level and severity is measured by using different tools such as, STAI (State-Trait Anxiety Inventory), BAI (Beck Anxiety Inventory), HAM-A (Hamilton Anxiety Rating Scale), and GAD-7 (Generalized Anxiety Disorder) illustrated in Figure 3. All of these methods can quantify the severity of anxiety symptoms, and they all rely on self-reporting and have adequate psychometric data.

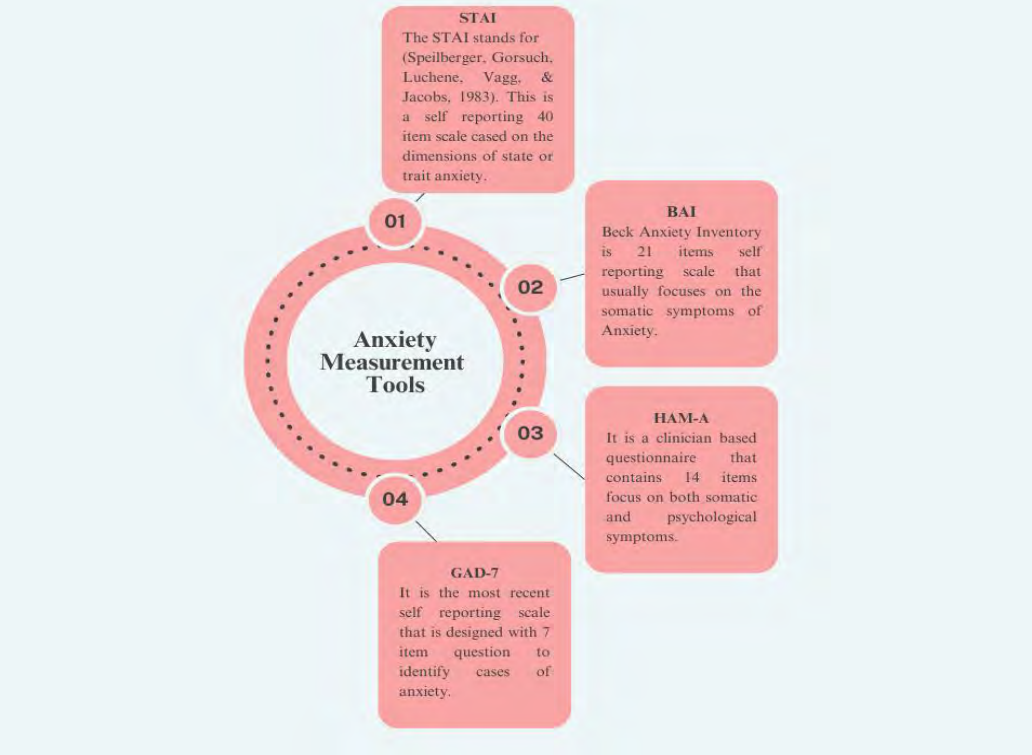

Figure 3: Measurement Tools for Anxiety

1.10 Treatment of Anxiety

Treatment plan for anxiety is twofold, the first one is Psychotherapy that is mainly the cognitive behavioral therapy (CBT) and the latter one is medication also known as anxiolytic drugs. In some cases, both of the treatment strategy is applied. The first and most important stage in the treatment is for the healthcare expert to diagnose the intensity of a patient's anxiety and provide clinical statements. Second, cognitive behavioral therapy (CBT) is based on the idea that a person's thoughts, emotions, physical sensations, and actions are all interconnected, resulting in a cycle in which negative thoughts and feelings are eliminated and replaced with self-reinforcing ones ("What Is Cognitive Behavioral Therapy?," 2017). The purpose of cognitive behavioral therapy is to help people deal with overwhelming problems by breaking them down into smaller, more manageable challenges. Third, patients may require both psychotherapy and medicine to manage their anxiety. For anxiolytic medication, the main group of drugs are: (Rang et al., 2011)

1. **Antidepressants:** SSRI's (sertraline, paroxetine) and SNRI's (venlafaxine, duloxetine) are most effective in treating GAD and other anxiety disorders.
2. **Benzodiazepines** are used in the treatment of acute anxiety.
3. **Gabapentin and Pregabalin** are also used for the treatment of GAD
4. **Buspirone** which is a $5HT_{1A}$ receptor antagonist helps in treating GAD
5. **Antipsychotics** such as olanzapine, quetiapine can be effective in treating GAD
6. **Beta blockers** are used when physical symptoms such as sweating, tremor and tachycardia becomes troublesome.

1.11 Impact of Anxiety

The consequences of anxiety among students are diverse which impact multiple facets of their academic, emotional, and well-being. Anxiety has a significant impact on academic performance, potentially impairing focus and contributing to untreated mental health concerns. The consequences include decreased academic integrity, alcohol and substance misuse, decreased empathetic behavior, relationship instability, low self-esteem, and suicidal ideation (Mofatteh, 2021). Anxiety and depression are associated with negative societal and individual effects, and their physical toll is underestimated. These effects include increased healthcare costs and the likelihood of physical comorbidities, such as cardiovascular disease. A prognostic cohort study conducted in the United States among 2041 initially shows that anxiety screening at baseline was associated with a higher risk of cardiovascular disease (CVD) up to 3 years later (Karlsen et al., 2021). Anxiety has a substantial impact on the overall quality of life for university students. Furthermore, anxiety has been linked to lower quality of life (QoL) in numerous cross-sectional and longitudinal studies, and it is a strong predictor of QoL outcomes (Hohls et al., 2021).

1.11 Objective of the study

Many mental health surveys primarily focus on specific subsets of the population, such as nursing, medical, or engineering students. However, conducting a study that includes all university student groups can provide a more complete picture of anxiety prevalence and risk factors in Bangladesh. The findings of such study have the potential to considerably benefit the healthcare sector. By identifying the factors contributing to poor mental health among university students, the society can develop policies and guidelines aimed at promoting mental well-being across all student demographics in Bangladesh.

Chapter 2

2. Literature Review

2.1 Global Prevalence of Anxiety in University Students

In a 2020 global study, universities worldwide were surveyed using PRISMA guidelines through five electronic databases. The results showed a 24.5% prevalence of anxiety symptoms among university students, with anxiety disorder symptoms ranging from 7.6% to 73.0% which involved 22,171 individuals (De Paula et al., 2020). One limitation of the survey was that various methodologies were used in these studies, resulting in a wide range of concepts and instruments for categorizing mental diseases. In addition, a four-year cohort study was conducted in China with subgroups of university students. The cohort data revealed anxiety prevalence percentages as follows; community college transfer students (30.9%), international students (21.6%), mainland Chinese students (18.9%), and student athletes (16.7%), for a total prevalence of 29.1% (Cheung et al., 2020). During the COVID-19 pandemic, a research was done to assess the mental health of university students in nine countries: Colombia, the Czech Republic (Czechia), Germany, Israel, Poland, Russia, Slovenia, Turkey, and Ukraine. According to the study, among 2349 university students (69% female) from nine countries, students from Turkey has the highest depression and anxiety risk, while the students from the Czech Republic has the lowest depression rate while students from Germany has the lowest anxiety rate (Ochnik et al., 2021). Another cohort study conducted in Malaysia with 449 (with a response rate of 93.9%) students pursuing undergraduate programs in health science discovered that 65% of the students had stress and 85.1% suffered from anxiety and among them 74.6% of students experienced moderate-to-extremely severe anxiety (Fauzi et al., 2021). The study discovered that poor sleep quality and fatigue were risk factors for anxiety, while low-grade fever and frequent headaches were risk factors for stress and anxiety.

2.2 Anxiety Prevalence in South Asian Universities

During COVID 19, a cross-sectional survey was conducted among public and private university students in Bangladesh, revealing that 53.99% of public university students experienced anxiety, 59.16% had depression, and 46.95% had co-morbidity ranging from moderate to severe (Mehareen et al., 2021). Among private university students, 33.33% reported moderate to severe anxiety, while 24.17% reported co-morbidity. In this survey, 46.55% of the 333 students reported anxiety symptoms (Mehareen et al., 2021). Another study, conducted over five months among university students in Sialkot, Pakistan, reported significant rates of depression (75%) and anxiety (88.4%). Anxiety was found to be prevalent in the following ranges: mild (4.4%), moderate (19.4%), severe (17.8%), and extremely severe (46.8%) (Asif et al., 2020). A systematic review focuses on six ASEAN countries (Cambodia, Laos, Malaysia, Myanmar, Thailand, and Vietnam) in Southeast Asia's low- and middle-income countries (LMICs) that have few mental health resources. Among the 5351 students surveyed for anxiety, the median point prevalence was 42.4%, with severe anxiety at 18.9% (Dessauvagie et al., 2021). Despite the high incidence, the review found a low desire among students to seek professional help. A cross-sectional study conducted in Malaysian government and private institutions using self-administered questions found a 29% prevalence risk of anxiety among 1821 participating students out of 1860, with a 97.90% response rate (Mohamad et al., 2021). The study revealed a number of risk factors for anxiety, including academic year, financial assistance, consumption of alcohol, sleep quality, body mass index (BMI), social involvement, future uncertainties, and interpersonal issues with peers and lecturers.

2.3 Urbanization and Mental Health

Urbanization is the process of population concentration in cities and the growth of urban areas. It is understandable that it might have a beneficial and negative influence on an individual's mental health. The impact of urban life on mental health is a complicated phenomenon that can

be caused by a variety of causes, including social, environmental, and individual elements. There are some literature evidences that have found a connection between urbanization and mental health. A study found that rapid urbanization around the world is associated with an increase in urban population. Evidence suggests that common mental disorders are more prevalent in urban areas. This is attributed to variables such as social disparities, insecurity, pollution, and inadequate exposure to nature (Ventriglio et al., 2020). Furthermore, a separate study found that people in urban areas are more likely to experience impaired functioning as a result of anxiety and depression than their rural counterparts. Studies using functional magnetic resonance imaging (MRI) have found increased amygdala activity in people living in cities, implying that an urban upbringing influences the pregenual anterior cingulate cortex, leading to stress and anxiety through modulation of the amygdala (Prakash et al., 2023). Lambert et al.'s research shows that urbanization contributes to anxiety and emotional disorders, adversely affecting the mental well-being of the residents and thus elevating the prevalence of infectious diseases, thereby compromising public health (Zhang et al., 2023).

2.4 Anxiety Prevalence in Different Gender

The focus of many studies has been on understanding the difference in psychological distress between genders. Previous epidemiological research consistently shows that generally, females tend to experience more mental health problems than males. There are two key reasons for this difference. Firstly, physiological differences between females and males, such as genetic vulnerability, hormone levels and cortisol level may result in emotional and behavioral differences (Gao et al., 2020). A study conducted at a Chinese university found that, on average, both male and female students experienced mild anxiety during their first three years of school. However, a much higher percentage of female students reported anxiety levels over the normal range, while a greater proportion of male students reported varying degrees of depression (Gao et al., 2020). Another study among medical students showed a significant gender difference,

with twice the rate of anxiety among females compared to males (40% versus 20%) (Mirza et al., 2021). Similarly, a research in Brazil evaluated anxiety symptoms among first- and sixth-year medical students and discovered that females were more likely to experience anxiety than boys. In Saudi Arabia, a cross-sectional study found that (89.7%) of the female premedical and first, second, and third-year medical students had more psychological issues, particularly anxiety, than males (60%) (Mirza et al., 2021).

2.5 Academic Performance and Anxiety

The effect of academic stress on university students' mental health is a current and relevant area of research. Recent studies underline the need of managing academic stress to ensure that students value their university experience. Academic stress appears to be a significant factor which influences the mental health of university students. A survey of 843 college students researched the connection between academic stress and mental health, identifying specific vulnerable groups depending on gender, race/ethnicity, year of study, and pandemic responses (Barbayannis et al., 2022). Using scores from the Perception of Academic Stress Scale (PAS) and the Short Warwick-Edinburgh Mental Well-Being Scale (SWEMWBS), the study discovered a significant association between higher academic stress and poor mental health, which was exacerbated by the pandemic (Barbayannis et al., 2022). A longitudinal study of 404 UAE university students (aged between 17-25) included a survey on socio-economic determinants and academic performance, including their most recent grade point average (GPA) (Awadalla et al., 2020). The study assessed depression and anxiety symptoms using GAD-7 measures. The group with suspected Generalized Anxiety Disorder (GAD) had lower GPAs at first, but there was no change at the follow-up. The association between the GAD group and GPA was gender-influenced, with female students in the possible GAD group having lower GPAs than females in the non-GAD group (Awadalla et al., 2020). Higher depression and anxiety symptom scores were linked to lower GPAs at the beginning of the trial.

2.6 Anxiety and Chronic Disease

A research study confirmed that individuals having chronic diseases are more likely to experience anxiety and other mental health issues. Chronic health conditions like diabetes, heart disease, cancer, and respiratory problems can contribute to emotional distress, anxiety, and depression in patients. Similarly, psychological factors like anxiety and depression can increase the risk of developing chronic diseases. In a research it was found that 68.7% of patients with chronic diseases experienced stress, and 51.1% had anxiety (Fattouh et al., 2019). The chronic diseases that were considered for the research were cardiovascular diseases, metabolic disorders, cancer, respiratory disorders, degenerative disorders, chronic kidney disease, and chronic liver disorders. Among these, patients with cardiovascular diseases had the highest rates of stress, and anxiety (Swathi et al., 2023). In another cohort study which involved about 40,360 individuals, women with depression and anxiety had a significantly higher risk of having chronic diseases in different age groups (Bobo et al., 2022). Similar trends were observed for men in the cohort study. A study conducted in China with 504 participants revealed that individuals with higher anxiety scores were more likely to experience acute exacerbation of COPD (54.1%) compared to those with lower scores (39.8%) (Hou et al., 2021). Similarly, individuals with higher depression scores had a higher risk of acute exacerbation (52.1%) than those with lower scores (40.4%). Ultimately, anxiety and/or depression increased the risk of acute exacerbation in patients with chronic obstructive pulmonary disease (AECOPD) (Hou et al., 2021b). Furthermore, college students with chronic illnesses displayed significantly more symptoms of anxiety and experienced more stressful life events, and had lower social support compared to their peers without chronic diseases (Johnston et al., 2021).

Chapter 3

3. Methodology

3.1 Study Description and Design

The study design for this mental health survey was descriptive. The sampling design of this survey can be referred to as stratified as it included male and female samples only from the urban area. The target population for the survey was all students studying both in undergraduate level or above. We gathered a total of 467 responses from students across Bangladesh residing in the urban area. The students were chosen randomly throughout this whole survey. Due to incomplete information, we discarded 14 responses. Additionally, responses from students with a medical background were excluded. After these exclusions, the final number of responses for our statistical analysis was 453. The population contained students aging from 18 and above. A snowball sampling technique was followed to obtain data for the survey. During the data collection process, consent was obtained from individuals in person, as outlined at the beginning of the provided form. The purpose of the study and the assurance of the confidentiality of the information was made clear to avoid any further conflicts or any miscommunication. As indicated by the study title, data were specifically collected from university students residing in the urban areas in Bangladesh, and participation was entirely voluntary. Without voluntary participation we did not obtain any data from the participants.

3.2 Study Period and Sites

The survey has been conducted physically since September 2023, to January 20, 2024. This period time included the preparation and development of the questionnaire, finalizing the questionnaire, preparation for field work, data collection, data processing and data analysis. Report writing was also conducted within this period, and along with that survey reports were also critically analyzed for the proper dissemination of knowledge. Field work for collecting the data took place during the time period of November to January. The sites for collecting data

were the major cities in Bangladesh as the survey only comprised on the students living in the urban area.

3.3 Estimation and Questionnaire

The objective of this study was to examine the correlation between sociodemographic factors and observable symptoms of anxiety among university students. To achieve this, we developed a questionnaire modeled after the GAD-7, a seven-item instrument used to gauge anxiety severity. Initially constructed in English as a self-administered tool, the questionnaire underwent a round-trip translation process to produce its Bengali version. The comprehensive questionnaire encompassed sections on consent, sociodemographic details, personal life inquiries, and the psychometric scale GAD-7 for participant assessment. The demographic questions were discrete whereas the GAD-7 contained questions with rating scale. To validate the questionnaire, a pilot test was conducted with 20 students, comprising 10 males and 10 females. This small-scale testing aimed to ensure the clarity and comprehensiveness of the questions, serving as a crucial step in refining the instrument for the larger survey.

3.4 Sample Selection Criteria

Inclusion Criteria

- Male and female students who are residing in the urban areas of Bangladesh and are studying in university were chosen for collecting data.
- Students that had Bangladeshi nationality
- Students from both public and private universities
- Students between the age range from 18-30 were included

Exclusion Criteria

- Students from medical background were excluded due to not having the cGPA based grading as the questionnaire parameter involved this answer.
- Any student undergoing pregnancy while studying in university were excluded
- Students living in the rural area were excluded.

3.5 Procedure of Data Collection

Data collection was conducted through the distribution of printed questionnaires at various universities. We engaged with students, persuading them to complete the forms. Throughout the questionnaire completion process, we actively addressed any difficulties students encountered in understanding the questions, ensuring clarity and comprehension.

Measures

3.6 Socio-Demographic and Personal Life Related Data

The survey instrument encompassed socio-demographic inquiries, covering aspects such as gender, age, height, weight, marital status, number of siblings, family type, income, and details regarding residence area, distinguishing between rural and urban locations. In relation to personal life, participants were presented with three choices to indicate their smoking status: non-smoker, current smoker, or ex-smoker. Furthermore, questions regarding education included distinctions between Undergraduate and Graduate/Masters levels, alongside inquiries about academic performance. Additionally, respondents were queried about the presence of any chronic diseases they may be managing.

3.7 Assessment of Generalized Anxiety Disorder (GAD_7)

The GAD-7 represents an anxiety measure based on seven items which are scored from zero to three and is most frequently used diagnostic self-report scales for screening, diagnosis and severity assessment of anxiety disorder. Public health practitioners can obtain information on the prevalence of anxiety symptoms in certain communities using tools like the GAD-7, assisting in the development of targeted public health interventions. A score is derived based on the patient's responses to the questions. Participants have the flexibility to select a response from a set of four scores, ranging from zero to three, for each question. A score of zero signifies "Not at all," one corresponds to "Several days," two represents "More than half the days," and three indicates "Nearly every day." The cumulative GAD-7 score spans from 0 to 27. Scores of four or below indicates normal anxiety, a range of five to nine signifies mild anxiety, 10 to 14 specifies a moderate level of anxiety, while scores of 15 or above designate a severe level of anxiety. anxiety, and 15 or above scores designate severe anxiety levels.

The GAD-7 Scale

The Severity of Anxiety level (Anxiety and Depression Association America, ADAA)

Score 0-4	Minimal/ No Anxiety
Score 5-9	Mild Anxiety
Score 10-14	Moderate Anxiety
Score 15 or above	Severe Anxiety

3.8 Statistical Analysis of Data

The datasets were analyzed using Microsoft Excel 2010 and IBM SPSS statistics version 25. By using the Microsoft Excel, the data processing was done as the datasets were edited, tabulated, sorted and classified to make the analysis easier in the SPSS software. This excel sheet was then imported in the SPSS software. For the analysis of the characteristics of the respondents descriptive was used. Chi square $\chi 2$ test was performed to determine the differences in anxiety and the variables. By using binary logistic regression with a 95% CI the correlations between risk factors and anxiety were measured. Statistically significant results were considered at $p<0.05$.

Chapter 4

4. Results

4.1 Description of Demographic Data

The demographic variables of the individuals are presented with the frequency percentage in Table 1. Altogether 453 data were collected among which the percentage of male and female is respondents are respectively, (46.38%) and (53.64%). Among these sample population most of the respondents fall in the age range of 18-25 which is about (95.14%). Regarding BMI range, 267 individuals had BMI within the normal range which is (57.84%) while 10.38% had a BMI below 18.5, and 31.38% had a BMI above 25.5. A large number of the respondents were undergraduate students which comprised of (86.75%). Furthermore, (84.99%) respondents were living with family along with parents not being separated (97.13%). Additionally, most of them were living in a nuclear family (84.99%). A significant portion, (57.36%) of the respondents came from a family having a medium economic background whereas, (32.23%) of the respondents came from a low economic background.

A minority of the participants were married having only (7.28%) and compared to that, over half of the participants were not involved in a relationship having a percentage of (58.94). More than half of the participants were non-smoker (80.13%). Lastly, only 60 (13.25%) participants out of 453 had a chronic disease and the rest 393 (86.75%) does not have any chronic condition.

Table 1. Demographic Data of the Study Participants (n=453)

Variables	Categories	Frequency (%)
Age range	18 -25	431 (95.14%)
	Above 25	22 (4.86%)
Sex	Male	210 (46.38%)
	Female	243 (53.64%)
BMI range	Below 18.5	47 (10.38 %)
	18.5-25.5	262 (57.84%)
	Above 25.5	144 (31.38%)
Marital status	Married	33 (7.28%)
	Unmarried	420 (92.78%)
Educational level	Undergraduate	393 (86.75%)
	Graduate or above	60 (13.24%)
Economic impression	Low	146 (32.23%)
	Medium	260 (57.36%)
	High	47 (10.38%)
Family Type	Nuclear	385 (84.99%)
	Joint	68 (15.01%)
Parents Status	Not Separated	440 (97.13%)
	Separated	13 (2.87%)
Relationship	Yes	186 (41.06%)
	No	267 (58.94%)
Living status	With family	344 (75.94%)
	Without family	109 (24.06%)
Smoking habit	Smoker	90 (19.87%)
	Non smoker	363 (80.13%)
Chronic disease	Yes	60 (13.25%)
	No	393 (86.75%)

4.2 Prevalence of Anxiety in Students

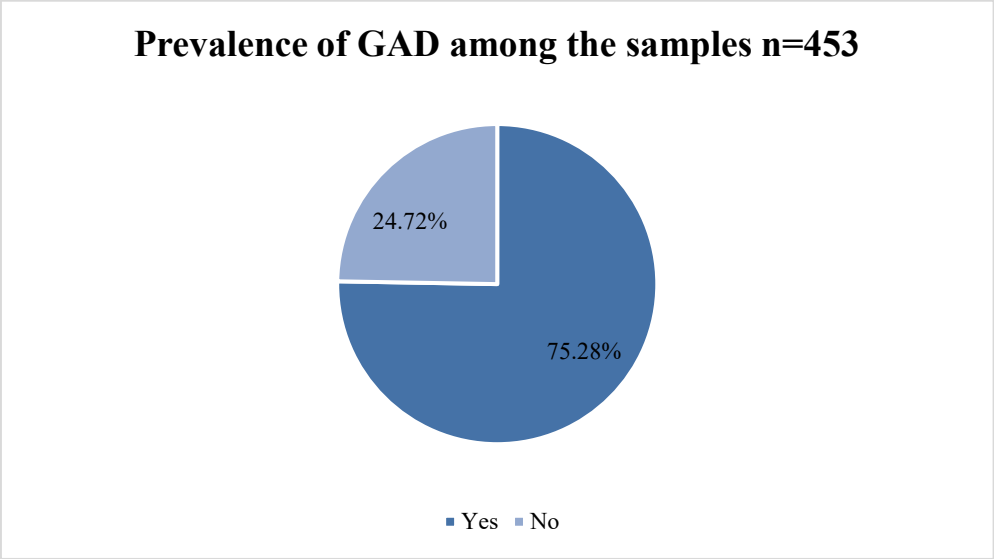

Figure 4: Prevalence of Anxiety Among Students

In Figure 4, among total 453 respondents, 341 (75.28%) respondents had mild to severe symptoms of generalized anxiety disorder (GAD). The rest 112 (24.72%) respondents were not found to have any symptoms related to anxiety.

4.3 Severity of Anxiety in students

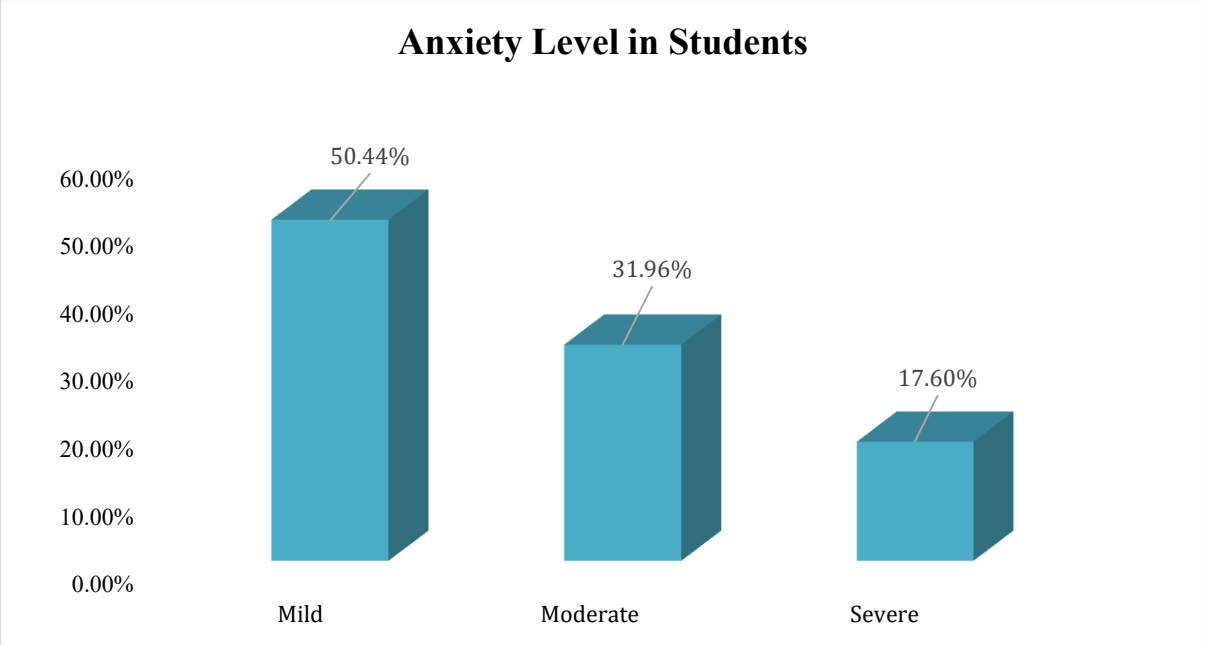

Figure 5: Severity of Anxiety in Students

Among total 341 respondents, about 172 participants had mild anxiety symptoms occupying a total of 50.44% of the total sample. 109 respondents had moderate level anxiety with a frequency of 31.96%. Lastly, 60 respondents were found to have severe anxiety which comprised 17.60% of the total sample (n=341) (Figure 5).

4.4 Prevalence of Anxiety in Different Genders

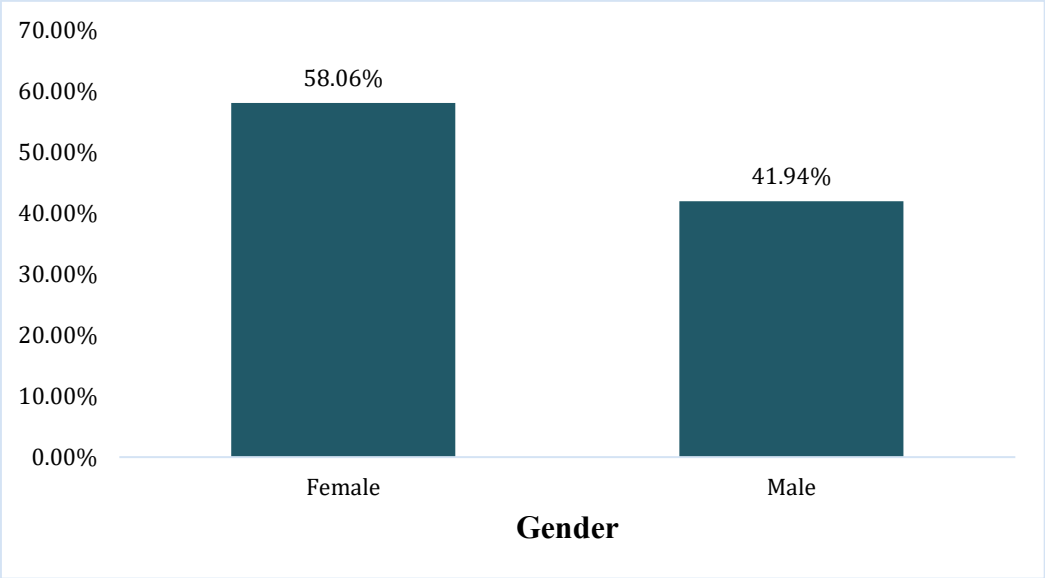

Figure 6: Prevalence of GAD in Different Genders

From the cross tabulation it was found that among 341 individuals, 198 females (58.06%) and 143 males (41.94%) have anxiety (Figure 6). According to the Pearson chi-square analysis, there is a statistically significant association between gender and Generalized anxiety disorder (GAD) with a value of ($\chi^2 = 10.846$, $p = 0.001$). Based on this analysis, there is evidence to indicate a statistically significant relation between gender and GAD, with females (58.06%) exhibiting slightly higher rates of GAD compared to males (41.94%).

4.5 Prevalence of Anxiety Based on Smoking Habit

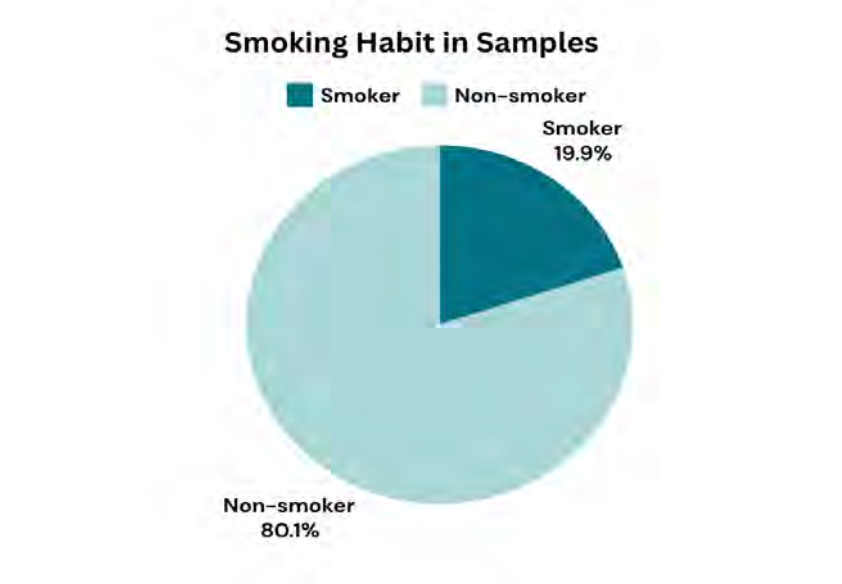

Figure 7: Smoking Habit in Samples (n=453)

It can be seen according to Figure 7, that most of the respondents which is almost (80.13%) is non-smoker and only (19.87%) of the respondents were found to be associated with smoking. The prevalence of Generalized anxiety disorder in association with smoking habit is explained below in Figure 8 below.

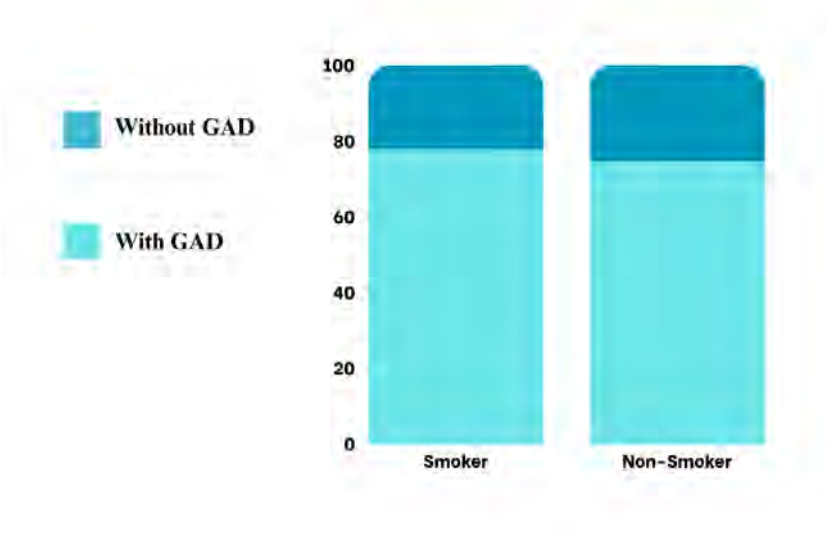

Figure 8: Prevalence of GAD in Smokers and Non-smokers

The Pearson chi-square analysis shows that there is no statistically significant relation between smoking habit and Generalized anxiety disorder (GAD), with a value of ($\chi^2 = 0.378$, $p = 0.539$).

4.6 Prevalence of Anxiety in Students Associated with Chronic Disease

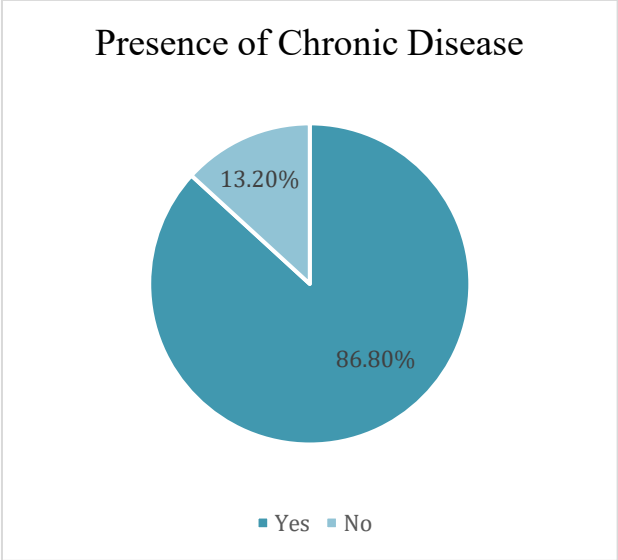

Figure 9: Presence of Chronic Disease in Samples (n=453)

A significantly low number of people had chronic disease which is only (13.2%) of the total sample. But among the sample (n=60), 53 individuals had chronic disease and symptoms of GAD, whereas 7 individuals with chronic disease had no symptoms of GAD (Figure 9).

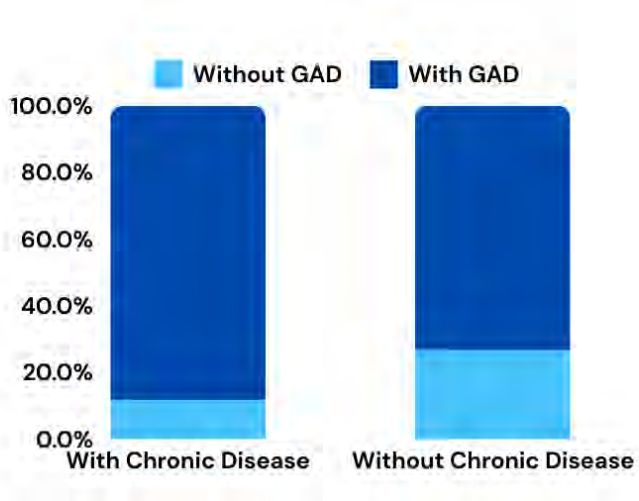

Figure 10: Prevalence of GAD in Individuals With and Without Chronic Disease

In the Pearson chi-square analysis, a statistically significant relation between chronic disease and Generalized anxiety disorder (GAD) is found with a value of ($\chi^2 = 6.336$, $p = 0.012$). Figure 10 depicts the prevalence of GAD among samples with and without chronic disease.

4.7 Association of Anxiety with Living Status

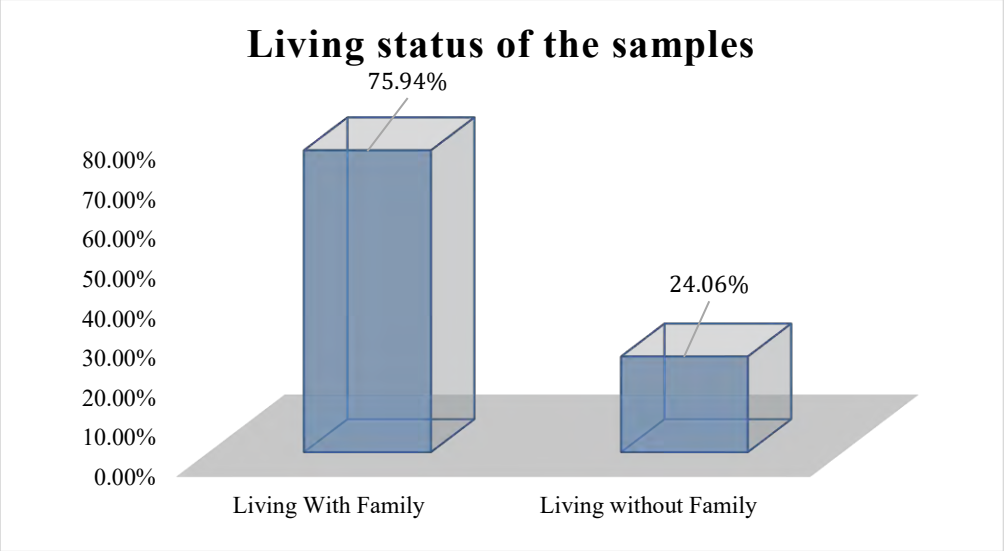

Figure 11: Living Status of The Samples (n=453)

From the cross tabulation it was found that among 453 individuals, 344 individuals were living with family and 109 individuals were living without family (Figure 11). But the prevalence of anxiety was found to have an upsurge with individuals living with family.

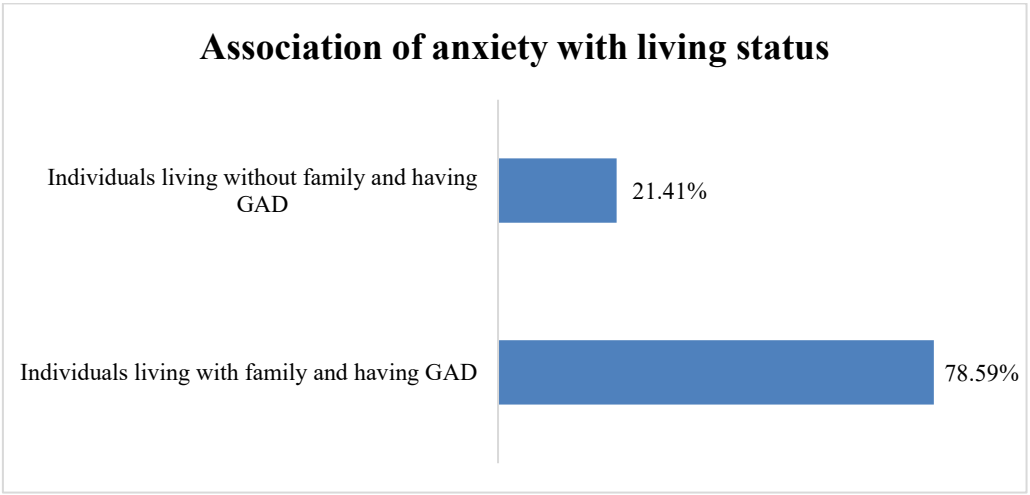

Figure 12: Association of Anxiety with Living Status of Individuals

According to Pearson chi-square analysis, there is a statistically significant correlation between living status and Generalized anxiety disorder (GAD) with a value of ($\chi^2 = 5.318$, $p = 0.021$). Figure 12 depicts the association of anxiety with living status of individuals

4.8 Correlation Between the Demographic Variables and GAD

A Pearson correlation test was performed in SPSS to identify the correlation between the continuous variables and GAD. The continuous variables for this test were Age, BMI, Academic performance, Family income, Number of siblings and Rank. The positive and negative sign in the correlation coefficient depicts positive and negative correlation with the variables and GAD in Table 2. A positive correlation means that when one variable increases, the Generalized Anxiety Disorder (GAD) will also increase. Conversely, a negative correlation suggests that as one variable increases, the GAD will decrease accordingly. The range of correlation coefficient is between +1 and -1. An interpretation table is given below for analyzing the correlation between the continuous variables used in the dataset and GAD.

Table 2: Interpretation of Correlation Coefficient (Schober et al., 2018)

Size of Correlation	**Interpretation**
From (+1 to +.90) to (-1 to -.90)	Very strong positive/negative correlation
From (+.70 to +.89) to (-.70 to -.89)	Strong positive/negative correlation
From (+.40 to +.69) to (-.40 to -.69)	Moderate positive/negative correlation
From (+.10 to +.39) to (-.10 to -.39)	Weak positive/negative correlation
From (+0 to +.10) to (-0 to -.10)	Negligible positive/negative correlation

Table 3: Correlation between GAD and Continuous Variables

Continuous Variables	Pearson Correlation	P Value
1. Age in years vs GAD	-0.27	.572
2. BMI (kg/m^2) vs GAD	.050	.284
3. Academic performance vs GAD	.067	.156
4. Family income (KBDT) vs GAD	-.004	.938
5. Number of siblings vs GAD	-.020	.667
6. Rank vs GAD	.021	.651

The data listed in Table 3 from the Pearson correlation test is described below;

For Age,

H_1: There is a significant relation between age and generalized anxiety disorder.

According to the analysis there is a weak negative correlation of -0.27 between age and Generalized Anxiety Disorder (GAD), which is not statistically significant ($r = -0.27$, $p = .572$, $n = 453$). As a result, H_1 cannot be supported leading to the fact that there is no significant relation between GAD and age.

For BMI,

H_1: There is a significant relation between BMI and generalized anxiety disorder.

There is moderate positive correlation of 0.050 between Body Mass Index (BMI) and Generalized Anxiety Disorder (GAD), which was not statistically significant ($r = 0.050$, $p = .284$, $n = 453$). However, the p-value of .284 indicates that this relationship is not statistically

significant. Therefore, there is insufficient evidence to describe that there is a meaningful association between BMI and GAD symptoms in this sample of 453 individuals. So, H_1 is not supported.

For Academic performance,

H_1: There is a significant relation between academic performance and generalized anxiety disorder.

According to the Pearson correlation analysis, there is a moderate positive correlation of 0.067 between academic performance and Generalized Anxiety Disorder (GAD), which is not statistically significant ($r=0.067, p = .156, n = 453$). This indicates that the observed relationship between Academic Performance and GAD may have occurred by chance. H_1 is not supported.

For family income,

H_1: There is a significant relation between family income and generalized anxiety disorder. As per the Pearson correlation analysis, there is a negligible negative correlation of -.004 between family income and Generalized Anxiety Disorder (GAD), which is not statistically significant ($r = -.004$, $p = .938$, $n = 453$). H_1 is not supported.

For number of siblings,

H_1: There is a significant relation between number of siblings and generalized anxiety disorder. In the Pearson correlation analysis, there is a weak negative correlation of -.020 between the number of siblings and Generalized Anxiety Disorder (GAD), which is not statistically significant ($r = -.020$, $p = .667$, $n = 453$). In other words, the number of siblings does not appear to have a meaningful impact on the severity of GAD symptoms in this population. H_1 is not supported.

For rank,

H_1: There is a significant relation between rank among siblings and Generalized anxiety disorder.

Pearson correlation analysis shows that there is a weak positive correlation of 0.021 between rank among siblings and Generalized Anxiety Disorder (GAD), which is not statistically significant ($r = 0.021$, $p = .651$, $n = 453$). Therefore, based on this analysis, there is no evidence to suggest that rank among siblings is associated with GAD symptoms in this sample of 453 individuals. So, H_1 is not supported.

4.9 Frequency of Responses

Table 4 below lists the frequency of responses to the questions included in the GAD-7 scale.

Table 4: Frequency of Responses

Questions	Responses	Frequencies
Over the past two weeks how often have you been bothered by feeling nervous, anxious, or on edge?	• Not at all • Several days • More that the half days • Nearly every day	• 14.1 % • 44.4 % • 20.3 % • 21.2 %
Over the past two weeks how often have you been bothered by not being able to stop or control worrying?	• Not at all • Several days • More that the half days • Nearly every day	• 26.9 % • 42.4 % • 16.8 % • 13.9 %
Over the past two weeks how often have you been bothered by worrying too much about different things?	• Not at all • Several days • More that the half days • Nearly every day	• 16.3 % • 45.5 % • 20.5 % • 17.7 %
Over the past two weeks how often have you been bothered by trouble relaxing?	• Not at all • Several days • More that the half days • Nearly every day	• 29.6 % • 43.7 % • 15.0 % • 11.7 %
Over the past two weeks how often have you been bothered by being restless that it is hard to sit still?	• Not at all • Several days • More that the half days • Nearly every day	• 40.0 % • 36.9 % • 16.8 % • 6.4 %
Over the past two weeks how often have you been bothered by becoming easily annoyed or irritable?	• Not at all • Several days • More that the half days • Nearly every day	• 21.2 % • 46.8 % • 17.0 % • 15.0 %
Over the past two weeks how often have you been bothered by feeling afraid as if something awful might happen?	• Not at all • Several days • More that the half days • Nearly every day	• 37.7 % • 36.6 % • 14.3 % • 11.3 %

4.10 Impact of Different Variables on Generalized Anxiety Disorder

For the assessment of how different variables can influence the outcomes for GAD a Binary logistic regression was done. It allowed to examine the relationship between predictor variables (e.g., Age range, Sex, BMI Range, Marital status, Education level, Economic impression, Family type, Parents status, Sibling (s), Relationship, Living status, Smoking habit, Chronic diseases) and the likelihood of a GAD occurring (Table 5).

Table 5: Binary logistic Regression of The Variables

Variables	B	df	P value	Exp (B)	95% cl for Exp (B) Upper	Lower
Age range (1)	-.058	1	.927	.944	.272	3.276
2. Sex (1)	1.039	1	.000*	2.827	1.703	4.692
BMI Range		2	.093			
BMI Range (1)	-.154	1	.702	.858	.390	1.886
BMI Range (2)	.439	1	.322	1.552	.651	3.699
5. Marital status (1)	-.655	1	.129	.519	.223	1.211
6. Education level (1)	.316	1	.415	1.372	.642	2.933
Economic impression		2	.972			
Economic impression (1)	.075	1	.847	1.078	.504	2.303
Economic impression (2)	-.023	1	.928	.977	.593	1.611
9. Family type (1)	-.458	1	.139	.632	.345	1.160
10. Parents status (1)	-.662	1	.426	.516	.101	2.635
11. Do you have any sibling (s) (1)	-.384	1	.282	.681	.338	1.372
12. Are you involved in a relationship?(1)	.536	1	.028*	1.709	1.061	2.754
13. Living status (1)	.526	1	.044*	1.693	1.015	2.822
14. Smoking habit (1)	-.646	1	.047*	.524	.277	.991
15. Do you have any chronic diseases? (1)	-1.005	1	.021*	.366	.156	.860

The coefficient (B) for the variable gender is 1.039 ($p < .001$), indicating a statistically significant positive relation between gender and generalized anxiety disorder (GAD). The odds ratio (Exp(B)) associated with gender is 2.827, with a 95% confidence interval ranging from 1.703 to 4.692.

The analysis between BMI range and GAD yielded a coefficient (B) of 0.439, with a corresponding significance (Sig) of 0.322. The odds ratio (Exp(B)) associated with this analysis is 1.552, and the 95% confidence interval (CI) for the odds ratio ranges from 0.651 to 3.699. However, the p-value of 0.322 suggests that this relationship between BMI range and GAD is not statistically significant.

While examining the relationship between education level and generalized anxiety disorder (GAD) it revealed a non-significant coefficient ($B = 0.316$, $p = .415$). The odds ratio (Exp(B)) associated with this analysis is 1.372, with a 95% confidence interval ranging from 0.642 to 2.933.

The p value for the variable involvement in a relationship is $p = .028$ ($B=0.536$), indicating a statistically significant positive relation between being in a relationship and generalized anxiety disorder (GAD).

The logistic regression analysis of the data also demonstrates that there is a significant association between living status of the samples and the presence of generalized anxiety disorder (GAD) where $p =.044$ $B =0.526$, and ($B =0.526$).

It is also evident that there is a significant connection between smoking habit and the presence of generalized anxiety disorder as the B value is -0.646 and the p value is .047.

The logistic regression analysis shows that there is a significant association between chronic disease and the presence of generalized anxiety disorder (GAD) ($B = -1.005$, $p = .021$). The p-value of .021 describes that this relationship is statistically significant. Hence, there is sufficient

evidence to conclude that there is a significant association between chronic disease and the likelihood of experiencing GAD.

Chapter 5

Discussion

From this study, the prevalence of anxiety among students in urban areas was found to be 75%, where out of 453 respondents 341 had anxiety, which is clearly a significant proportion of the young population. About one-third of adults' experience anxiety disorders, which makes it the most common mental health condition to be reported (*What Are Anxiety Disorders*, n.d.). The American College Health Association describes that anxiety disorders are most commonly reported by university students and it may have a significant effect on their academic performance (Tan et al., 2023). Researchers have shown that university students and young adults are more prone to experience psychological distress compared to other individuals (Liyanage et al., 2021).

Based on the binary logistic regression analysis and Pearson chi-square analysis, gender, living status, smoking habit, involvement in a relationship and choric disease have statistically significant association with anxiety. Among these factors gender is the strongest associated risk factor of anxiety, describing females tend to experience anxiety symptoms compared to males. This statement is supported by the literature review. Between smoking habit and anxiety, it was found that they are negatively correlated whereas the evidences support otherwise. Research shows that people suffering from anxiety disorders are much more likely to have smoking habits compared to those without the symptoms (Garey et al., 2020). Choric disease and involvement in relationship along with living status also had significant correlation with anxiety.

5.1 Analysis of Pearson Chi-square Results

Gender: In this analysis, the chi-square statistic (χ^2) is 10.846 with df (1) and a p-value of 0.001, indicating a significant relation between gender and GAD symptoms. The p-value of 0.001 is lower than significance level of 0.05, meaning there is a statistically significant relation between these two variables. Furthermore, the phi coefficient (φ) is -0.155, which depicts that there is a weak negative association between gender and GAD. This implies that there is a minor tendency for one gender to have higher rates of GAD compared to the other. So, based on this analysis, there is evidence to indicate a statistically significant relation between gender and GAD, with females having higher rates of GAD compared to males.

Smoking: The variables of interest for this analysis are smoking habit (smoker or non-smoker) and the presence of GAD. The chi-square statistic (χ^2) value obtained is 0.378 with df (1) and p-value of 0.539, indicating there is no significant association between smoking habit and GAD symptoms. The p-value of 0.539 is greater than 0.05, which is not statistically significant. The phi coefficient showed 0.029 which describes that there might be slight positive relation between smoking habit and GAD. Hence, smoking habit is unlikely to be a significant predictor of GAD.

Chronic disease: For this analysis, the variables are the presence or absence of chronic disease and GAD. The chi-square (χ^2) value is 6.336 indicating that there is certainly a significant relation between chronic disease and GAD symptoms. P-value is 0.012 which is less than 0.05, showing statistical significance. Furthermore, the phi coefficient (φ) value is 0.118, means there is a weak positive correlation between chronic disease and GAD. So, individuals with chronic diseases may have slightly higher rates of GAD compared to those without chronic diseases. Lasty, it can be said that there is a statistically significant correlation between chronic disease and GAD.

Living Status: The chi-square (χ^2) value is 5.318 with df (1), which indicates a statistically significant relation between living status and GAD symptoms. The p-value of 0.021 is less than 0.05, suggesting a significant association. The phi coefficient value is -0.108, which means a weak negative association between living status and GAD with certain living arrangements potentially being linked to higher rates of GAD symptoms.

5.2 Analysis of Correlation Coefficient Variables and GAD

There is no significant correlation between the quantitative variables with generalized anxiety disorder. In this case the variables were, age, BMI, academic performance, family income, number of siblings and rank among the siblings. In case of age and BMI, the p-values are $p = 0.572$ and $p = 0.284$, which support the fact that there is no significant relation between GAD, age and BMI. For academic performance the positive correlation coefficient ($r = 0.067$) suggests that if the academic Performance increases, there is a moderate tendency for GAD scores to increase as well. Since the p-value ($p = 0.156$) is greater than the 0.05, the correlation is not statistically significant. The correlation coefficient of -0.004 indicates a very weak and practically negligible relationship between family income and GAD symptoms. This suggests that variations in family income are not associated with changes in GAD symptoms among the individuals in the sample. Additionally, the p-value of 0.938 indicates that this correlation is not statistically significant. For number of siblings and rank among the siblings the p-values stands at $p = 0.667$ and $p = 0.651$ which are also not significant to prove any correlation with GAD.

5.3 Analysis of Binary Logistic Regression Results

Gender: The coefficient (B) for the variable gender is 1.039 and the p-value is ($p < .001$). The odds ratio (Exp(B)) associated with gender is 2.827, with a 95% confidence interval ranging from 1.703 to 4.692. This suggests that individuals of one gender (females) are approximately 2.827 times more likely to have GAD compared to individuals of the other gender (males). The

p-value associated with the coefficient is reported as < .001, indicating that the association between gender and GAD is statistically significant and is unlikely to have occurred by chance alone.

BMI: Between BMI range and GAD, the result yielded a significance (Sig) of p= 0.322. The Exp (B) value is 1.552, and the 95% confidence interval (CI) for the odds ratio ranges from 0.651 to 3.699. The coefficient (B) of 0.439 shows the change in the log odds of experiencing GAD for each one-unit increase in BMI range. However, the p-value of 0.322 suggests that this relationship between BMI range and GAD is not statistically significant. The odds ratio (Exp(B)) of 1.552 signifies the ratio of the odds of experiencing GAD for individuals in one BMI range category compared to individuals in another BMI range category.

Education: The odds ratio (Exp(B)) for education level (undergraduate) is 1.372, meaning that for every one-unit increase in education level, the odds of experiencing GAD increased by approximately 1.372 times. The p-value of 0.415 suggests that this relationship is not statistically significant. Thus, there is insufficient evidence to conclude that there is a significant association between education level and the likelihood of experiencing GAD.

Involvement in a relationship: The p-value for this regression analysis is p= 0.028 which indicates a significant statistical correlation between these two variables. The odds ratio (Exp(B)) linked with this factor is 1.709, with a 95% confidence interval ranging from 1.061 to 2.745. This suggests that the individuals that are involved in a relationship are at 1.709 times higher odds of having GAD compared to those that are not involved in a relationship.

Living Status: The p value for this analysis is p = 0.044 which proves that the data is statistically significant. Individuals living in certain conditions or living statuses can have 1.693 times higher odds of suffering from GAD compared to those in that are living in other living conditions.

Smoking Habit: The p-value for this analysis is p = 0.047 which indicates a significant statistical correlation between these two variables. The odds ratio (Exp(B)) of 0.524 indicates that individuals who smoke have 0.524 times lower odds of experiencing GAD compared to those who are non-smokers. It can thus be said that, smokers have lower chance of experiencing GAD compared to non-smokers and that smoking habit is significantly related with the likelihood of experiencing GAD in the sample population.

Chronic Disease: The p-value of 0.021 describes that there is sufficient evidence to conclude that there is a significant association between chronic disease and the likelihood of experiencing GAD.

5.4 Strength and Limitation

Very few studies have been conducted to assess the mental health of students living in urban regions; consequently, this study can assist in determining the mental status of university students living in such areas, which will be a valuable finding. As the questionnaire was set up in both Bangla and English, the students could understand the questions better and could asses their mental state accordingly. Certainly, there are some limitations of this study. Relying on self-report measures for assessing anxiety levels may result in response bias or inaccuracy due to social desirability. Also, the number participants only cover the urban areas of Bangladesh and not the rural areas. So, the study's geographical scope may not fully capture the range of experiences among university students in different parts of Bangladesh, potentially limiting the findings. The cross-sectional of this study may make it difficult to establish associations between identified risk factors and anxiety results.

5.5 Conclusion

Among 17 variables only five variables were found to have a correlation with anxiety. The prevalence rate of anxiety has a significant burden within the urban population emphasizing the need of addressing mental health issues among university students. This also indicates the fact that students are prone to have anxiety and many factors can trigger that. This type of research can help develop targeted interventions and raise awareness to enhance students' mental health, which may also help in early detection. Understanding individual risk factors can help establish prevention programs that reduce anxiety levels. All these implications can help in improving the quality of life of the students. Altogether, mental health problems should be taken seriously to avoid its persistence upsurge.

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Appendix A

A study on the prevalence and associated risk factors for mental health problems among university students in Bangladesh

[বাংলাদেশি বিশ্ববিদ্যালয় পড়ুয়া ছাত্র-ছাত্রীদের উপর মানসিক স্বাস্থ্য এবং তার কারণ নিয়ে একটি গবেষণা]

The survey is designed to assess the mental health of university students in Bangladesh. This research work has received ethical approval from an Institutional Review Board (UAP/REC/2023/201-S). This is completely an anonymous survey where no one will identify you or compromise your privacy requested here. All information collected here only for explaining the various aspects of this study that will be kept confidential. Your consent to participate in this survey is very important. Thank you in advance for your cooperation in this noble initiative.

[এই গবেষণাটি বাংলাদেশের বিশ্ববিদ্যালয় পড়ুয়া ছাত্র-ছাত্রীদের মানসিক স্বাস্থ্য এবং তার কারণ মূল্যায়ন করার জন্য করা হয়েছে। এই গবেষণা কার্যক্রমটি একটি ইনস্টিটিউশনাল রিভিউ বোর্ড (UAP/REC/2023/201-S) থেকে নৈতিক অনুমোদন পেয়েছে। এটি সম্পূর্ণরূপে একটি অজ্ঞাতনামা/নামবিহীন জরিপ যেখানে আপনাকে সনাক্ত করা যাবে না কিংবা আপনার প্রদানকৃত সকল তথ্য শতভাগ গোপন ও সুরক্ষিত থাকবে। আপনার দেওয়া সকল তথ্য শুধুমাত্র গবেষণা কাজে এবং একাডেমিক উদ্দেশ্যে গোপনীয়তা বজায় রেখে ব্যবহার করা হবে।এই গবেষণায় অংশগ্রহণের জন্য সম্মতি খুব গুরুত্বপূর্ণ। এই মহৎ উদ্যোগে আপনার সহযোগিতার জন্য অগ্রিম ধন্যবাদ।]

Express your consent to participate in the research and processing of anonymous data for scientific purposes [এই নামবিহীন/অজ্ঞাতনামা বৈজ্ঞানিক সমীক্ষায় অংশগ্রহনের জন্য সম্মতি প্রকাশ করুন]

*I am a Bangladeshi university student and have no objection to the privacy policy of this survey and the information collected. I voluntarily agree to take part in this study. [আমি একজন বাংলাদেশী বিশ্ববিদ্যালয়ের ছাত্র/ছাত্রী এবং এই সমীক্ষার গোপনীয়তা নীতি এবং সংগৃহীত তথ্য নিয়ে আমার কোন আপত্তি নেই। আমি স্বেচ্ছায় এই গবেষণায় অংশ নিতে সম্মত।]

- o I do agree (আমি একমত)
- o I do not agree (আমি একমত নই)

Please tick one box for each statement [প্রতিটি উক্তির জন্য যে উত্তরটি আপনার মতামতকে সবচেয়ে ভালোভাবে বর্ণনা করে তা চিহ্নিত করুন]

Section 01: General Questions (*সাধারণ প্রশ্ন*)

1. Age in years [বয়স (বছর)]
   - o ……..
2. Sex [লিঙ্গ পরিচিতি]
   - o Male (পুরুষ)

- Female (মহিলা)
- Others (অন্যান্য)

3. Height (Feet and Inch) [উচ্চতা (ফুট এবং ইঞ্চিতে)]
   - ……..
4. Weight (kg) [ওজন (কেজি)]
   - ……
5. Marital status [বৈবাহিক অবস্থা]
   - Unmarried (অবিবাহিত)
   - Married (বিবাহিত)
   - Divorced (ডিভোর্সড)
6. Education level [শিক্ষাগত যোগ্যতা]
   - Undergraduate level (Year:…….) [স্নাতক (বর্ষ)]
   - Graduate/above level (স্নাতকোত্তর)
7. Academic performance [লেখাপড়ায় ফলাফল]
   - CGPA:……. (সিজিপিএ)
8. Family income monthly (KBDT) [পারিবারিক মাসিক আয় (হাজারে)]
   - …….
9. Family type [পরিবারের ধরণ]
   - Nuclear family (একক পরিবার)
   - Joint family (যৌথ পরিবার)
10. Parents status [পিতামাতার বর্তমান সম্পর্ক]
    - Not separated (অবিচ্ছিন্ন)
    - Separated (বিচ্ছিন্ন)
11. Do you have any sibling (s) [আপনার কি ভাইবোন আছে?]
    - Yes (number……..& your rank…….) [হ্যাঁ (সংখ্যা এবং আপনার ক্রম)]
    - No (না)
12. Are you involved in a relationship? [আপনি কি কোন সম্পর্কে জড়িত আছেন?]
    - Yes (হ্যাঁ)
    - No (না)
13. Living status [বসবাসের অবস্থা]
    - With family (পরিবারের সাথে)
    - Without family (পরিবার ছাড়া)
14. Smoking habit [ধূমপানের অভ্যাস]
    - Non-smoker (অধূমপায়ী)
    - Current smoker (ধূমপায়ী)
    - Ex-smoker (আগে ধূমপায়ী ছিলেন)
15. Do you have any chronic diseases? [আপনি কি কোন দীর্ঘস্থায়ী রোগে আক্রান্ত?]
    - Yes (হ্যাঁ)
    - No (না)

16. Residence area [বসবাসের এলাকা]
    - Urban (শহর)
    - Rural (গ্রাম)

Section 2: Mental Health Related Questions (*মানসিক স্বাস্থ্য সম্পর্কিত প্রশ্ন)*

1. Over the last 2 weeks, how often have you been bothered by feeling nervous, anxious or on edge? [বিগত দুই সপ্তাহে কতোবার আপনি বিচলিত, উদ্বিগ্ন, এবং চিন্তিত অনুভব করেছেন?]
    - Not at all (0) (একবারেই না)
    - Several days (1) (মাঝে মাঝে)
    - More than half the days (2) (বেশিরভাগ দিন)
    - Nearly every day (3) (প্রায়ই)
2. Over the last 2 weeks, how often have you been bothered by not being able to stop or control worrying? [বিগত দুই সপ্তাহে কতোবার আপনি উদ্বেগ প্রশমিত অথবা নিয়ন্ত্রণ করতে ব্যর্থ হয়েছেন?]
    - Not at all (0) (একবারেই না)
    - Several days (1) (মাঝে মাঝে)
    - More than half the days (2) (বেশিরভাগ দিন)
    - Nearly every day (3) (প্রায়ই)
3. Over the last 2 weeks, how often have you been bothered by worrying too much about different things? [বিগত দুই সপ্তাহে আপনি কতোবার বিভিন্ন বিষয় নিয়ে অতিরিক্ত উদ্বিগ্নবোধ করেছেন?]
    - Not at all (0) (একবারেই না)
    - Several days (1) (মাঝে মাঝে)
    - More than half the days (2) (বেশিরভাগ দিন)
    - Nearly every day (3) (প্রায়ই)
4. Over the last 2 weeks, how often have you been bothered by trouble relaxing? [বিগত দুই সপ্তাহে আপনি কতোবার শান্ত অথবা স্থির হতে ব্যর্থ হয়েছেন?]
    - Not at all (0) (একবারেই না)
    - Several days (1) (মাঝে মাঝে)
    - More than half the days (2) (বেশিরভাগ দিন)
    - Nearly every day (3) (প্রায়ই)
5. Over the last 2 weeks, how often have you been bothered by being so restless that it's hard to sit still? [বিগত দুই সপ্তাহে কতোবার আপনি এতটাই অস্থিরতাবোধ করেছেন যে আপনার কাছে স্থির হয়ে বসা কঠিন মনে হয়েছে?]
    - Not at all (0) (একবারেই না)
    - Several days (1) (মাঝে মাঝে)
    - More than half the days (2) (বেশিরভাগ দিন)
    - Nearly every day (3) (প্রায়ই)

6. Over the last 2 weeks, how often have you been bothered by becoming easily annoyed or irritable? [বিগত দুই সপ্তাহে কতোবার আপনি অতি সহজেই বিরক্তবোধ করেছেন?]
   - o Not at all (0) (একবারেই না)
   - o Several days (1) (মাঝে মাঝে)
   - o More than half the days (2) (বেশিরভাগ দিন)
   - o Nearly every day (3) (প্রায়ই)
7. Over the last 2 weeks, how often have you been bothered by feeling afraid as if something awful might happen? [বিগত দুই সপ্তাহে কতোবার আপনি ভয়াবহ কিছু ঘটার সম্ভাবনায় ভীত বোধ করে বিচলিত হয়েছেন?]
   - o Not at all (0) (একবারেই না)
   - o Several days (1) (মাঝে মাঝে)
   - o More than half the days (2) (বেশিরভাগ দিন)
   - o Nearly every day (3) (প্রায়ই)
8. Over the last 2 weeks, how often have you been bothered by little interest or pleasure in doing things? [বিগত দুই সপ্তাহে আপনি কতোবার স্বাভাবিক কাজকর্ম করতে আনন্দ বা আগ্রহের অভাব অনুভব করেছেন?]
   - o Not at all (0) (একবারেই না)
   - o Several days (1) (মাঝে মাঝে)
   - o More than half the days (2) (বেশিরভাগ দিন)
   - o Nearly every day (3) (প্রায়ই)
9. Over the last 2 weeks, how often have you been bothered by feeling down, depressed, or hopeless? [বিগত দুই সপ্তাহে কতোবার আপনি মন খারাপ, হতাশা অথবা নিরাশ অনুবভ করেছেন?]
   - o Not at all (0) (একবারেই না)
   - o Several days (1) (মাঝে মাঝে)
   - o More than half the days (2) (বেশিরভাগ দিন)
   - o Nearly every day (3) (প্রায়ই)
10. Over the last 2 weeks, how often have you been bothered by trouble falling or staying asleep, or sleeping too much? [বিগত দুই সপ্তাহে, ঘুমের অসুবিধা অথবা অনেক বেশি ঘুম, এমনটি কতোবার ঘটেছে আপনার সাথে?]
    - o Not at all (0) (একবারেই না)
    - o Several days (1) (মাঝে মাঝে)
    - o More than half the days (2) (বেশিরভাগ দিন)
    - o Nearly every day (3) (প্রায়ই)
11. Over the last 2 weeks, how often have you been bothered by feeling tired or having little energy? [প্রায়ই ক্লান্ত অনুভব বা কাজেকর্মে শক্তি পাচ্ছেন না এমনটি কতোবার ঘটেছে আপনার সাথে বিগত দুই সপ্তাহে?]
    - o Not at all (0) (একবারেই না)
    - o Several days (1) (মাঝে মাঝে)
    - o More than half the days (2) (বেশিরভাগ দিন)
    - o Nearly every day (3) (প্রায়ই)

12. Over the last 2 weeks, how often have you been bothered by poor appetite or overeating? [বিগত দুই সপ্তাহে, কতোবার আপনার সাথে এমন হয়েছে যে, অনেক ক্ষুধা পাচ্ছে অথবা একদমই খেতে ইচ্ছে করছে না?]
    - o Not at all (0) (একবারেই না)
    - o Several days (1) (মাঝে মাঝে)
    - o More than half the days (2) (বেশিরভাগ দিন)
    - o Nearly every day (3) (প্রায়ই)
13. Over the last 2 weeks, how often have you been bothered by feeling bad about yourself or that you are a failure or have let yourself or your family down? [বিগত দুই সপ্তাহ ধরে, আপনার কি এমন মনে হয় যে, আপনি ব্যর্থ এবং আপনি নিজেকে এবং আপনার পরিবারকে নিরাশ করছেন?]
    - o Not at all (0) (একবারেই না)
    - o Several days (1) (মাঝে মাঝে)
    - o More than half the days (2) (বেশিরভাগ দিন)
    - o Nearly every day (3) (প্রায়ই)
14. Over the last 2 weeks, how often have you been bothered by trouble concentrating on things, such as reading the newspaper or watching television? [বিগত দুই সপ্তাহ ধরে, আপনার কি এমন মনে হয় যে, আপনি স্বাভাবিক কোনো কাজকর্মে মনোযোগ দিতে পারছেন না?]
    - o Not at all (0) (একবারেই না)
    - o Several days (1) (মাঝে মাঝে)
    - o More than half the days (2) (বেশিরভাগ দিন)
    - o Nearly every day (3) (প্রায়ই)
15. Over the last 2 weeks, how often have you been bothered by moving or speaking so slowly that other people could have noticed? Or the opposite, being so fidgety or restless that, you have been moving around a lot more than usual? [বিগত দুই সপ্তাহে, আপনি আপনার কাজেকর্মে এবং কথাবার্তায় অনেক বেশি ধীরগতি অথবা অধৈর্য এবং অস্থিরতা অনুভব করেছেন কিনা?]
    - o Not at all (0) (একবারেই না)
    - o Several days (1) (মাঝে মাঝে)
    - o More than half the days (2) (বেশিরভাগ দিন)
    - o Nearly every day (3) (প্রায়ই)
16. Over the last 2 weeks, how often have you been bothered by thoughts that you would be better off dead or of hurting yourself in some way? [বিগত দুই সপ্তাহে, আপনার কি মনে হয়েছে যে বেঁচে থাকার চেয়ে মরে যাওয়া ভালো বা এমন কোনো চেষ্টা করেছেন কিনা?]
    - o Not at all (0) (একবারেই না)
    - o Several days (1) (মাঝে মাঝে)
    - o More than half the days (2) (বেশিরভাগ দিন)
    - o Nearly every day (3) (প্রায়ই)

17. Over the last 2 weeks, how often have you been bothered by the time taken to fall asleep after turning off the lights? [ঘুমাতে গিয়েও ঘুম আসছে না অথবা অনেক সময় লাগছে এমনটি আপনার সাথে কতোবার হয়েছে বিগত দুই সপ্তাহে?]
    - Not at all (0) (একেবারেই না)
    - Slightly delayed (1) (সামান্য দেরি)
    - Markedly delayed (2) (যথেষ্ট দেরি)
    - Very delayed or did not sleep at all (3) (অতিরিক্ত দেরি/ অনিদ্রা)
18. Over the last 2 weeks, how often have you been bothered by awakenings during the night? [মাঝরাতে হঠাৎ করে ঘুম ভেঙে যাওয়ার মতো অসুবিধা বিগত দুই সপ্তাহে কতোবেশি অনুভব করেছেন?]
    - No problem (0) (একবারও হয়নি)
    - Minor problem (1) (সামান্য পরিমাণ অসুবিধা)
    - Considerable problem (2) (যথেষ্ট পরিমাণ অসুবিধা)
    - Serious problem or did not sleep at all (3) (গুরুতর অসুবিধা/অনিদ্রা)
19. Over the last 2 weeks, how often have you experienced final awakening earlier than desired? [সকালে ওঠার যথেষ্ট আগে ঘুম ভেঙে যায় এবং আর ঘুম আসেনা এমন সমস্যা আপনি বিগত দুই সপ্তাহে কতোবার অনুভব করেছেন?]
    - Not earlier (0) (একবারও হয়নি)
    - A little earlier (1) (সামান্য আগে ঘুম ভেঙে যায়)
    - Markedly earlier (2) (যথেষ্ট আগে ঘুম ভেঙে যায়)
    - Much earlier or did not sleep at all (3) (অনেক আগে/ অনিদ্রা)

20. Over the last 2 weeks, how long was your total sleep duration? [বিগত দুই সপ্তাহে আপনার সম্পূর্ণ ঘুমের সময়কাল কেমন ছিলো?]
    - Sufficient (0) (পর্যাপ্ত)
    - Slightly insufficient (1) (কিছুটা অপর্যাপ্ত)
    - Markedly insufficient (2) (যথেষ্ট অপর্যাপ্ত)
    - Very insufficient or did not sleep at all (3) (অনেক বেশি অপর্যাপ্ত/ অনিদ্রা)
21. Over the last 2 weeks, how was your experience of the overall quality of sleep (no matter how long you slept)? [বিগত দুই সপ্তাহে আপনার সামগ্রিক ঘুমের কোয়ালিটি কেমন ছিলো (ঘুমের সময়কালের সাথে সম্পর্কহীন)?]
    - Satisfactory (0) (যথেষ্ট ভালো)
    - Slightly unsatisfactory (1) (সামান্য খারাপ)
    - Markedly unsatisfactory (2) (যথেষ্ট খারাপ)
    - Very unsatisfactory or did not sleep at all (3) (অতিরিক্ত খারাপ/ অনিদ্রা)
22. Over the last 2 weeks, have you realized that your sense of well-being is being decreased during the day? [বিগত দুই সপ্তাহ ধরে, আপনার সামগ্রিক ভালো লাগা অথবা ভালো থাকার মতো বিষয়গুলো কি ক্রমশ কমে যাচ্ছে বলে মনে হয়?]
    - Normal (0) (স্বাভাবিক আছে)
    - Slightly decreased (1) (সামান্য পরিমাণ কমেছে)
    - Markedly decreased (2) (যথেষ্ট পরিমাণ কমেছে)
    - Very decreased (3) (অতিরিক্ত পরিমাণ কমেছে/ অনিদ্রা)

23. Over the last 2 weeks, have you realized that your ability to function (physical and mental) during the day has decreased? [বিগত দুই সপ্তাহ ধরে আপনার কি এমন মনে হয় যে, আপনার শারিরীক এবং মানসিক কর্মক্ষমতা কমে গিয়েছে?]
    - Normal (0) (স্বাভাবিক আছে)
    - Slightly decreased (1) (সামান্য পরিমাণ কমেছে)
    - Markedly decreased (2) (যথেষ্ট পরিমাণ কমেছে)
    - Very decreased (3) (অতিরিক্ত পরিমাণ কমেছে/ অনিদ্রা)
24. Over the last 2 weeks, how often have you been bothered by sleepiness during the day? [বিগত দুই সপ্তাহ ধরে আপনার কি এমন মনে হয় যে, দিনের বেলা আপনি ঘুম ঘুম অনুভব করেন?]
    - None (0) (একবারেই না)
    - Mild (1) (সামান্য পরিমাণ)
    - Considerable (2) (যথেষ্ট পরিমাণ)
    - Intense (3) (অতিরিক্ত পরিমাণ)

Any comments [আপনার মতামত]

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Thank you for completing this survey [আপনার সহযোগিতার জন্যে অসংখ্য ধন্যবাদ।]