

**SCHOOL OF PUBLIC HEALTH
COLLEGE OF HEALTH SCIENCES
UNIVERSITY OF GHANA**



**DETERMINANTS OF SHISHA SMOKING AMONG STUDENTS AT THE
UNIVERSITY OF GHANA**

BY

**DR. QUEENLY ABIGAIL NAA OYOO QUARTEY
(11366325)**

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DECLARATION

I, Dr. Queenly Abigail Naa Oyoo Quarthey, declare that this proposal is the result of my own research. Published literature of other research have been duly acknowledged by means of referencing.



28-02-2025

DR. QUEENLY ABIGAIL NAA OYOO QUARTEY

DATE

STUDENT



29-08-2025

DR. PAUL K. BOTWE

DATE

SUPERVISOR



DEDICATION

I dedicate this work to my family, my husband and to all my friends and loved ones who helped me throughout this journey. I appreciate the contributions and unflinching support throughout my school journey.



ACKNOWLEDGMENT

I am eternally grateful to the Lord Almighty for his grace, favour and wisdom to navigate through this course and successfully bring it to completion.

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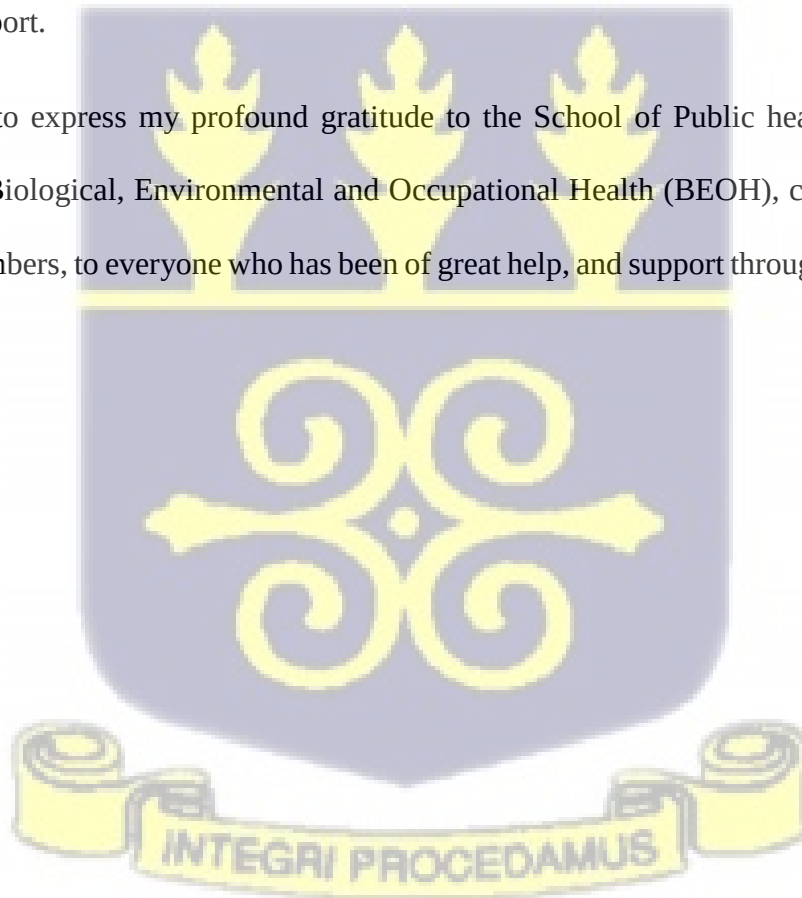


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ABSTRACT

Background: Shisha smoking has gained popularity among university students globally, despite its associated health risks. In Ghana, there is limited research on the factors influencing its use among university students. This study examines the factors associated with shisha smoking among students at the University of Ghana.

Aim: To assess the factors associated with the use of Shisha by students at the University of Ghana

Methods: A cross-sectional study was conducted among University of Ghana students using a structured questionnaire. The study assessed socio-demographic characteristics, knowledge, and behavioural factors associated with shisha smoking. Descriptive statistics, logistic regression analyses and chi-square tests were performed to determine associations between shisha smoking and various factors.

Results: Out of the total respondents, 54.1% were male, and 79% were aged 20-29 years. The proportion of students who smoke shisha was 14.3%, with 11.1% of smokers reporting previous shisha use. Knowledge of shisha smoking was generally high, with 84.5% of students demonstrating good knowledge. However, 65% believed that shisha is healthier than cigarette smoking. Factors significantly associated with shisha smoking included educational level, marital status, and parental background. Second year and postgraduate students had lower odds of smoking shisha, while students with divorced parents were more likely to engage in shisha smoking.

Conclusion: Shisha smoking is prevalent among University of Ghana students, despite their high level of knowledge about its risks. Misconceptions regarding its safety persist, indicating the need for targeted health education. Preventive measures should focus on addressing social and

demographic influences, particularly parental background and academic level, to reduce shisha smoking among university students.



CHAPTER ONE

INTRODUCTION

1.1 Background

Tobacco kills millions of people every year. Approximately, 8 million deaths and 200 million disability adjusted life-years worldwide were recorded by tobacco use in 2019 based on the Global Burden of Disease Study. (Rehman & Baig, 2024) Tobacco, mostly presented in various forms including cigarettes, cigars, chewable tobacco, bidis, and “Shisha” also known as Hookah, water pipe, goza, nargile and hubble-bubble. (Aanyu et al., 2019)

Shisha is a new practice of smoking tobacco. The use of shisha has evolved recently in many countries, especially among the youth. Shisha smoking originated in the 16th century by Hakim Abdul-Fath Gilani, who was a physician. The purpose of smoking was to pass smoke through water in the quest to ‘filter’ the smoke and make it less harmful to smoke. Shisha smoking was mostly used by the elderly men during the 20th Century. Its use was associated with cultural and social norms that were geared towards leisure practices. This practice was popular among men from the Middle East Region. By the late 20th century, the trend of smoking shisha became very prominent among the youth in high schools and in universities.

The reasons for the emerging use of shisha and the fast acceptance worldwide is the belief that it causes less harm, due to peer pressure, media influence, particularly in advertisements and movies, affordability and widespread availability. Of all the beliefs, the idea that shisha is less harmful and comes in a variety of flavors is the reason for the fast growth of shisha smoking most especially among the youth. (Fagbule & Cadmus, 2022)

A significant number of studies have been done on Shisha smoking worldwide and especially in Africa. Most studies have focused mainly on the prevalence of shisha smoking. For example, a study conducted in South Africa and Nigeria recorded 66% and 14% in prevalence respectively.(Fagbule & Cadmus, 2022)

In Ghana, there has been an emerging use of shisha smoking among the youth. The shisha serves as a form of recreation in pubs, nightclubs and restaurants. The use of shisha is profound especially among students in the universities. In comparison to other countries, some research has been done in reference to the factors and knowledge level of shisha but in Ghana, there has been limited research conducted on the aforementioned references.

Students in the university engage in shisha smoking, making them exposed to these detrimental health, social and academic effects. This study therefore seeks to assess factors such demographic, environmental and socio-economic factors associated with shisha smoking and the knowledge level among undergraduate and post-graduate students at the University of Ghana.

1.2 Problem Statement

Tobacco use has become an issue of public health interest. Global efforts against tobacco use have traditionally focused on cigarette smoking and alternative tobacco products, such as shisha which has gained popularity among the youth. In Ghana, recent GYTS findings reveal that 1.5% of the youth are involved in smoking of tobacco related products such as shisha. (Logo et al., 2021)

Despite's Ghana's implementation of tobacco control measures such as the Tobacco Control Regulations (2016 L.I.2247) and the Public Health Act (2012, Act 851), these policies primarily

target cigarette use and often omit or inadequately address alternative products like Shisha. (Kyei-Gyamfi & Kyei-Arthur, 2023) This regulatory gap, allows shisha smoking to emerge in settings like cafes, lounges and among student groups, unchallenged by robust enforcement and awareness campaigns.

Regardless of its effects, shisha has gained increased use due to acceptance, appeal and the notion that it is less harmful due to the pleasant fruity flavour it exudes. (Aanyu et al., 2019)

The rise in shisha smoking could be as a result of the fact that the youth is oblivious of the harmful effects of the use of shisha. In a study conducted in Kampala-Uganda, it was realized that the youth had insufficient knowledge on the harmful effects of shisha. The lack of knowledge on the harmful effects of shisha has led to the proliferation of its use by the youth. (Aanyu et al., 2019)

Shisha smoke contains more harmful chemicals than cigarette smoke. Additionally, shisha smoke can be loaded with dangerous heavy metals, further exacerbating the potential harm to individuals who use it. (Patil et al., 2022) 95.2% of students in Burkina Faso stated that Shisha may be harmful to health. Similar responses were seen in Uganda and South Africa with 86.7% and 91% respectively. (Ouedraogo et al., 2023)

In Ghana, there is limited information on the knowledge level of shisha among University students and therefore the rationale for the conduct of this study. (Logo et al., 2020)

Moreover, there are many factors associated with the smoking of shisha among the youth and among students. In a study conducted among university students in Sharjah in Dubai, factors such as addiction, pleasure and social interaction were the significant factors associated with the use of shisha smoking behaviours among students in the University of Sharjah (Saravanan et al., 2019).

The social and behavioural aspect has been considered an important feature specific to shisha

smoking due to the fact that shisha smoking was a good coping mechanism of handling stress, anxiety and depression. Moreover, close friends and family members who smoked shisha had the notion that it is socially acceptable and not harmful to use. (Ouedraogo et al., 2023)

An alarming trend is the lack of focused research on shisha smoking among Ghanaian students especially at the secondary and tertiary level. Most available studies emphasize cigarette use, leaving a critical knowledge gap regarding shisha's prevalence, socio-demographic determinants, perception and policy context in educational institutions.

Thus, there is an urgent need for comprehensive research into shisha smoking among Ghanaian students- one that explores its prevalence, determinants (behavioural, social, demographic, and socio-economic factors) and the knowledge gap among students. Addressing this gap is essential not only for protecting student health but for informing effective public health interventions and policies tailored to evolving shisha use among university students.

1.3 Justification

Tobacco use among young people remains a global public health concern. According to the Global Youth Tobacco Survey (GYTS), approximately 1 out of 7 students use any form of tobacco product, the number of students who currently smoked cigarette and currently used other forms of tobacco products other than cigarettes were 4% and 12.5% respectively. (Logo et al., 2020)

Shisha smoking has recorded an increased prevalence in recent years. Shisha is used among the youth in nightclubs, cafes, bars, and eateries. There is an emerging use of shisha in some countries because it is known to be safer as compared to cigarettes smoking. (Nghane et al., 2023) This prevalence has influenced the majority of the youth into smoking of shisha. The factors associated with its use could be social interaction and addictive behavioral factors among others.

The University of Ghana is currently populated with over 60,000 students. Due to the high prevalence of shisha smoking by the youth, it is imperative for the study to be carried out to find out the number of people who smoke shisha among the student population. This information will furnish the stakeholders of the university with information about the determinants and factors associated with Shisha smoking and the knowledge level of students on Shisha smoking.

In Ghana, studies conducted by (Logo et al., 2020) and by (Kyei-Gyamfi & Kyei-Arthur, 2023) looked at the prevalence of shisha smoking among the youth.

The gaps in this research are that the studies did not explore thoroughly the factors associated with shisha smoking and the knowledge level among the youth.

Moreover, this study seeks to bridge the gaps and will, therefore look at the factors associated with the use of shisha and the knowledge level of students on shisha smoking at the University of Ghana.

Findings from the research can be used for targeted health education. Thus, by identifying knowledge gaps and misconceptions about shisha (e.g., the belief that it is less harmful than cigarettes), the University can design campus-specific awareness campaigns and integrate anti-shisha education into student orientation programs. This ensures that students are adequately informed about the risks before or during their exposure to campus life.

Moreover, the study's findings will provide evidence to guide policy formulation by the Food and Drugs Authority (FDA), University Health Services, and other stakeholders. Specifically, results can inform the regulation of shisha lounges and eateries around the university, limiting student access to such environments. University administrators can also develop campus policies that discourage or prohibit shisha use in student spaces.

In addition, identifying the risk profiles of shisha smokers (e.g., students influenced by peers, stress, or social settings) will enable early intervention measures, including counselling, peer-support systems, and cessation programs. This proactive approach can prevent long-term dependence and health complications.

In a nut shell, some studies done by (Logo et al., 2021) that focused primarily on prevalence, this research will simultaneously assess knowledge levels and multiple determinants of shisha smoking among undergraduate and post-graduate university students. This novel approach will thereby fill a critical gap in existing literature and ensure that interventions are evidence-based and holistic.



1.4 Conceptual Framework

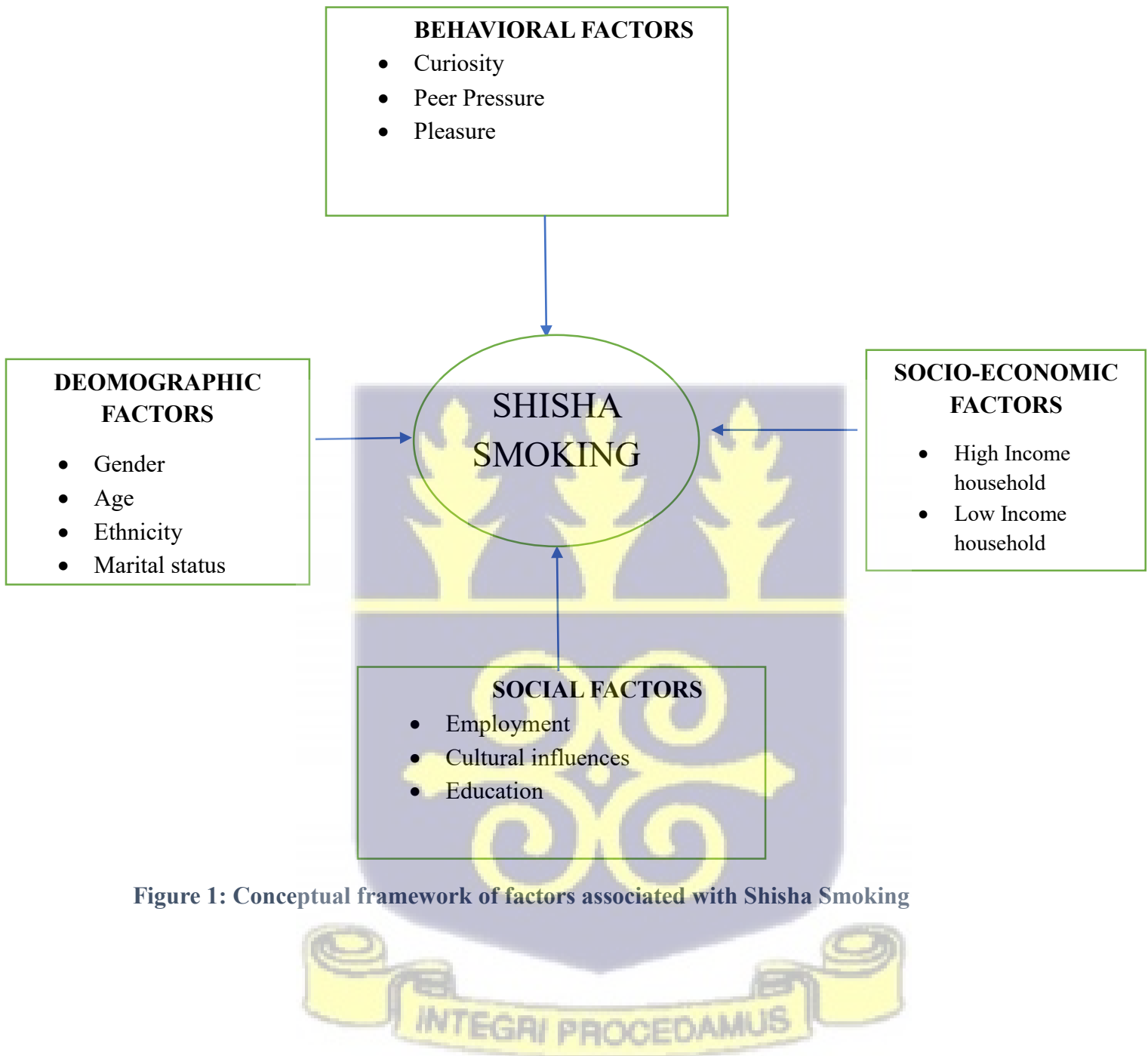


Figure 1: Conceptual framework of factors associated with Shisha Smoking

1.5 Narrative of Conceptual Framework

There are various factors associated with the smoking of shisha, and these can broadly be categorized into demographic, socio-economic, social, and behavioural factors. Some of these determinants are personal in nature, arising from socio-demographic characteristics such as age, level of education, family background, and ethnicity. These personal factors play a crucial role in shaping students' attitudes and behaviours toward shisha smoking.

First of all, social factors are highly influential in the initiation and continuation of shisha smoking. Students are often exposed to peer pressure, curiosity, and the desire for pleasure, which significantly affect their decision to smoke. The need for a sense of belonging makes students more likely to listen to their peers, and in many cases, this leads to engagement in habits such as shisha smoking.

Moreover, curiosity is another important factor influencing shisha use among students. Being naturally adventurous, students often seek new experiences without necessarily considering the consequences. This tendency drives many of them to experiment with shisha.

Furthermore, gender differences play a significant role in shaping smoking patterns. Evidence from studies in Nigeria and Cameroon indicates that the prevalence of shisha smoking is higher among males compared to females. (Ngahane et al., 2023; Otakhoigbogie et al., 2022) Cultural beliefs and values also contribute to this pattern, as some societies are more permissive of shisha use among men than women.

In addition, socio-economic factors influence shisha smoking in diverse ways. Students from low-income backgrounds may encounter challenges in affording shisha due to its cost. However, they may also view shisha smoking as a relatively accessible form of recreation or relaxation, especially when financial constraints limit their participation in other social activities. (Mdege et al., 2025). On the other hand, students from high-income backgrounds may have greater access to shisha smoking because of their frequent involvement in social events such as clubbing, parties, and gatherings—venues where shisha is commonly available. (Redempta Mutei David, 2024).

In summary, the conceptual framework highlights that shisha smoking among students is shaped by an interplay of personal, social, cultural, and socio-economic factors. Understanding these interlinked factors is essential in addressing the growing prevalence of shisha use among the youth.

1.6 Research Questions

1. What is the level of knowledge on the use of shisha by undergraduate and post-graduate students at the University of Ghana?
2. What are the determinants of shisha smoking by students at the University of Ghana?
3. To assess the prevalence of shisha smoking by undergraduate and post-graduate students at the University of Ghana.

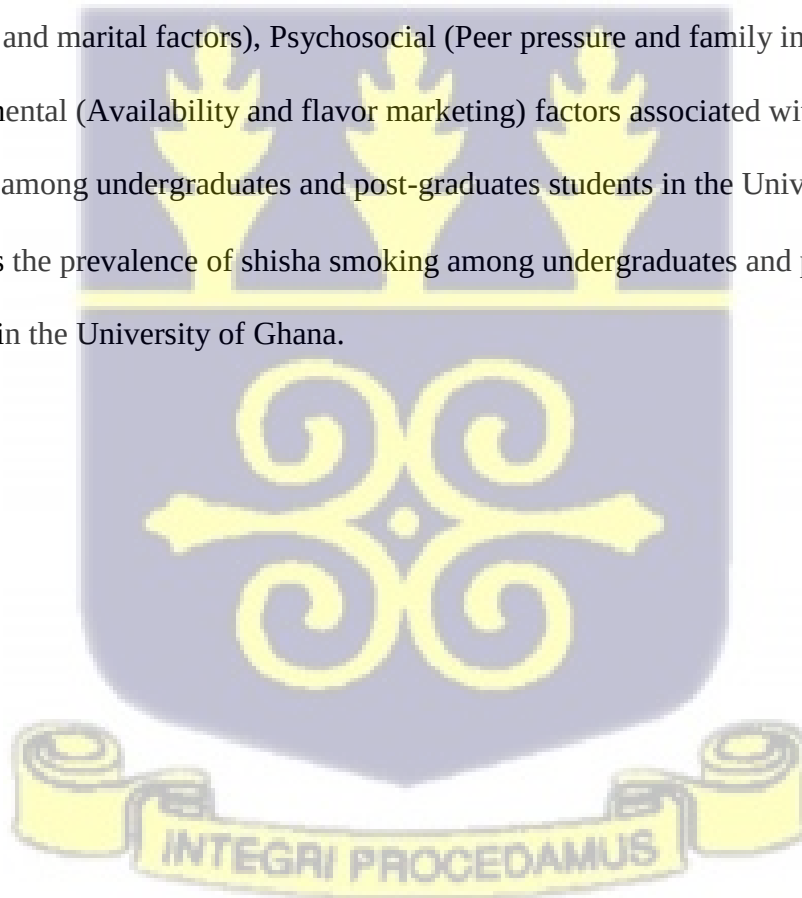
1.7 Objectives of the Study

1.7.1 General Objective

The main objective of the study is to assess the factors associated with the use of Shisha by students at the University of Ghana.

1.7.2 Specific Objectives

- To assess the level of knowledge about the health risks of shisha among undergraduates and post-graduates students of the University of Ghana using a 5-Point Likert scale.
- To identify and measure the relative contribution of socio-demographic (age, gender, ethnicity and marital factors), Psychosocial (Peer pressure and family influence) and environmental (Availability and flavor marketing) factors associated with current shisha smoking among undergraduates and post-graduates students in the University of Ghana.
- To assess the prevalence of shisha smoking among undergraduates and post-graduates students in the University of Ghana.



CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Smoking is a leading cause of preventable death and morbidity worldwide, with strong associations to lung cancer, chronic obstructive pulmonary disease (COPD), stroke, and ischemic heart disease. Although conventional cigarette smoking has received significant public health attention, alternative forms of tobacco, especially shisha (hookah or water pipe smoking) have emerged as an increasing concern among young adults and university students. Originating as a method to “filter” tobacco smoke through water, shisha smoking has evolved from an ancient cultural practice into a global phenomenon. Despite popular misconceptions that water filtration renders shisha safer than cigarettes, recent evidence consistently demonstrates that shisha use exposes individuals to numerous toxic substances, contributing to serious health risks. This review synthesizes current research on the prevalence, determinants, knowledge and health implications of shisha smoking, with a focus on how these factors may be relevant for undergraduate and post-graduate students at the University of Ghana. Particular attention is given to Ghana, where empirical data remain limited, yet anecdotal and some studies suggest a rising trend among University Students.

2.2 Global Prevalence and Regional Variations

Shisha smoking has gained widespread popularity across diverse regions. In Qatar, (Rashed et al., 2022) reported that nearly half of adult tobacco users in primary healthcare settings were current shisha smokers, highlighting its prevalence in the Eastern Mediterranean. Similarly, studies from Sub-Saharan Africa indicate that shisha use is emerging among youth; for example, (Otakhoigbogie et al., 2022) found that approximately 24.7% of Nigerian university students had

ever smoked shisha, while research in Kisumu County, Kenya, documented a prevalence rate as high as 37% among tertiary students (Redempta Mutei David, 2024). In Burkina Faso, (Ouedraogo et al., 2023) noted that 38.5% of university students had engaged in shisha smoking. These studies underscore not only regional variations in prevalence but also the influence of local socio-economic and regulatory environments on tobacco use patterns.

In Ghana, available evidence remains limited but signals similar trends. A nationwide survey reported that 44% of female smokers and 6.6% of male smokers used shisha. ("Ghana Steps Report ", 2023), while an Accra-based study reported a mean initiation age of 23.2 years. (Massawudu et al., 2021) Compared to Nigeria (22.6 years) and Saudi Arabia (18–20 years), Ghanaian students initiate later, suggesting a unique local trajectory. However, data remain sparse, underscoring the need for targeted studies within Ghanaian universities.

Highlighting the fact that most of the above studies are cross-sectional, limiting the ability to establish causal patterns or trajectories of use. Therefore, there is a need for longitudinal or mixed methods work to establish causality and trajectories of shisha use especially since curiosity, peer pressure and sensory appeal are dynamic rather than static influences which may 'change over time.

2.3 Factors associated with Shisha Smoking

2.3.1 Behavioral factors

Shisha smoking is associated with some behavioral factors such as peer pressure, sexual behavior, emotions, sexual health, and curiosity.

Curiosity:

Curiosity is consistently identified as a key factor driving the initiation of shisha smoking among university students. Recent evidence indicates that the novelty of the sensory experience characterized by aromatic flavors and visually appealing, dense smoke plays a critical role in prompting first-time use. For example, (Mdege et al., 2024) reported that many Nigerian students-initiated shisha smoking primarily out of a desire to explore its unique sensory characteristics. The study emphasizes that this initial curiosity, when reinforced by a pleasurable experience, can lead to the development of habitual smoking behavior.

In a cross-sectional study among undergraduate students in Saudi Arabia, curiosity was identified as a significant factor for starting shisha smoking, accounting for 14.4% of the reasons given by shisha smokers. This study also highlighted other factors, such as stress, peer pressure, and boredom, as common reasons for initiating shisha use (Issrani et al., 2024). These findings demonstrate that while curiosity is a primary motivator, it does not operate in isolation; rather, it is intertwined with other behavioral and emotional factors. Similarly, (Al-Sawalha et al., 2021) found that among university students in Jordan, the sensory appeal of shisha especially its variety of flavors and the novelty of the waterpipe significantly predicted its initiation. Their findings indicate that even when health risks are acknowledged, the allure of trying something new can override caution.

Collectively, these recent studies underscore that the sensory novelty of shisha is a powerful catalyst for its initiation among university students. However, the cross-sectional nature of most current research limits our understanding of how curiosity evolves into habitual behavior.

Moreover, based on the theory of planned behavior, curiosity reflects attitude towards the behavior of smoking because it shapes or encourages students' beliefs that trying shisha is fun, harmless and trendy and the sensory appeal (eg. flavors) creates great expectations and reinforces the appeal of the smoking of shisha.

Peer Pressure:

Peer influence is widely recognized as a critical determinant of shisha smoking among university students. Recent studies underscore that individuals are significantly more likely to initiate shisha use when they observe friends or family members engaging in the habit. For instance, (Mdege et al., 2024) in Nigeria found that a substantial proportion of university students reported that peer pressure was a key motivator for their initiation into shisha smoking, with many indicating that they frequently smoked in the company of friends. Similarly, (Otakhoigbogie et al., 2022) observed that students with close friends who smoked shisha were significantly more likely to become users themselves, reinforcing the role of social norms in shaping behavior. Additional evidence from Cameroon supports these findings. (Ngahane et al., 2023) reported that among university students, the presence of peers who smoked shisha was one of the strongest predictors of individual use. Their study showed that the normalization of shisha smoking within academic and social circles contributed markedly to its uptake. However, while these studies provide valuable insights, several methodological limitations must be acknowledged. Both studies largely rely on cross-sectional designs and self-reported data, which are susceptible to recall and social desirability biases. Consequently, the causal relationship between peer influence and shisha smoking remains unclear; it is difficult to ascertain whether peer pressure is a precursor to shisha initiation or a concurrent factor that reinforces an already established behavior. Additionally, although statistical associations are significant, these studies often do not control potential confounding factors such

as family influence, socioeconomic status, and academic pressures, which might also contribute to the observed associations. In Ghana, where social gatherings and nightlife are integral to campus culture, peer influence may be similarly strong but remain undocumented.

Moreover, the cultural context within which these studies were conducted is critical. In Nigeria, where social gatherings and communal experiences are deeply valued, the peer effect might be more pronounced compared to settings with different cultural dynamics. This raises the question of whether similar findings would be observed in other contexts, including within the University of Ghana, where different social and academic environments might moderate the influence of peers.

Based on the theory of planned behavior, attitude towards the behavior of smoking, subjective norms and perceived behavioral control forms an integral part in the smoking of shisha by students of the university. However, peer pressure is mainly classified under subjective norms where students feel the social pressure to indulge in smoking. According to the social cognitive theory, the influence of smoking is created by social norms and observational learning where students adapt to peer behavior to engage in the smoking of shisha.

Pleasure:

The pleasurable experience associated with shisha smoking is a key driver behind its use among University students. Recent studies underscore that the sensory appeal of shisha characterized by its attractive flavors, pleasant aroma, and unique tactile experience of using a waterpipe plays a critical role in its initiation and maintenance. For instance, (Mdege et al., 2024) found that a considerable number of shisha users in Nigeria cited the enjoyment and fun aspect of shisha sessions as primary motivators. They reported that the sensory pleasure, combined with the social

bonding experienced during group sessions, reinforces the habit and makes it more likely to persist over time.

Similarly, (Ngahane et al., 2023) documented that university students in Cameroon identified the appealing taste and aroma of flavored shisha as major factors in their decision to smoke. Their findings suggest that the hedonic qualities of shisha not only attract first-time users but also contribute to the continuation of the behavior among regular users.

In contrast, (Fagbule & Cadmus, 2022) observed among medical and dental students in Ibadan that, while the pleasurable aspects of shisha smoking were acknowledged, the behavior was also strongly linked to the social context in which it occurs. Their study highlighted that the fun and communal nature of shisha sessions contributed significantly to its uptake, with the sensory enjoyment acting as a reinforcing element alongside peer influence.

Findings from (Rashed et al., 2022) in Qatar further elaborate on these themes. Their research indicated that although the pleasurable sensory experience of shisha is a well-recognized factor, its use is also driven by broader social factors such as peer pressure and the ease of access in urban environments. These studies, taken together, illustrate that the pleasurable aspects of shisha smoking, ranging from the sensory enjoyment of flavors and aromas to the social bonding in group settings are central to its appeal. However, the relative importance of pleasure as a motivator appears to be moderated by contextual variables such as cultural norms, regulatory environments, and the specific social settings in which shisha is consumed.

Thus, while pleasure is a common and critical driver of shisha use, its influence is interwoven with social and environmental factors,

2.3.2 Demographic Factors

Age:

According to (Perez et al., 2025), the largest increase in hookah use occurs between ages 18 and 19, with ever use rising from 5.8% to 10.5% by age 21 and reaching 20.4% by age 25. This indicates that early adulthood is a critical period for the initiation of shisha smoking, as young adults are often drawn to the novel sensory experience it offers. In Saudi Arabia, (Issrani et al., 2024) observed that shisha use is particularly common among students aged 18 to 20, reinforcing the notion that this age group is highly susceptible to experimenting with new forms of tobacco use. Complementing these findings, Nigeria reports a mean initiation age of approximately 22.6 years, suggesting that while many users begin in early adulthood, the habit continues to develop into the mid-twenties and beyond (Mdege et al., 2024) Notably, a survey in Accra reported that shisha smoking was initiated by respondents at a mean age of 23.2 ± 4.6 years, highlighting that the Ghanaian context aligns with these global trends yet may present its own unique characteristics. (Ghana, 2023)

These studies illustrate that while age itself may not directly predict habitual shisha smoking, the period from late adolescence to early adulthood is a critical window marked by high susceptibility to experimentation. This study therefore suggests that exposure opportunities in Ghana are linked more to university students' life rather than earlier adolescence.

Gender:

Gender differences in shisha smoking present a complex and context-dependent picture. Traditionally, tobacco use has been more prevalent among males; however, recent evidence indicates that shisha smoking may follow a different pattern. For instance, the Ghana Youth Tobacco Factsheet reports that 12.2% of shisha smokers in Ghana are male compared to 9.7% female (Logo et al., 2021). In contrast, studies from Nigeria and Cameroon consistently show a higher prevalence among males (Otakhoigbogie et al., 2022), (Ngahane et al., 2023), suggesting that cultural norms and social expectations in these regions favor male smoking behaviors.

Internationally, the gender gap in shisha smoking appears to be nuanced. Research among Iranian university students found that past-month hookah use was significantly higher in males (42.2%) than in females (26.3%), although the gap was narrower than that observed for cigarette smoking. Notably, females in this context were more likely to transition rapidly from experimentation to regular use, driven by socializing and peer pressure (Shiraly & Mohamadinezhad, 2024). Similarly, among Saudi medical students, shisha smoking was markedly more common among females (67.6%) than males (24.7%), while the reverse was true for cigarette smoking (56.2% among males versus 23.5% among females), indicating that shisha may be perceived as a more socially acceptable form of tobacco use for women in certain culture. (Alnasser et al., 2022)

In the broader Eastern Mediterranean region, although overall waterpipe tobacco smoking remains more prevalent among males, the gender gap is considerably smaller than that for cigarette smoking. Women in this region tend to favor flavored tobacco products, a preference that is bolstered by targeted marketing strategies emphasizing the pleasant sensory experience of shisha (Hamadeh et al., 2020) Supporting this, a nationwide survey in Ghana revealed that among current

smokers, 44% of females used shisha compared to only 6.6% of males, highlighting a trend where shisha is increasingly popular among young women. (Ghana, 2023) Moreover, Global Youth Tobacco Survey data indicate that among Junior High School students aged 13–15, a greater proportion of girls reported current shisha use compared to boys. (Logo et al., 2020).

Collectively, these findings suggest that while traditional tobacco use remains male-dominated in many settings, shisha smoking exhibits a more nuanced gender distribution that is heavily influenced by local cultural norms, social influences, and targeted marketing. The conflicting evidence across different regions underscores the need for more context-specific research, particularly within Ghana, to understand how these gender dynamics play out and to develop targeted public health interventions accordingly.

Ethnicity:

Ethnicity can also influence shisha smoking patterns, particularly in multicultural societies. Research from Malaysia has shown variations in shisha use among different ethnic groups, such as Chinese, Indian, and Malay populations. However, more research is needed to determine how ethnicity affects shisha use in African contexts as data on ethnicity is sparse regarding shisha smoking. In Ghana, provided with the diverse ethnic groups and distinct urban-rural dynamics, this remains an unexpected area that needs to be explored.

MaritalStatus:

Recent studies indicate that marital status may influence tobacco use patterns, including shisha smoking, though findings are not entirely consistent. In several international contexts, marital status has been associated with differences in smoking behavior. For example, (Rehman & Baig, 2024) conducted a case-control study in Pakistan and found that married individuals had an 81%

reduced odds of shisha smoking compared to unmarried individuals. Their analysis suggests that marital responsibilities, stable family structures, and potential reductions in social exposure might protect against shisha use.

Conversely, research conducted among university students in Cameroon by (Ngahane et al., 2023) reported that in bivariate analyses, single students appeared more likely to smoke shisha than their married counterparts. However, this association lost significance after adjusting for confounding variables, indicating that while marital status might be linked to shisha use at a descriptive level, its independent effect is less clear when other social and economic factors are considered.

The divergent findings across studies highlight several critical issues. First, the methodological differences are notable: while (Rehman & Baig, 2024) employed a case-control design focusing on adults in a broader community context, (Ngahane et al., 2023) used cross-sectional surveys among university students. The differing study designs and populations likely contribute to the contrasting results. In community-based settings, marital status may more strongly correlate with lifestyle stability and reduced exposure to risk factors, whereas among university students, where peer influence and social experimentation are highly prevalent, marital status might play a less distinct role.

In Ghana, research on marital status as a determinant of shisha smoking among university students is limited. A study by (Massawudu et al., 2021) conducted in Accra found no statistically significant difference in shisha smoking between single and married participants. This finding suggests that, in the Ghanaian university setting, marital status may not be a strong independent predictor of shisha use. One explanation for this is that the vast majority of university students in

Ghana are single, which limits the variability necessary to detect distinct patterns based on marital status. Additionally, factors such as peer influence, academic pressures, and economic constraints may play a more dominant role in shaping smoking behavior than marital status.

Data from the Ghana Youth Tobacco Factsheet (Logo et al., 2021) further indicate that most shisha users among young adults are single, reflecting the overall demographic profile of university populations. This predominance of single status in the target group may obscure any potential protective effects of marriage that have been observed in other contexts. Moreover, cultural norms and social structures in Ghana differ from those in regions where marital status has been shown to significantly impact smoking behaviors, such as in some Middle Eastern or South Asian studies.

In summary, while international studies have sometimes identified a protective effect of marriage against tobacco use, the evidence from Ghana suggests that marital status does not independently predict shisha smoking among university students. Instead, the influence of marital status is likely intertwined with other socio-demographic factors and contextual influences.

2.3.3 Socio-Economic Factors

Socio-economic factors have emerged as key determinants in shisha smoking behaviors among young people, especially in urban university settings. Recent studies indicate that students from higher-income households are more likely to frequent recreational venues such as lounges and cafés where shisha is readily available, thereby increasing their likelihood of engaging in the practice. (Redempta Mutei David, 2024)

In contrast, other research suggests that lower socio-economic status may be associated with an earlier initiation of shisha smoking, as individuals with fewer recreational opportunities may resort

to shisha as an affordable social activity (Mdege et al., 2024) . Furthermore, parental income and educational attainment have been identified as significant predictors of shisha use among university students, with evidence from Nigeria showing that economic affluence can facilitate access to environments that promote shisha smoking, while lower socio-economic backgrounds might predispose individuals to early experimentation. (Otakhoigbogie et al., 2022)

These findings underscore that socio-economic determinants operate through multiple pathways: while increased financial resources provide greater access to social settings that normalize shisha use, economic constraints may drive early initiation due to limited alternative leisure options. Together, these insights from recent studies emphasize the multifaceted role of socio-economic status in shaping shisha smoking patterns among university students.

2.3.4 Environmental and Policy-Related Factors

Recent studies suggest that the physical environment characterized by the density of shisha lounges, cafés, and recreational venues near university campuses plays a pivotal role in shaping smoking patterns. For instance, (Rashed et al., 2022) found that the high availability of shisha outlets in urban settings contributes significantly to its use among young adults, as these venues not only provide easy access to shisha but also create a social atmosphere that normalizes and even glamorizes the behavior.

In addition to environmental availability, the regulatory framework governing tobacco products has a profound influence on shisha use. Many low and middle-income countries lack stringent policies specifically targeting shisha. This regulatory gap allows shisha products to be marketed aggressively and sold without the robust health warnings typically mandated for cigarettes. (Mdege et al., 2024) highlighted that inadequate enforcement of health warnings and advertising

restrictions on shisha contributes to widespread misconceptions about its safety. Without clear, enforced regulations, shisha smoking is often perceived as a less harmful alternative to cigarette smoking, a perception that is further bolstered by the appealing flavors and social context in which shisha is consumed.

Moreover, studies such as those by (Otakhoigbogie et al., 2022) have demonstrated that environments with weak regulatory oversight tend to have higher rates of shisha use. In contrast, regions with strict smoke-free policies and comprehensive tobacco control measures tend to report lower prevalence rates among young people. For example, in settings where robust policies are implemented and effectively enforced, there is evidence of reduced shisha use, suggesting that environmental and policy interventions can play a significant role in mitigating the public health risks associated with shisha smoking.

In Ghana, environmental and policy-related factors appear to play a similarly crucial role in shaping shisha smoking behaviors, although the research is still emerging. Recent findings indicate that the lack of targeted regulations for shisha as opposed to traditional cigarette control measures creates an environment in which shisha is more accessible and socially normalized. For example, studies in urban areas of Ghana have noted that shisha outlets and lounges are often located near university campuses, making it easier for students to access these venues (Massawudu et al., 2021). This high density of shisha outlets, combined with minimal enforcement of tobacco control policies specific to shisha, contributes to its widespread use.

Overall, these findings underscore that both the physical availability of shisha and the strength of regulatory policies are instrumental in influencing shisha smoking behavior. Effective public health strategies should therefore focus on both restricting the environmental cues that encourage

shisha use and strengthening the policy framework to reduce its accessibility and appeal among university students.

2.3.5 Cultural Influences

Cultural norms and traditions are pivotal in shaping smoking behaviors. In many Middle Eastern societies, shisha smoking is deeply embedded in social rituals and is considered a traditional practice that fosters community bonding. However, in more heterogeneous settings such as Ghana, shisha is increasingly viewed as a modern, fashionable alternative to cigarette smoking, influenced by global media and evolving social norms. The absence of culturally specific tobacco control policies for shisha in Ghana further exacerbates misconceptions about its safety, thereby facilitating its spread among university students. Cultural influences align with social cognitive theory of social reinforcement and identity modelling, where behaviors are shaped by perceived norms and group belonging.

2.4 Knowledge Level of Shisha Smoking

However, recent studies indicate a persistent gap between general awareness and personal risk perception, which may contribute to the continued prevalence of shisha use.

For example, (Rashed et al., 2022) found that in a study of shisha users in Qatar, 72.9% of respondents demonstrated inadequate knowledge of its harmful effects despite active public health campaigns. This suggests that even in regions with considerable efforts to disseminate health information, a substantial proportion of shisha users remain unaware of the true risks ranging from respiratory disorders to cardiovascular diseases associated with shisha use.

Similarly, (Ouedraogo et al., 2023) conducted research among university students in Ouagadougou, Burkina Faso, and discovered that 43.5% of participants had poor knowledge regarding the adverse health outcomes linked to shisha smoking. Their findings underscore that even in academic settings where one might expect higher levels of awareness, significant knowledge gaps persist.

In Nigeria, (Mdege et al., 2024) reported that while 63% of shisha smokers acknowledged that shisha smoking is harmful, only 52% believed it had a personal adverse effect on their health, and merely 54% perceived that their smoking impacted those around them. This discrepancy indicates that users may understand the theoretical risks but fail to internalize them on an individual level. Such a gap between general awareness and personal risk perception is concerning, as it may lead to complacency and sustained engagement in risky behaviors.

Compounding the issue, (Patil et al., 2022) argue that regulatory shortcomings such as the lack of standardized warning labels, inadequate disclosure of toxic constituents, and weak enforcement of age restrictions play a significant role in perpetuating these misconceptions. Without clear and compelling regulatory measures, consumers are left vulnerable to misleading information that portrays shisha as a safer alternative to cigarettes.

Moreover, the sensory appeal of shisha, particularly its flavored variants, further obscures the risks. Several studies noted that the pleasant aroma and taste of flavored shisha can create a false perception of reduced harm, making it more appealing, especially among young adults (Fagbule & Cadmus, 2022), (Hirpa et al., 2021), (Rehman & Baig, 2024), (Mdege et al., 2024). This sensory allure, combined with attractive marketing and the absence of robust health warnings, contributes to a normalization of shisha smoking that undermines public health messages.

Critically, literature reveals a consistent knowledge-behavior gap across diverse cultural contexts. Although many studies demonstrate that a baseline level of awareness exists, this knowledge does not always translate into behavior change. The interplay of regulatory gaps, the appealing sensory attributes of shisha, and the social normalization of its use collectively contribute to a scenario in which users may underestimate personal risk despite widespread acknowledgment of its general harmfulness.

In conclusion, while there is some awareness of the health risks associated with shisha smoking, the insufficient translation of this knowledge into personal risk perception remains a major barrier to behavior change. Addressing this gap requires multifaceted strategies that not only enhance public health education but also strengthen regulatory frameworks to ensure clear, consistent, and impactful warnings on shisha products. Future research should focus on developing and evaluating interventions that bridge the gap between general awareness and personal risk perception, ultimately reducing the prevalence of shisha smoking. Under the theory of planned behavior, knowledge influences attitudes, but without translating into perceived behavior control, it fails to prevent smoking.

2.5 Health Implications of Shisha Smoking

Shisha smoking is associated with numerous adverse health effects. The harmful impacts of shisha are due to the presence of polycyclic aromatic hydrocarbons, carbon monoxide, volatile aldehydes, nitric oxide, nicotine, ammonia, heavy metals, and particulate matter in the generated smoke. Carbon monoxide competes with oxygen in the blood to form carboxyhemoglobin, which can cause cellular hypoxia and impair respiration. Additionally, the nicotine in the smoke has been linked to both acute and chronic cardiovascular effects, including an increased heart rate. Sharing

a shisha mouthpiece poses a high risk of transmitting communicable diseases such as herpes, hepatitis A, and tuberculosis. Moreover, shisha smoking during pregnancy has been associated with low birth weight and respiratory problems in newborns.

In Ghana, shisha smoking has seen tremendous growth over the past few years, particularly in settings such as nightclubs, restaurants, beaches, and cafés. Its rising prevalence is partly due to a lack of awareness about its harmful effects and health implications. Research indicates that shisha smoking is predominantly a behavior of young people, especially students. Most studies on shisha prevalence have been conducted in African countries, the Middle East, and Asia, and these findings suggest that socio-demographic factors, peer pressure, and the recreational appeal of shisha contribute to its widespread use. Despite its growing popularity, relatively little research has been conducted on shisha smoking among the population in Ghana. The University of Ghana, with over 60,000 students, may have a significant number of students who smoke shisha due to factors such as limited knowledge and unawareness of its deleterious health effects.

2.6 Implications for Public Health and Policy in Ghana

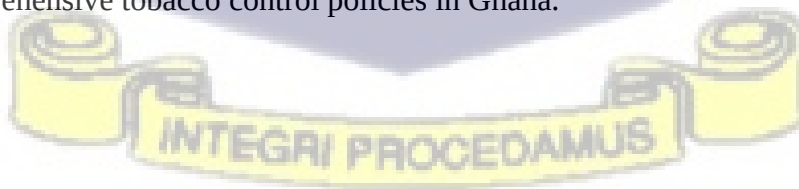
The rising prevalence of shisha smoking among university students carries significant public health implications for Ghana. Misconceptions about the safety of shisha, coupled with its growing popularity, may contribute to an increase in tobacco-related non-communicable diseases (NCDs) over time. In Ghana, where tobacco control policies have traditionally focused on cigarette smoking, there is a regulatory gap concerning shisha. Addressing this gap by implementing strict health warning labels, regulating flavored tobacco products, and controlling the operation of shisha lounges near university campuses is critical. Furthermore, targeted health education campaigns are needed to correct misconceptions and promote healthier lifestyle choices among students.

Engaging stakeholders such as university administrators, student groups, and public health officials is essential to develop and implement effective interventions.

2.7 Conclusion

In conclusion, shisha smoking is a complex behavior influenced by a multifaceted array of determinants, including behavioral, socio-demographic, socio-economic, environmental, and policy-related factors. Global research indicates that shisha use is rising among university students, driven by factors such as curiosity, peer pressure, and the appeal of flavored tobacco products. However, persistent misconceptions about its safety, compounded by regulatory shortcomings, continue to fuel its prevalence. While studies from various regions provide valuable insights, significant gaps remain in the context-specific understanding of shisha smoking among Ghanaian university students.

Additionally, although regional data show 43-73% (Ngahane et al., 2023; Rashed et al., 2022) demonstrate accurate perception, no Ghanaian study has quantified both general awareness and personalized knowledge among undergraduate and post-graduate students in the University of Ghana. Similarly, no study has systematically assessed the relative contribution of behavioral, demographic and policy-related factors at the University of Ghana. Addressing these gaps through robust, mixed-methods research is essential for developing targeted public health interventions and informing comprehensive tobacco control policies in Ghana.



CHAPTER THREE

METHODS

3.1 Study Design

This study used a cross-sectional study design with quantitative data collection methods to assess the determinants and factors associated with shisha smoking by students at the University of Ghana.

3.2 Study Area

The University of Ghana, popularly known as the Premier University is a public university located in Accra, Ghana. For the purpose of this research, the Legon Campus will be used.

The Legon campus was chosen for this study because it has the highest number of students' population among the other universities in Ghana. Some studies have been done in different universities in Africa. Among them are studies done by (Fagbule & Cadmus, 2022), (Ngahane et al., 2023) and (Hirpa et al., 2021) on the smoking of shisha by students in universities located in Nigeria, Cameroon and Ethiopia respectively. In Ghana, shisha smoking study has not been done in any of the universities. The study done by (Logo et al., 2021) was conducted in different regions of Ghana. There has been no study on the determinants and factors associated with shisha smoking among university students in Ghana, therefore, the University of Ghana, Legon Campus was chosen for this study.

3.3 Study Population

The study population included students at the University of Ghana.

3.4 Eligibility Criteria

3.4.1. Inclusion Criteria

Male and female students who are resident on campus and smoke shisha.

3.4.2 Exclusion Criteria

Male and female students who are not resident on campus.

Students who do not consent to being part of the study.

3.5 Sampling Strategies

3.5.1 Sample Size Determination

The sample size for the study was calculated using the Yamane's Formula. The Yamane's formula is used in various studies to estimate the sample size of a population.

Halls	Total Number of Students
1. Legon Hall	1326
2. Akuaffo Hall	1807
3. Volta Hall	699
4. Commonwealth Hall	1054
5. Mensah Sarbah Hall	1995
Total	6881

$$n = \frac{N}{1 + N(e)^2} = \frac{6881}{1 + 6881 (0.05)^2} = 378$$

where n = desired sample size

N = Population size estimated to smoke Shisha

e = margin of error estimated at 5%

3.5.2 Sample size adjustment

Adding 15% to make up for wrongly filled or incomplete questionnaire gave a total sample size of 435.

Thus, a total of 435 respondents will be selected from among the students at the University of Ghana.

3.5.3 Sampling Method

A cross-section of the study population was picked using a probability simple random sampling technique. The list of students was obtained from the various halls and used as the sampling frame from which eligible participants were selected.

The number of study participants was picked from the sampling frame randomly with the simple random sampling technique. The study participants were numbered from 1 to N (study population size). The numbers served as a unique identifier and were assigned to each person on the sampling frame. A sequence of n random numbers between 1 and N was generated using a random number table on Ms-excel. Eligible study participants were then selected from the randomly selected numbers. This technique enabled all study participants to have an equal chance of being selected for the study to ensure that there was no bias. This technique was used because it enables a greater degree of representativeness to be achieved.

3.6 Statistical Analysis

The knowledge level of the students was assessed based on the Likert scale. A composite score (1-5) was computed and categorized into two groups. We grouped the Composite score from 1-3 as Poor knowledge and anything above 3 as Good Knowledge.

The chi-square test of association was used to identify factors associated with the dependent variable. Fisher's exact test was also used when the cell counts were small, and the chi-square test. The Binary logistic regression was used to identify the factors that were significantly related to the dependent variables which did not hold.

3.6.1 Variables

The study variables are made up of dependent and independent variables.

3.6.1.1 Dependent Variable

Dependent Variable	Operational definition	Measure
Smoking of shisha	The prevalence of shisha smoking and the factors that affect the smoking by students in the University of Ghana.	By asking students whether they smoke or not. Yes, or no?

3.6.1.2 Independent Variables

This will look at the factors associated with shisha smoking.

Behavioural factors	Curiosity		Categorical variable
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(Behavioural factors that lead to smoking)	Peer Pressure		Categorical Variable
	Family Influence		Categorical Variable
	Pleasure		Categorical Variable
(Socio-demographic factors) Demographics	Age	Age in years of participant.	Categorical variable
	Sex	Male or female	Categorical variable
	Marital status	Married, Single or Divorced	Categorical variable
	Education Background	Level of Educational qualification	Categorical variable
Demographics	Religion	Christian, Muslim, or Traditionalist	Categorical variable
	Ethnicity	Akan, Ga, Fante, Ewe, Northerner	Categorical variable

	Knowledge	21 questions on the knowledge on shisha use A composite score (1-5) was computed and categorized to two groups.	Categorical variable
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3.7 Data Collection

In this study, a structured questionnaire was used to collect primary data from the study participants after they had agreed to be part of the study. A questionnaire-based interview was used to collect responses using Google Forms software through face-to-face interviews. The questionnaire-based interview was used because it enables data collection to be done quickly. Data was collected from 29th August 2024 to 17th December 2024. Data collection was done in person at the various five traditional halls of residence. Data collected from each participant was between 10 to 20 minutes. Data collection was done on the University Campus. All questions in the questionnaire were explained thoroughly to avoid misunderstanding and misinterpretations.

3.8 Data Collection Tool

A structured questionnaire comprised of close-ended questions designed with google forms was used for the study. The questionnaire was divided into 3 sub-sections. The first section of the questionnaire was used to collect data on the socio-demographic characteristics of the students.

The second section was used to collect data on the knowledge level of students on shisha smoking and the third section focused on the factors associated with Shisha smoking (Behavioural, Environmental and Socio-economic factors).

3.9 Pretesting

The questionnaire was pretested among thirty-three students at the department of Biological Environmental and Occupational Health (BEOH), School of Public Health at the University of Ghana. The Students of the School of Public Health have similar characteristics as the study participants but will not be part of the final study. The pretesting was done to ensure that students could comprehend the questions and also identify any gaps in the questionnaire.

3.9 Quality Assurance

The study's questionnaire went through assessment and validation by the supervisor. This review focused on ensuring that the questions are clear, relevant, and aligned with the study objectives. The Principal Investigator (PI) collected the data to ensure completeness and accuracy. Regular checks were conducted to verify that all required data fields were adequately filled out and that there were no missing or erroneous entries. This was done to ensure the integrity and reliability of the study.

3.10 Validity and Reliability

The pretesting of the questionnaire was done to ensure validity and reliability. The questionnaire was assessed to ensure it adequately covers all relevant aspects of the research topic. The questionnaires were administered to a small sample of participants who were similar to the target population. This was done to identify any ambiguities, confusing items, or problems with the

questions or format. Based on the feedback from pretesting the questionnaire was revised and refined as needed to improve its validity and reliability.

3.11 Data Processing and Analysis

Data will be cleaned, coded, and entered into Microsoft Excel after which it will be exported to STATA (statistical analysis software) version 17 for processing.

Descriptive statistics such as means, cross-tabulations and frequencies will be used to describe demographic characteristics of the study participants with 95% confidence intervals. The results will be presented using tables and graphs. Chi-square test statistics and Fisher's exact test were conducted to determine association between smoking of shisha and socio-demographic variables. Binary logistic multivariable regression was used to determine factors related to shisha smoking. Variables with a p-value less than 0.05% were considered significant.

3.12 Ethical Considerations

The study proposal was submitted to the Noguchi Memorial Institute -Institutional Review Board for review and ethical approval before data collection began. Permission to conduct this research was obtained from Noguchi Memorial Institute for Medical Research-University of Ghana. The Ethical Approval number is IRB 00001276.

Permission was also obtained from hall management/senior tutors of the five traditional halls.

In view of the sensitive nature of this study permission was also obtained from students who met the inclusion criteria, and an informed written consent was obtained from each respondent. The objective and the rationale of this study was discussed with each of the respondents, client privacy and confidentiality was assured. Participation in this study was entirely voluntary.

Data collected was known to the researcher alone and was used for purposes related to the research work only. Participants have the chance to opt out at any time during the study. Consent from each student was obtained before data collection and the questionnaires were filled anonymously.

3.13 Consenting Process

The purpose of the study was explained to the study participants that the aim was to determine the factors associated with Shisha smoking and the results would help gain valuable insights that can inform effective interventions, policies, and educational programs aimed at promoting educational awareness and curbing the smoking of shisha. It also involved answering a set of questions which took about 15-20mins.

3.14 Voluntary Consent/Withdrawal

Participants were informed that participation in this study was voluntary. No form of coercion or force was used to influence participation. Participants were informed about the right to decline and withdraw from the study at any period.

3.15 Risks and Benefits

It was anticipated that the questions may be sensitive and may result in some emotional discomfort. Also, it was anticipated that the information gained may be beneficial in the future. It would enhance educational programs and inform policies.

3.16 Confidentiality and Anonymity

Participants were guaranteed confidentiality and privacy throughout the study period. Personal identifiers were not used throughout the study to ensure anonymity. Information provided was kept confidential thus it was not shared with any unauthorized person.

3.17 COVID-19 Protocols

COVID-19 protocols were strictly observed throughout the study period. Participants were encouraged to wear nose masks during interviews and wash their hands with soap under running water before and after interviews.

3.18 Data storage and usage

Data collected were stored on the PI's laptop. A duplicate copy of the data was stored on an external hard drive, and both were encrypted with a password. All gathered data was stored safely and access to the data was limited to the PI and the supervisor.

3.19 Results Dissemination

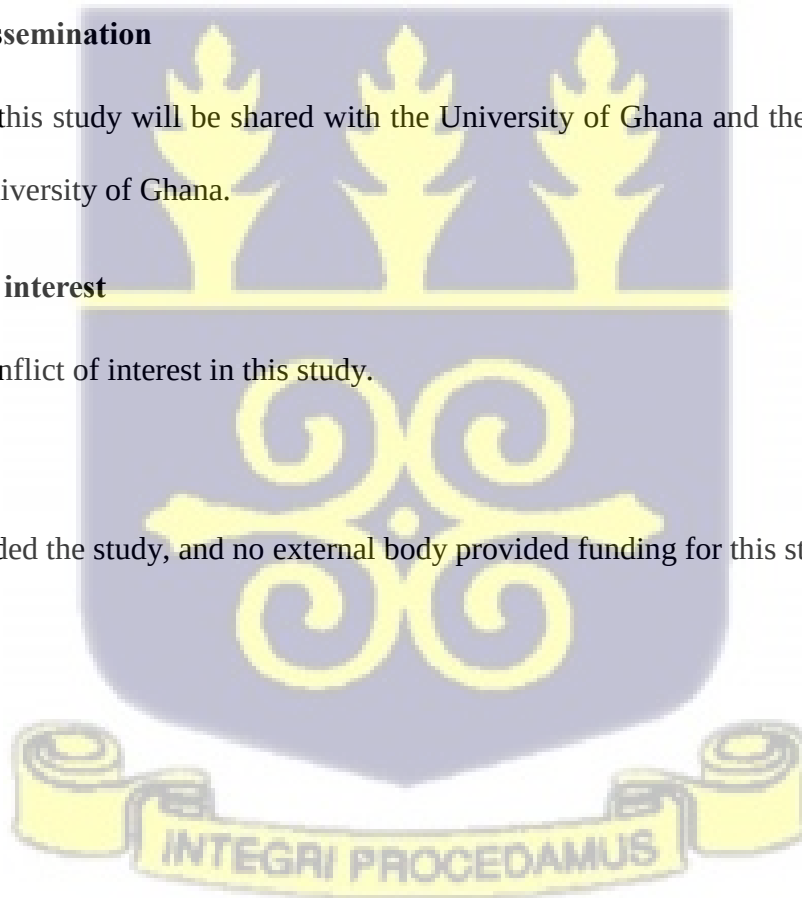
The findings of this study will be shared with the University of Ghana and the School of Public Health of the University of Ghana.

3.20 Conflict of interest

There was no conflict of interest in this study.

3.21 Funding

The PI fully funded the study, and no external body provided funding for this study.



CHAPTER FOUR

RESULTS

4.1 Sociodemographic characteristics of respondents.

Table 1 presents the socio-demographic characteristics of the respondents. About 54.1% (n=235) were males. Third-year students were 24.9% (n=108), while first-year students were 15.2% (n=66). Of the total respondents, 79% (n=343) of the respondents were between the ages of 20 to 29 years of age. The majority 80.4% (n=349) of the respondents were also single and not in any relationship. The majority 91% (n=395) of the respondents were Christians. About 38.5% (n= 165) were students reading programs within the College of Health. Twenty-six percent (n=116) of the respondents were students in the College of Basic and Applied Sciences while about 15.2% (n=66) of the respondents read programs within the College of Education. About 28.3% (n=123) were affiliated to Mensah Sabah Hall while only 10.1% (n=44) were affiliated in Volta Hall. Majority of the students 80.4% (n=349) and 79.5% (n=345) resided with their parents and were raised by both parents respectively. About 15.2% (n=66) of the respondents have divorced parents. About 9.9% (n=43) of the respondents have either of their parents being deceased.

Table 4.1 Socio-demographic characteristics of respondents

Characteristics	Frequency (n=434)	Percent (%)
Gender		
Female	199	45.9
Male	235	54.1
Educational Level		
Level 100	66	15.2
Level 200	94	21.7
Level 300	108	24.9
Level 400	94	21.7
Post-graduate	72	16.6

Age		
less than 20	66	15.2
20-29	343	79
30-39	20	4.6
40 and above	5	1.2
Marital status		
Married/In a relationship	85	19.6
Single	349	80.4
Religion		
Christian	395	91
Muslim	37	8.5
Non	2	0.5
Program college		
College of Basic and Applied Sciences	114	26.3
College of Education	66	15.2
College of Health Sciences	167	38.5
College of Humanities	87	20
Hall affiliation		
Akuaffo Hall	116	26.7
Commonwealth Hall	67	15.4
Legon Hall	84	19.4
Mensah Sarbah Hall	123	28.3
Volta Hall	44	10.1
Live with parents		
No	85	19.6
Yes	349	80.4
Raised by both parent		
No	89	20.5
Yes	345	79.5
Divorced parents		
No	368	84.8
Yes	66	15.2
Deceased parent		
No	391	90.1
Yes	43	9.9

4.2 Knowledge of the harmful effects of Shisha among respondents

Overall, 84.5% of respondents were found to have a good knowledge of shisha smoking, while 15.5% had poor knowledge (Fig 4.2). More than 60% of respondents agree/strongly agree that shisha contains nicotine. About 55% of respondents agree/strongly agree that there are health hazard associated with habitual mouthpiece sharing. About 65.5% of the respondents agreed/strongly agreed that shisha is more addictive than cigarettes. Approximately a quarter of respondents, (25.5%) agreed/strongly agreed that the water in the shisha apparatus does not filter toxins from the smoke. The majority (79.9%) of respondents agree/strongly agree that shisha smoking is addictive. About 35% of the respondents agree/strongly agree that nicotine in shisha smoke is less than in cigarette smoke. More than half (65%) of respondents agree/strongly agree shisha smoking is healthier than cigarette smoking.

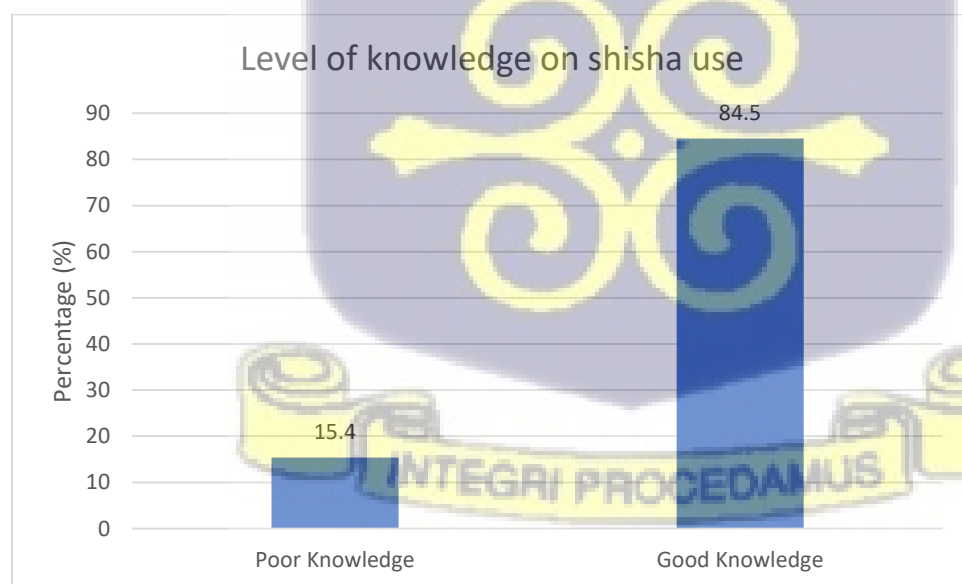


Figure 4.2 Knowledge level of shisha among respondents

Table 4.2 Respondents knowledge on shisha use.**4.3 Factors associated with smoking shisha**

Table 4.4 illustrates results from a bivariate analysis which highlights the association between

Knowledge on Shisha	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Shisha contains nicotine	44 (10.1)	52 (12.0)	69 (15.9)	92 (21.2)	177 (40.8)
2. Health hazards are associated with habitual mouthpiece sharing such as oral herpes	41 (9.4)	79 (18.2)	74 (17.1)	173 (39.9)	67 (15.4)
3. Shisha is more addictive than cigarette	31 (7.1)	41 (9.4)	78 (18.0)	98 (22.6)	186 (42.9)
4. Shisha smoking leads to lung cancer	26 (6.0)	22 (5.1)	47 (10.8)	213 (49.1)	126 (29.0)
5. Shisha smoking leads to dental problem such as gum disease	28 (6.5)	21 (4.8)	48 (11.1)	154 (35.5)	183 (42.2)
6. Habitual Shisha smoking can lead to cardiovascular diseases	20 (4.6)	22 (5.1)	41 (9.4)	216 (49.8)	135 (31.1)
7. Shisha smoking reduces weight	30 (6.9)	28 (6.5)	65 (15.0)	136 (31.3)	175 (40.3)
8. Stress influences one to start shisha smoking	27 (6.2)	21 (4.8)	66 (15.2)	207 (47.7)	113 (26.0)
9. Family problems lead to shisha smoking	29 (6.7)	27 (6.2)	54 (12.4)	150 (34.6)	174 (40.1)
10. Problems with friends can lead to shisha smoking	20 (4.6)	34 (7.8)	68 (15.7)	201 (46.3)	111 (25.6)
11. Relationship problems with husband or wife or girlfriend can lead to shisha smoking	24 (5.5)	18 (4.1)	60 (13.8)	157 (36.2)	175 (40.3)
12. Financial problems can lead to shisha smoking	26 (6.0)	23 (5.3)	57 (13.1)	206 (47.5)	122 (28.1)
13. University life stress can lead to shisha smoking	21 (4.8)	26 (6.0)	60 (13.8)	162 (37.3)	165 (38.0)
14. Shisha advertisement can lead to its smoking	19 (4.4)	19 (4.4)	53 (12.2)	202 (46.5)	141 (32.5)
15. Shisha smoking is harmful to health	26 (6.0)	11 (2.5)	39 (9.0)	157 (36.2)	201 (46.3)

other variables and the smoking of shisha. Variables such as level of knowledge on shisha, age,

16. Water in shisha apparatus filters toxins from the smoke	83 (19.1)	133 (30.6)	103 (23.7)	60 (13.8)	55 (12.7)
17. Shisha contains harmful chemicals	29 (6.7)	27 (6.2)	44 (10.1)	144 (33.2)	190 (43.8)
18. Shisha smoking is addictive	26 (6.0)	17 (3.9)	44 (10.1)	195 (44.9)	152 (35.0)
19. Shisha smoking is not as polluting or intrusive as cigarette smoke.	129 (29.7)	106 (24.4)	47 (10.8)	61 (14.1)	91 (21.0)
20. Nicotine present in shisha smoke is less than in cigarette smoke	69 (15.9)	130 (30.0)	83 (19.1)	57 (13.1)	95 (21.9)
21. Shisha smoking is healthier than cigarette smoking	45 (10.4)	46 (10.6)	61 (14.1)	53 (12.2)	229 (52.8)

gender, educational level, marital status, religion, college of program, hall of affiliation, whether students lived with their parents, students were raised by both parents, whether students had divorced parents or deceased parents were considered. Educational level, marital status, divorced parents and raised by both parents ($p < 0.05$). All other factors were not statistically associated to shisha smoking in this analysis of the study (Table 4.3)

Table 4.3 Bivariate association of factors associated with smoking shisha

	Do not smoke shisha N=386	Smoke shisha N=48	x ²	p-value
Gender			0.1	0.76
Female	178 (46.1)	21 (43.8)		
Male	208 (53.9)	27 (56.3)		
Educational level			12.24	0.016
Level 100	55 (14.2)	11 (22.9)		
Level 200	90 (23.3)	4 (8.3)		
Level 300	90 (23.3)	18 (37.5)		
Level 400	83 (21.5)	11 (22.9)		
Post-graduate	68 (17.6)	4 (8.3)		
Age[†]				0.63

less than 20	61 (15.8)	5 (10.4)		
20-29	301 (78.0)	42 (87.5)		
30-39	19 (4.9)	1 (2.1)		
40 and above	5 (1.3)	0 (0.0)		
Marital Status			6.48	0.011
Married/In a relationship	69 (17.9)	16 (33.3)		
Single	317 (82.1)	32 (66.7)		
Religion				0.53
Christian	349 (90.4)	46 (95.8)		
Muslim	35 (9.1)	2 (4.2)		
Non	2 (0.5)	0 (0.0)		
College of program			3.64	0.3
College of Basic and Applied Sciences	103 (26.7)	11 (22.9)		
College of Education	59 (15.3)	7 (14.6)		
College of Health Sciences	143 (37.0)	24 (50.0)		
College of Humanities	81 (21.0)	6 (12.5)		
Hall of affiliation			9.23	0.056
Akuaffo Hall	96 (24.9)	20 (41.7)		
Commonwealth Hall	62 (16.1)	5 (10.4)		
Legon Hall	79 (20.5)	5 (10.4)		
Mensah Sarbah Hall	112 (29.0)	11 (22.9)		
Volta Hall	37 (9.6)	7 (14.6)		
Live with Parents			1.93	0.17
No	72 (18.7)	13 (27.1)		
Yes	314 (81.3)	35 (72.9)		
Raised by both Parents			33.01	<0.001
No	64 (16.6)	25 (52.1)		
Yes	322 (83.4)	23 (47.9)		

Divorced Parents			63.53	<0.001
No	346 (89.6)	22 (45.8)		
Yes	40 (10.4)	26 (54.2)		
Deceased Parent[‡]				0.009
No	343 (88.9)	48 (100.0)		
Yes	43 (11.1)	0 (0.0)		
Knowledge Level			1.2	0.27
Poor knowledge	57 (14.8)	10 (20.8)		
Good knowledge	329 (85.2)	38 (79.2)		

[‡]- Fisher's exact test

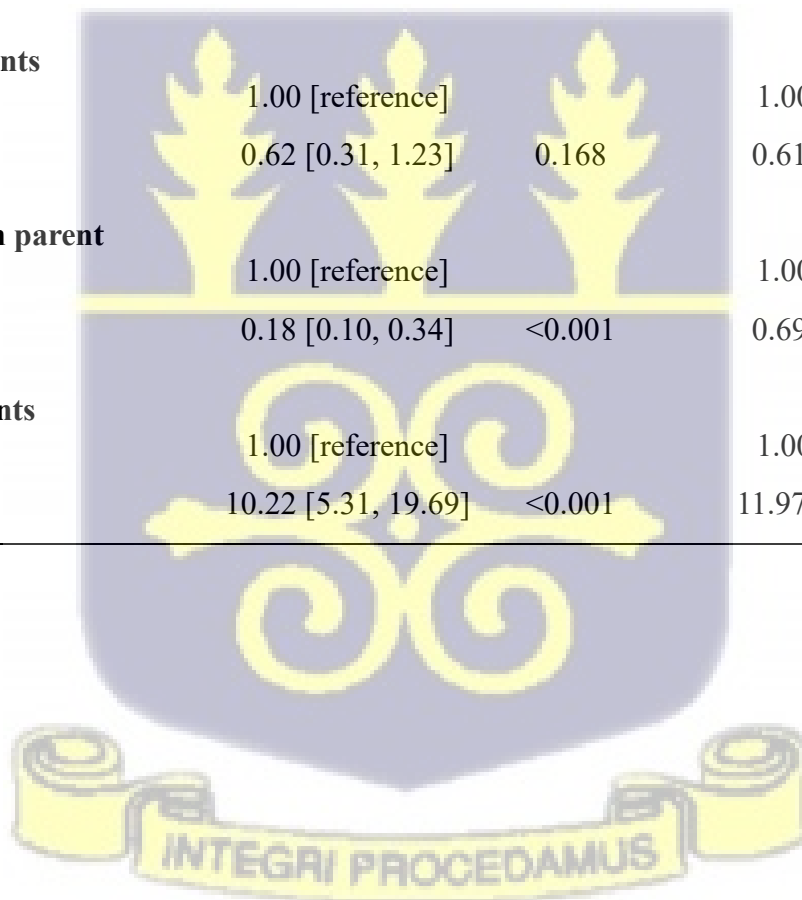
4.4 Multivariable analysis of factors associated with smoking shisha

In the adjusted model of the ordinal logistic regression model in Table 4, students in the post-graduate level, Level 200 of study (students in second year), students affiliated to Legon Hall and Mensah Sabah Hall and respondents with divorced parents were all statistically associated with smoking shisha, given that all the other variables were kept constant. Second-year students had 87% decreased odds [AOR = 0.13, CI: 0.03-0.57, p=0.007] of smoking shisha compared to the first-year students. Postgraduate students are 90% less likely [AOR = 0.10, CI: 0.02-0.57, p=0.010] to smoke shisha than the other group. Students in Legon hall were found to be less likely to smoke shisha compared to students in Akuafo Hall [AOR = 0.16 CI: 0.04-0.62, p=0.008]. Students affiliated to Mensah Sabah Hall had 71% decreased odds [AOR = 0.29, CI: 0.11-0.80, p=0.017] of smoking shisha compared to those affiliated to Akuafo hall. Students with divorced parents are 11.97 times more likely [AOR = 11.97, CI: 4.01-35.73, p=0.001] to smoke shisha than those without divorced parents.

Table 4.4 Multivariable analysis of factors associated with smoking shisha

Characteristics	Unadjusted model		Adjusted model	
	COR [95% CI]	P-value	AOR [95% CI]	P-value
Knowledge				
Poor knowledge	1.00 [reference]		1.00 [reference]	
Good knowledge	0.66 [0.31, 1.40]	0.275	0.95 [0.33, 2.73]	0.919
Gender				
Female	1.00 [reference]		1.00 [reference]	
Male	1.10 [0.60, 2.01]	0.757	1.74 [0.70, 4.31]	0.231
Education level				
Level 100	1.00 [reference]		1.00 [reference]	
Level 200	0.22 [0.07, 0.73]	0.013	0.13 [0.03, 0.57]	0.007
Level 300	1.00 [0.44, 2.27]	1.000	0.65 [0.20, 2.12]	0.472
Level 400	0.66 [0.27, 1.63]	0.372	0.44 [0.12, 1.58]	0.209
Post-graduate	0.29 [0.09, 0.97]	0.045	0.10 [0.02, 0.57]	0.010
Age				
less than 20	1.00 [reference]		1.00 [reference]	
20-29	1.70 [0.65, 4.48]	0.281	1.64 [0.43, 6.36]	0.471
30-39	0.64 [0.07, 5.84]	0.694	0.84 [0.05, 15.38]	0.907
40 and above	1.00 [0.00, 0.00]		1.00 [0.00, 0.00]	
Marital status				
Married/In a relationship	1.00 [reference]		1.00 [reference]	
Single	0.44 [0.23, 0.84]	0.013	0.42 [0.17, 1.02]	0.054
Religion				
Christian	1.00 [reference]		1.00 [reference]	
Muslim	0.43 [0.10, 1.86]	0.261	0.23 [0.04, 1.49]	0.123
Non	1.00 [0.00, 0.00]		1.00 [0.00, 0.00]	

College of Program				
College of Basic and Applied Sciences	1.00 [reference]		1.00 [reference]	
College of Education	1.11 [0.41, 3.02]	0.837	1.13 [0.34, 3.72]	0.845
College of Health Sciences	1.57 [0.74, 3.35]	0.242	2.42 [0.92, 6.38]	0.074
College of Humanities	0.69 [0.25, 1.96]	0.489	0.85 [0.25, 2.83]	0.791
Hall of affiliation				
Akuaffo Hall	1.00 [reference]		1.00 [reference]	
Commonwealth Hall	0.39 [0.14, 1.09]	0.071	0.73 [0.22, 2.38]	0.599
Legon Hall	0.30 [0.11, 0.85]	0.023	0.16 [0.04, 0.62]	0.008
Mensah Sarbah Hall	0.47 [0.22, 1.03]	0.060	0.29 [0.11, 0.80]	0.017
Volta Hall	0.91 [0.35, 2.33]	0.841	1.39 [0.35, 5.55]	0.639
Live with parents				
No	1.00 [reference]		1.00 [reference]	
Yes	0.62 [0.31, 1.23]	0.168	0.61 [0.22, 1.63]	0.321
Raised by both parent				
No	1.00 [reference]		1.00 [reference]	
Yes	0.18 [0.10, 0.34]	<0.001	0.69 [0.23, 2.03]	0.499
Divorced parents				
No	1.00 [reference]		1.00 [reference]	
Yes	10.22 [5.31, 19.69]	<0.001	11.97 [4.01, 35.73]	<0.001



CHAPTER FIVE

DISCUSSION

5.1 Introduction

Shisha smoking is emerging as a notable public health concern among university students worldwide, and its prevalence in Ghana has attracted growing attention. In the context of the University of Ghana, understanding the correlates of shisha smoking is critical, given its potential implications for student health and well-being. This study investigated a range of socio-demographic, familial, and institutional factors—such as marital status, religion, and family structure, college of program, and hall affiliation— that may influence shisha smoking behavior among students. The following discussion interprets our findings, situates them within the broader literature, and explores possible explanations for the observed relationships, with the ultimate aim of informing targeted interventions and future research initiatives in this area.

5.2 Knowledge of the Harmful Effects of Shisha Smoking

In our study, 79.2% of participants who smoke shisha demonstrated good knowledge of its use, while 20.8% had poor knowledge. These findings suggest that despite being well-informed about shisha, a significant proportion of students continue to engage in its use. This indicates a disconnect between knowledge and behavior, highlighting that awareness alone may not be sufficient to deter shisha smoking. In the context of Ghana, this could be due to several factors, including social influences, the social acceptance of shisha as a more socially acceptable form of substance use compared to cigarettes.

The observation that 79.2% of shisha users possess good knowledge yet continue to smoke suggests that other factors, such as peer pressure, social norms, or perceived social status, may

play a more influential role in shaping behavior than knowledge alone. Additionally, the misconception that shisha is less harmful than cigarettes as observed in 65% of participants in this study could contribute to continued use despite awareness of its addictive and harmful nature.

These findings align with a study conducted among university students in Cameroon, where 59.2% of participants had good knowledge, 17.6% had moderate knowledge, and 23.2% had poor knowledge (Ngahane et al., 2023). Similarly, studies in Jordan and Burkina Faso reported comparable findings (Al-Sawalha et al., 2021); (Ouedraogo et al., 2023). However, contrasting results were observed in a study conducted in Port Harcourt, Nigeria, where 85.2% of participants had poor knowledge, while only 14.8% had good knowledge of shisha use (Otakhoigbogie et al., 2022). Likewise, a similar trend was observed in Ibadan, Nigeria, among medical and dental students, where only 42% of participants had good overall knowledge about shisha use, while 58% had poor knowledge (Fagbule & Cadmus, 2022). These discrepancies likely reflect methodological differences, such as varying definitions of “Good Knowledge” as well as contextual influences including exposure to health campaigns, cultural framing of shisha and the strength of tobacco regulations. For instance, Nigeria’s National Tobacco (2015) exists but is poorly enforced, allowing easy access to tobacco products and potentially weakening risk awareness. (Fagbule et al., 2023)

These variations highlight significant disparities in awareness and understanding of shisha’s health risks among university students in different regions. It appears that in West Africa and Sub-Saharan Africa, knowledge about the use and health effects of shisha is generally moderate. However, concerning knowledge gaps still persist, even among medical students who are expected to be more knowledgeable about the health implications of shisha use.

Differences in tobacco control laws and the level of enforcement could also contribute to the disparity in knowledge about shisha smoking. A study in Nigeria revealed that cigarettes are often sold to minors without age verification, despite the existence of the National Tobacco Control Act, 2015 (NTCA), which prohibits the sale of tobacco products to minors (Fagbule et al., 2023). The lack of strict enforcement allows unrestricted access to tobacco products, contributing to lower awareness of their health risks among young people.

Tobacco control policies significantly influence knowledge and behavior related to shisha smoking. In countries with stringent regulations—such as advertising restrictions, public smoking bans, and mandatory health warning labels, there is generally higher awareness of the risks associated with tobacco use. Conversely, in countries with weak or poorly enforced regulations, shisha use is often glamorized and perceived as a safer alternative to cigarettes.

In Ghana, the absence of specific regulations targeting shisha, as opposed to cigarettes, may contribute to misconceptions about its safety. This regulatory gap allows misleading narratives about shisha to persist, which could explain why knowledge alone does not necessarily lead to reduced usage among university students. Internationally, countries with strong tobacco frameworks—comprising health warning labels, restriction on advertising and bans on public smoking—report higher awareness and lower uptake. Strengthening tobacco control laws and ensuring strict enforcement could play a crucial role in bridging the knowledge-behavior gap and reducing the prevalence of shisha smoking among young adults.

These findings underscore the need for targeted public health campaigns and educational interventions aimed at addressing misconceptions, particularly the false perception of shisha as a safer alternative to cigarettes. Additionally, efforts should be made to shift societal perceptions of

shisha use from social acceptance to social condemnation, equating it with other harmful substances such as cocaine, tramadol, and marijuana. This approach could help reduce its appeal and prevalence among university students.

5.3 Factors Influencing Shisha Smoking

5.3.1 Gender

Although gender was not significantly associated with shisha use in our study, a larger proportion of shisha smokers were male (56.3%). This finding aligns with a study conducted in Nima and Osu, Ghana, where a higher proportion of males (13.6%) smoked shisha compared to females (3.2%). However, unlike our study, gender was significantly associated with shisha smoking in that setting (Massawudu et al., 2021)

Contrary to our findings, the 2023 STEPS survey, a nationally representative survey conducted in Ghana, reported a preference for shisha use among females. The survey revealed that among current smokers, 6.6% of men and 44% of women smoked shisha, suggesting that shisha is more popular among females. This is despite overall tobacco use being male dominated, with 9.3% of men and only 0.3% of women smoking tobacco. This suggests that although tobacco use is generally more prevalent among males, shisha appears to be more socially accepted and appealing to females.

These contrasting findings may be explained by sampling differences: the STEPS survey was nationally representative, while our study focused on traditional hall residents, where female smokers may have been underrepresented. The 2023 Ghana STEPS Survey interviewed a total of

5,438 individuals aged between 18 and 69 years across the country. Women constituted 3,416 (62.8%) of the respondents, while men accounted for 2,022 (37.2%). Our study's sample had more male participants, which may have influenced the gender distribution of shisha users. Another hypothesis is that shisha may be more socially acceptable for women than cigarettes, aligning with gendered perceptions of risk and sociability. Future qualitative research could explore how social norms and hall-specific cultures differentially shape male and female participation in shisha use.

Consistent with these findings, studies conducted in Nigeria, Saudi Arabia, South Africa, Cameroon, and Ethiopia also reported higher rates of shisha use among males (Fagbule & Cadmus, 2022); (Hirpa et al., 2021); (Ngahane et al., 2023) ;(N Naicker, 2020); (Sarah Salih & Arwa Hakami, 2020) This trend across different cultural contexts suggests that social norms, cultural perceptions, and gender roles may play a crucial role in influencing shisha smoking behavior.

Overall, the conflicting results across studies indicate that gender differences in shisha use are complex and may be influenced by cultural, social, and environmental factors. Further research is needed to explore the underlying reasons for these gender disparities and to better understand the social dynamics influencing shisha use among both males and females.

5.3.2 Educational level

Our study found a statistically significant association between educational level and shisha smoking among students. Shisha smoking was most prevalent among Level 300 students (37.5%), followed by Level 100 (22.9%) and Level 400 (22.9%) students. In contrast, the lowest proportions were observed among Level 200 (8.3%) and postgraduate students (8.3%).

Logistic regression analysis, with Level 100 as the reference category, revealed that Level 200 students were significantly less likely to smoke shisha compared to Level 100 students. Similarly, postgraduate students also showed significantly lower odds of shisha smoking. However, no statistically significant differences were observed for Level 300 and Level 400 students compared to Level 100 students.

These findings suggest that students in Level 200 and at the postgraduate level are less likely to engage in shisha smoking compared to Level 100 students. One possible explanation is that Level 200 students are typically in a transitional phase, adjusting to university life and increased academic demands, which may limit their involvement in social activities associated with shisha smoking. Additionally, the lower prevalence among postgraduate students may be attributed to greater maturity, heightened health awareness, and increased responsibilities, which may reduce the likelihood of engaging in risky behaviors such as shisha smoking.

Conversely, the higher prevalence of shisha smoking among Level 300 students (37.5%) could be linked to more established social networks, increased social freedom, and reduced academic pressure compared to final-year students. At this stage, students may feel more comfortable in their social circles and engage more in leisure activities, including shisha smoking. This suggests that social influences and peer pressure may play a significant role in shaping smoking behavior at this educational level.

Our findings align with the notion that social influences, peer pressure, and lifestyle changes throughout university life significantly impact smoking behavior. However, these results contrast with findings from a study in Nigeria, where students in Level 200 and Level 400 were twice and thrice more likely to have smoked shisha, respectively, compared to other educational levels

(Otakhoigbogie et al., 2022). Several factors could account for the discrepancies between our study and that of Cultural norms, social dynamics, and environmental factors can influence shisha smoking behavior differently across study locations. For instance, the availability and accessibility of shisha lounges near university campuses may vary, impacting usage patterns among students. Additionally, differences in academic pressures and social environments across universities could shape smoking behavior. In some settings, Level 400 students may experience higher stress levels due to final-year projects and exams, potentially leading to increased smoking as a coping mechanism. Conversely, in our study, Level 400 students might prioritize academic responsibilities, reducing social interactions that encourage shisha use.

Furthermore, differences in sampling techniques, study populations, and institutional policies on tobacco use could contribute to the inconsistencies. Public health messaging and tobacco control regulations also vary across countries and institutions, potentially influencing awareness and perceptions of shisha smoking. These findings highlight the complex interplay of social, cultural, and institutional factors influencing shisha smoking behavior among university students. It underscores the need for tailored interventions that consider the unique social dynamics and academic pressures experienced at different educational levels. Interventions should therefore be tailored-peer-led campaigns may be the most effective for mid-level undergraduates, while final-year students may benefit from stress management programs.

5.3.3 Age

Our study did not find a statistically significant association between age and shisha use ($p = 0.63$), although most shisha users were in the 20–29 age bracket, followed by those under 20 years. While age was not a significant predictor in our analysis, the concentration of shisha users in these age

groups suggests that social influences, peer pressure, and lifestyle factors may still shape smoking behavior among university students.

In contrast, previous studies have reported varying findings regarding the influence of age on shisha smoking. For instance, (Otakhoigbogie et al., 2022) found that older students particularly those in the 30–34 age group tended to exhibit higher odds of shisha smoking, although the overall association was not statistically significant. Conversely, (Ouedraogo et al., 2023) reported that students under 20 years had higher odds of smoking compared to those aged 20 or above, while (Massawudu et al., 2021) observed that, in certain Accra communities, students aged 26–35 were more likely to smoke shisha than those aged 18–25

These conflicting findings may be attributable to differences in cultural contexts, social dynamics, and local environments. In some settings, younger students might be more influenced by social trends and peer behaviors that favor shisha use, while in others, older students may have greater autonomy or opportunities for engaging in shisha smoking. Moreover, studies from the Middle East (Al-Sawalha et al., 2021) have shown a significant association between age and shisha use, likely reflecting cultural practices and social norms that embed shisha smoking within adult social gatherings and confer social status.

The discrepancies in these findings underscore the importance of contextual factors such as cultural norms, peer influence, and the specific social milieu of university settings in shaping shisha smoking behavior. Although our study did not demonstrate a significant relationship between age and shisha smoking, future research should explore how these contextual factors interact with age to influence shisha use among university students in Ghana. Understanding these

interactions remains crucial for informing targeted public health interventions aimed at reducing the potential long-term health risks associated with shisha smoking.

5.3.4 Marital Status

Our study revealed a statistically significant association between marital status and shisha smoking, with 66.7% of shisha smokers being single and 33.3% being married or in a relationship. The logistic regression analysis showed that single participants had lower odds of smoking shisha compared to those who were married or in a relationship. However, this association lost statistical significance after adjusting for potential confounders. This suggests that the observed relationship between marital status and shisha smoking is likely influenced by other underlying factors

Our findings contrast with a case-control study in Pakistan by (Rehman & Baig, 2024), which reported that married individuals had 81% reduced odds of using shisha compared to unmarried individuals, and this association was statistically significant. This discrepancy could be attributed to cultural differences, social norms, or lifestyle variations between Ghana and Pakistan, influencing smoking behaviors differently. Additionally, a study conducted among university students in Cameroon by (Ngahane et al., 2023) found that singles had a significantly increased odds of smoking compared to married individuals in their bivariate analysis. However, after adjusting for potential confounders, the association was no longer significant, suggesting that other variables explain the initial relationship. This aligns our findings, where the association also lost significance after adjustment, emphasizing the role of confounding factors. In Ghana, a study by (Massawudu et al., 2021) found no significant difference in the odds of smoking between single and married participants, consistent with the adjusted results from our study. This similarity might

be due to the shared cultural context and social dynamics influencing smoking behaviors among young adults in Ghana.

The lack of a statistically significant association after adjustment suggests that marital status alone may not directly predict shisha smoking but could be influenced by other social, cultural, or psychological factors. Interestingly, our findings showed that single individuals had reduced odds of shisha smoking compared to married individuals, even though this association was not statistically significant after controlling for confounders. This contrasts with the common narrative that single individuals have more social freedom and exposure to peer influence. A possible explanation for this disparity could be that in Ghana, married individuals might face more responsibilities, stressors, or social obligations, which could lead them to adopt smoking shisha as a coping mechanism. In contrast, singles may engage in alternative social activities or stress-relief strategies that do not involve shisha. Additionally, married individuals may have greater disposable income or joint financial resources, potentially increasing their access to recreational luxuries like shisha. In contrast, singles, especially students or young adults, might have budget constraints limiting such expenditures.

5.3.5 Religion

Our study found no statistically significant association between religion and shisha smoking among university students. Although Muslim participants had lower odds of shisha smoking compared to Christians, this association was not statistically significant. This indicates that religious affiliation alone may not be a strong predictor of shisha smoking behavior in this population. Our findings also indicate a complex interplay of social, cultural and psychological factors that influence shisha use beyond religious identity. These findings align with the results of

(Mdege et al., 2025), who also reported no significant association between religion and shisha smoking. In both studies, it is possible that personal beliefs, peer influence, and social integration diluted any potential impact of religious teachings on smoking behavior.

The lack of a significant association in our study may also be influenced by the underrepresentation of Muslim and non-religious participants. Since the majority of respondents were Christian, the sample may not adequately capture the influence of religious diversity on shisha smoking behavior.

5.3.6 College of Program

Our study found no statistically significant association between the college of program and shisha smoking among university students. Although students in the College of Health Sciences had higher odds of smoking shisha compared to those in the College of Basic and Applied Sciences, this was not statistically significant. Similarly, no significant associations were found for students in the College of Education or the College of Humanities. This suggests that academic discipline alone may not strongly predict shisha smoking behavior in this population.

Our findings differ from those of (Ouedraogo et al., 2023), who reported that students in Health Sciences had reduced odds of smoking compared to students in other faculties, although the result was not statistically significant. This discrepancy could be due to contextual differences in social norms and peer influences within Health Sciences faculties across different countries. In Ghana, the increased odds observed in our study could be attributed to the growing social acceptance of shisha smoking among young adults, including Health Sciences students who may not perceive shisha as harmful despite their health education. Additionally, a study by (Otakhoigbogbe et al., 2022) in Nigeria found that students in Health Sciences also significantly reduced odds of smoking compared to other faculties. The differences observed in the Nigerian study could be due to social

science programs in Nigeria being associated with more liberal social environments, leading to higher smoking rates.

5.3.7 Hall of Affiliation

Our analysis of hall affiliation revealed notable differences in shisha smoking behavior among students residing in various halls, suggesting that the residential environment may play an important role in shaping smoking habits.

Using Akuaffo Hall as the reference category, logistic regression analysis indicated that students from Legon Hall and Mensah Sarbah Hall had significantly lower odds of shisha smoking. In contrast, students from Commonwealth Hall and Volta Hall did not differ significantly from those in Akuaffo Hall.

Descriptive statistics further underscore these differences. For instance, Akuaffo Hall reported a notably higher proportion of shisha smokers compared to the other halls, suggesting that its residential culture or peer environment might be more conducive to shisha use. On the other hand, halls like Legon and Commonwealth appear to foster environments where shisha smoking is less prevalent.

The chi-square test for hall affiliation approached significance, reinforcing the idea that hall affiliation, and by extension the social dynamics within these residential settings, may influence smoking behavior. Possible explanations for these variations include differences in hall culture, peer networks, and the availability or accessibility of social venues (such as shisha lounges) near the halls. Halls with lower smoking odds may enforce stricter social norms or have more supportive environments that discourage risky behaviors, while halls with higher odds might

have a more permissive atmosphere. This suggests that residential culture and peer norms strongly influence smoking behavior. Halls may differ in leadership structures, disciplinary climates, or proximity to shisha lounges. Such hall-based dynamics present opportunities for intervention—for example, hall-specific peer education programs or smoke-free charters could leverage existing social networks to reduce use.

5.3.7 Parental Influence

Our analysis examined the relationship between various aspects of family structure and shisha smoking behavior among university students. Three main family-related factors were considered: living with parents, being raised by both parents, and having divorced parents.

Students who reported living with their parents had lower odds of shisha smoking compared to those who did not live with their parents. Although these findings suggest a potential protective effect of parental cohabitation, possibly due to increased supervision and a more structured environment they did not reach statistical significance. Interestingly, (Hirpa et al., 2021) noted that students who received financial support from their parents were more likely to engage in shisha smoking, suggesting that disposable income may contribute to this behavior. This indicates that while living with parents might limit exposure to risky social environments, the financial resources provided could enable the purchase and use of shisha, thereby counterbalancing the potential protective effects.

In the unadjusted analysis, being raised by both parents was strongly associated with lower odds of shisha smoking, indicating a significant protective effect. However, after adjusting for potential

confounders, the association diminished and was no longer statistically significant. This suggests that the initially observed protective effect of being raised by both parents may be influenced by other variables such as socioeconomic status, peer influence, or additional family dynamics that, when controlled for, lessen the independent impact of this factor.

In contrast, having divorced parents was strongly associated with increased odds of shisha smoking. Students with divorced parents had more than ten times the odds of smoking shisha compared to those with non-divorced parents. This robust and statistically significant finding, observed in both unadjusted and adjusted analyses, indicates that family disruption, as reflected by parental divorce, may be a substantial risk factor for shisha smoking. The markedly increased odds suggest that factors related to family instability such as stress, reduced parental supervision, or emotional distress could predispose students to engage in risk behaviors, including shisha smoking.

Our imply that while certain aspects of family stability, such as living with parents or being raised by both parents, may offer some protective benefits against shisha smoking, these effects are either weak or counteracted by other influences such as increased disposable income, as highlighted by (Hirpa et al., 2021). In stark contrast, parental divorce emerges as a clear risk factor, suggesting that family instability has a pronounced impact on smoking behavior among students. These findings underscore the importance of considering the multifaceted nature of family dynamics when developing interventions to reduce shisha smoking. Future research should further investigate these relationships and explore how financial factors, emotional support, and parental involvement interact to influence smoking behaviors.

5.4 Implications of the Findings for Public Health in Ghana

Our findings have significant public health implications, particularly concerning the growing burden of non-communicable diseases (NCDs) in Ghana. Shisha smoking is associated with a range of serious health issues, including cardiovascular diseases, respiratory conditions, diabetes, and various cancers. The high prevalence of shisha use among young adults is particularly concerning, as early initiation and prolonged exposure to harmful substances in shisha can increase the risk of chronic diseases later in life.

This presents a major public health challenge in Ghana, where the prevalence of NCDs is steadily rising. The increasing popularity of shisha among young people could potentially exacerbate this trend, leading to higher healthcare costs and a greater strain on the healthcare system. Additionally, the misconception among a significant proportion of participants that shisha is healthier than cigarettes highlights a critical gap in health education and awareness.

Addressing these issues requires comprehensive public health interventions, including targeted awareness campaigns to dispel myths about the safety of shisha, stricter regulatory measures to control its accessibility, and integration of shisha-related health risks into existing tobacco control programs. Effective intervention strategies could help curb the rising trend of shisha smoking, ultimately reducing the future burden of NCDs in Ghana.

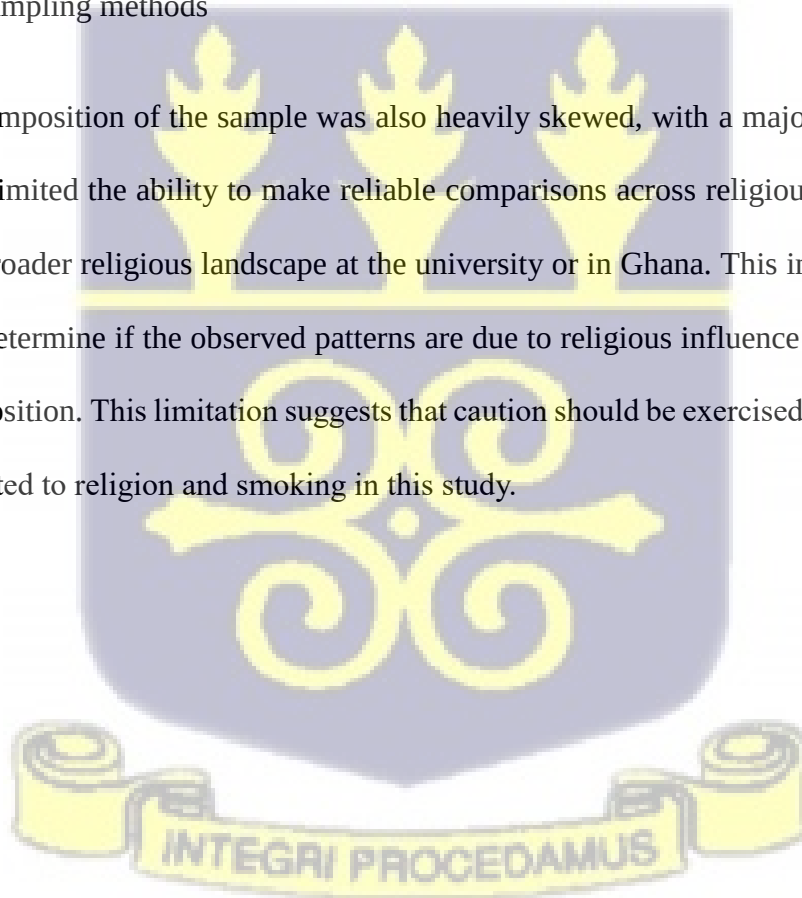
5.5 Limitations

This study has several limitations that should be considered when interpreting the findings. Although a proportionate stratified sampling procedure was used, selecting participants from the five traditional halls at the University of Ghana, this approach may not fully represent the entire

student population. Students residing in non-traditional halls or off-campus accommodations were excluded, potentially limiting the generalizability of the findings to all students at the university.

Additionally, the study had an uneven gender distribution, with more male participants than females. Given that tobacco use is typically male dominated, this imbalance could have influenced the observed preference of shisha smoking among males, possibly overestimating its occurrence compared to females. A more balanced gender representation would have allowed for a clearer understanding of gender-specific factors influencing shisha use. These limitations underscore the need for cautious interpretation of the findings and highlight the importance of using more representative sampling methods

The religious composition of the sample was also heavily skewed, with a majority identifying as Christian. This limited the ability to make reliable comparisons across religious groups and may not reflect the broader religious landscape at the university or in Ghana. This imbalance makes it challenging to determine if the observed patterns are due to religious influence or merely a result of sample composition. This limitation suggests that caution should be exercised when interpreting the findings related to religion and smoking in this study.



CHAPTER SIX

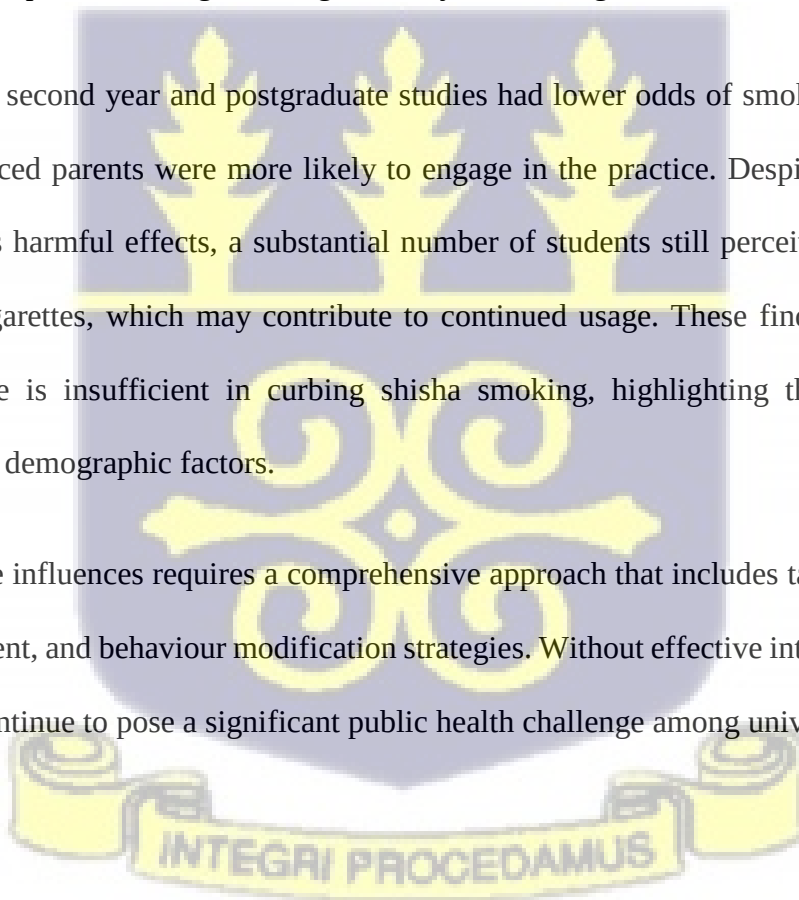
CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

This study examined the prevalence, knowledge, and factors associated with shisha smoking among students at the University of Ghana. The findings revealed that while the majority of students exhibited a high level of knowledge regarding the risks of shisha smoking, a significant proportion held misconceptions about its safety compared to cigarette smoking. The prevalence of shisha smoking among the study population was 11.1%, with factors such as educational level, marital status, and parental background significantly influencing its use.

Students in their second year and postgraduate studies had lower odds of smoking shisha, while those with divorced parents were more likely to engage in the practice. Despite the widespread knowledge of its harmful effects, a substantial number of students still perceived shisha as less harmful than cigarettes, which may contribute to continued usage. These findings suggest that knowledge alone is insufficient in curbing shisha smoking, highlighting the role of social, behavioural, and demographic factors.

Addressing these influences requires a comprehensive approach that includes targeted education, policy enforcement, and behaviour modification strategies. Without effective interventions, shisha smoking may continue to pose a significant public health challenge among university students.



6.2 Recommendations

Based on the study's findings, we recommend a series of actionable interventions designed to reduce shisha smoking among university students, each grounded in the evidence gathered and tailored to the Ghanaian context. First, it is imperative that university administrators, in collaboration with the Ghana Health Service and the Ministry of Health, develop and implement targeted health promotion campaigns. These campaigns should go beyond traditional awareness programs and incorporate peer-led initiatives, social media engagement, and interactive workshops that challenge the misconceptions surrounding shisha use. Stakeholders responsible for these efforts include the University of Ghana's Student Affairs and Health Promotion Units, working in partnership with national health agencies.

Second, given the significant association between family instability and shisha smoking, interventions should be directed towards providing psychosocial support and counseling services for students experiencing family disruptions. The University Counseling Center, in collaboration with non-governmental organizations specializing in mental health, should establish regular counseling sessions and support groups aimed at mitigating stress and emotional distress. These services should be monitored with specific performance indicators, such as increased uptake of counseling services by at least 20% within the first academic year of implementation.

Third, the influence of institutional factors, particularly hall affiliation, suggests that the university should explore tailored interventions within residential settings. For instance, halls with higher reported rates of shisha smoking, such as Akuaffo Hall, should receive focused attention through the development of hall-based health clubs and peer mentoring programs. These programs should aim to promote healthier lifestyles and offer alternatives to social activities that encourage shisha

use. The effectiveness of these interventions can be measured by periodic surveys to track changes in smoking behaviors, with an aim to achieve a measurable reduction in prevalence within 18 months.

Lastly, academic institutions and the Ministry of Education should consider integrating comprehensive tobacco control modules into the university curriculum. These modules should address the health risks associated with shisha smoking, the influence of social and cultural factors, and effective strategies for resisting peer pressure. By equipping students with both knowledge and practical skills, such curricular interventions can contribute to long-term behavior change. The curriculum update should be completed within the next academic year, with periodic evaluations to assess its impact on students' attitudes and behaviors towards shisha smoking.

6.3 Further Research

- Conduct qualitative studies to explore the underlying motivations and social dynamics influencing shisha smoking among university students.
- Examine the long-term health effects of shisha smoking among young adults in Ghana to provide more empirical evidence for policy formulation.
- Investigate the effectiveness of intervention programs aimed at reducing shisha smoking prevalence in university settings.



6.4 Final Remarks

This study has contributed to understanding the prevalence and determinants of shisha smoking among university students in Ghana. While knowledge about its risks is relatively high, persistent misconceptions and social influences continue to drive its use. Addressing these factors requires a multi-faceted approach involving education, policy regulation, and support systems. By implementing these recommendations, stakeholders can work towards reducing the burden of shisha smoking and its associated health risks among young adults in Ghana.

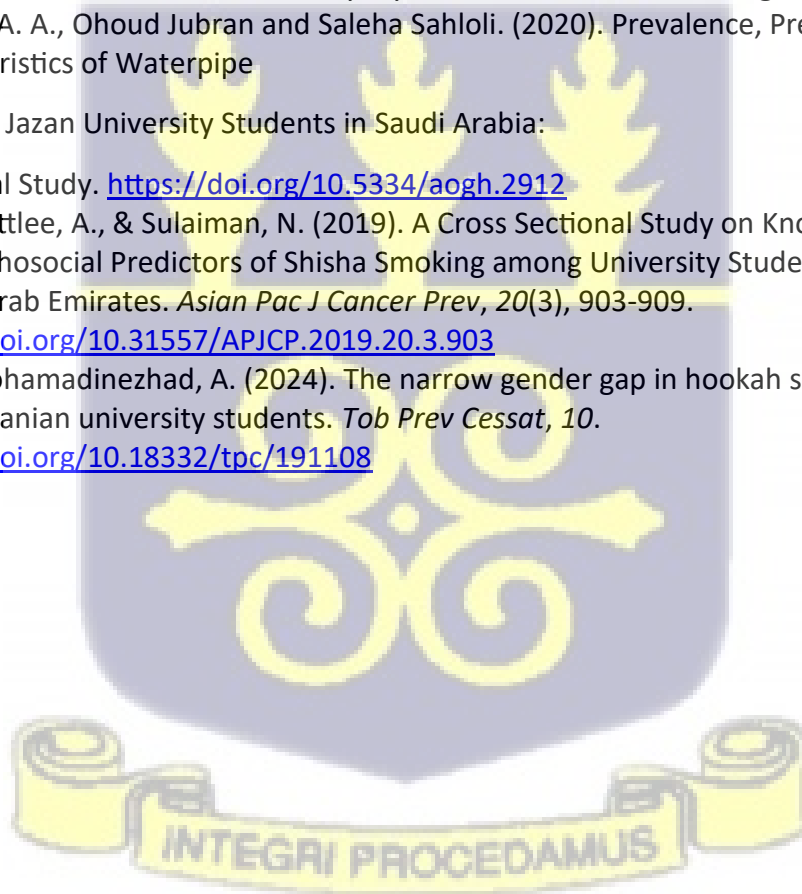


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APPENDIX A: CONSENT FORM

Title: Prevalence and factors associated with the use of Shisha by students in the University of Ghana.

Principal Investigator: Dr. Queenly Abigail Naa Oyoo Quartey

Address: School of Public Health, University of Ghana, Legon. P.O. Box LG 13.

General Information about Research

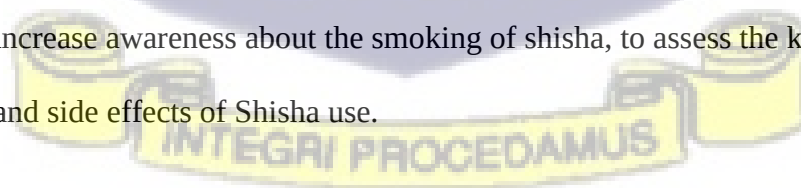
There has been an emerging trend of the use of shisha globally. Among the users of Shisha, it has been found mostly among the youth. This study involves research that seeks to determine the prevalence and factors associated with the use of shisha by students in the University of Ghana. The study is a one-time study, and findings obtained from the study would be helpful in policy development and policy implementation in providing education for the youth on the detrimental side effects of shisha smoking. Participation in this study is expected to take about ten minutes.

Possible Risks and Discomforts

Participating in this study involves minimal risk which may be due to some form of discomfort experienced because of the time spent filling out the questionnaire.

Possible Benefits

There is no direct benefit to you the individual, but the study's findings will help in policy development to increase awareness about the smoking of shisha, to assess the knowledge level of shisha smoking and side effects of Shisha use.



Confidentiality

Responses will be kept confidential, and your identity will be kept anonymous as the names of respondents will not be included in the questionnaire. Information gathered from the study will be used solely for academic purposes and will only be made available to the researcher and the supervisor of this study.

Compensation

There would be no form of compensation for you the participant either in cash or kind.

Voluntary Participation and Right to Leave the Research

Participation in this study is completely voluntary, and you have the right to disagree to participate without any negative consequences. You may also withdraw from the study at any time without any penalty.

Contacts for Additional Information

If you have pertinent questions about this research and seek further clarification, you may contact Queenly Abigail Naa Oyoo Quartey, the Principal Investigator of this study. You may also contact the Department of Biological, Environmental and Occupational Health of the School of Public Health, Legon on 0570761925.

Your rights as a Participant

This research has been reviewed and approved by the Institutional Review Board of Noguchi Memorial Institute for Medical Research (NMIMR-IRB). If you have any questions about your rights as a research participant, you can contact the IRB Office between the hours of 8am-5pm through the landline 0302916438 or email addresses: nirb@noguchi.ug.edu.gh



VOLUNTEER AGREEMENT

The above document describing the benefits, risks, and procedures for the research title “Prevalence and Factors associated with the use of Shisha by students in the University of Ghana” has been read and explained to me. I have been given an opportunity to have any questions about the research answered to my satisfaction. I agree to participate as a volunteer.

Date

Name and signature or mark of volunteer.

I hereby consent to participate in this study. Thank you.

If volunteers cannot read the form themselves, a witness must sign here:

I was present while the benefits, risks and procedures were read to the volunteer. All questions were answered, and the volunteer has agreed to take part in the research.

Date

Name and signature of witness.



I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual.

.....

Date

.....

Name Signature of Person Who Obtained Consent



APPENDIX B: Questionnaire for Data Collection at Study Sites

Questionnaire: Prevalence and factors associated with shisha smoking by students at the University of Ghana.

Thank you for consenting to participate in this study. This tool will capture information for this cross-sectional study.

Questions	Code	Questions	Code
Unique Student ID: _____	UPID	Interviewer code: _____	ICODE
Date(dd/mm/yy): _____	DATE	Site Name: _____	UG-Legon
District: _____	DIST	Region: _____	Greater Accra

SECTION A – Demographic information

No.	Questions	Coding categories	Skip to
1.	Sex	☐ 0. Male ☐ 1. Female	
2.	Age	_____	
3.	Educational level	☐ 0. Level 100 ☐ 1. Level 200 ☐ 2. Level 300	

☐ 3. Level 400

☐ 4. Postgraduate

4. If post-graduate, which ☐ 0. Masters

post graduate program? ☐ 1. PhD

☐ 2. N/A (Not applicable)

5. Religion ☐ 0. Christian

☐ 1. Muslim

☐ 2. Traditionalist

☐ 3. Other (please specify)

6. Ethnicity (e.g. Akan, Ga _____
etc.)

7. Marital Status ☐ 0. Single

☐ 1. Married

☐ 2. Separated

☐ 3. Divorced

☐ 4. Widowed

☐ 5. Co-habiting



☐ 6. In a relationship

8. Place of Residence

9. Program of study

☐ 0. College of health sciences

☐ 1. College of basic and applied sciences

☐ 2. College of education

☐ 3. College of Humanities

10. Which Hall are you
affiliated to?

☐ 0. Mensah Sarbah Hall

☐ 1. Legon Hall

☐ 2. Akuafio Hall

☐ 3. Volta Hall

☐ 5. Commonwealth Hall

11. Are you a resident or a
non-resident?

☐ 0. Resident

☐ 1. Non-resident

12. Where do you belong?

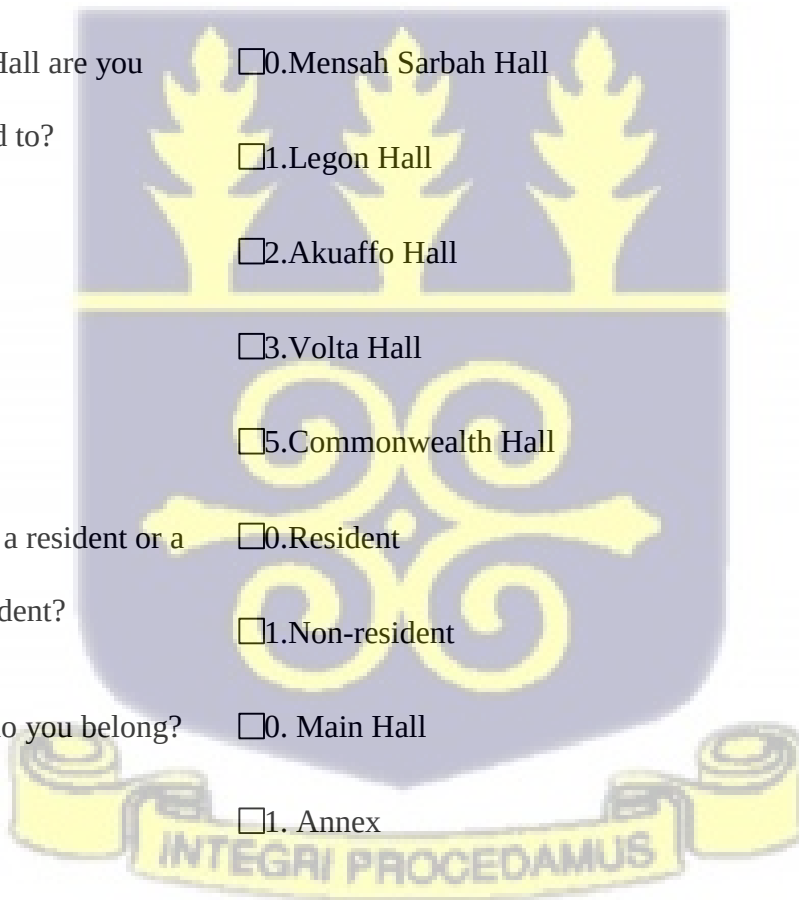
☐ 0. Main Hall

☐ 1. Annex

13. If Main Hall, which
block?

☐ 0. Block A

☐ 1. Block B



☐2.Block C

☐3. Block D

☐4. Block E

☐5.Block F

☐6.N/A

14. If Annex, which Annex? ☐0. Annex A

☐1.Annex B

☐2.Annex C

☐3.Annex D

☐4. Only Annex

☐5.N/A

15. Pocket money/ Income ☐0. 500-1000gh

level (GH per month) ☐1.1500-2000gh

☐2.2500-3000gh

☐3. Other

Section B – Prevalence of Shisha Smoking

No. Questions

Coding categories

Skip to

16. Do you smoke

☐0. Yes

☐ 1.No

17. If “YES”, what do
you smoke?

☐ 0.Shisha

☐ 1.Cannabis

☐ 2.Cigarette

☐ 3.Tobacco

☐ 4.I do not smoke

☐ 5.Other

18. If “No”, why don’t
you smoke?

☐ 0. It is unhealthy

☐ 1. Because of its health implications

☐ 2.Because it is harmful to our body

☐ 3.Personal values

☐ 4.Religious values

☐ 5.I do not like the smell

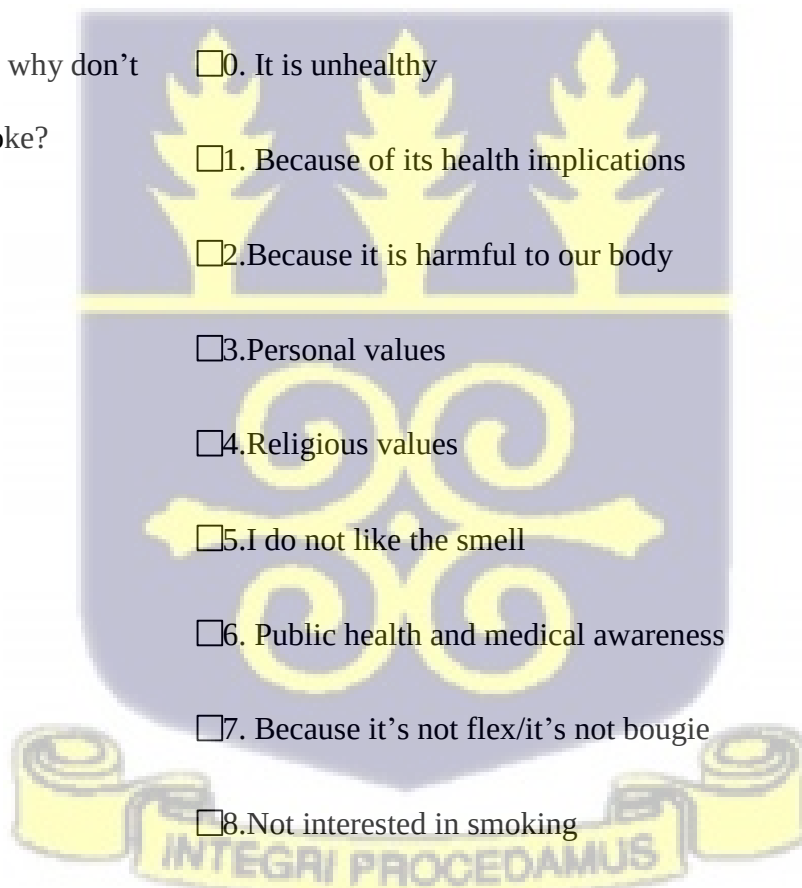
☐ 6. Public health and medical awareness

☐ 7. Because it’s not flex/it’s not bougie

☐ 8.Not interested in smoking

☐ 9. To avoid smoke related diseases

☐ 10. Other.....



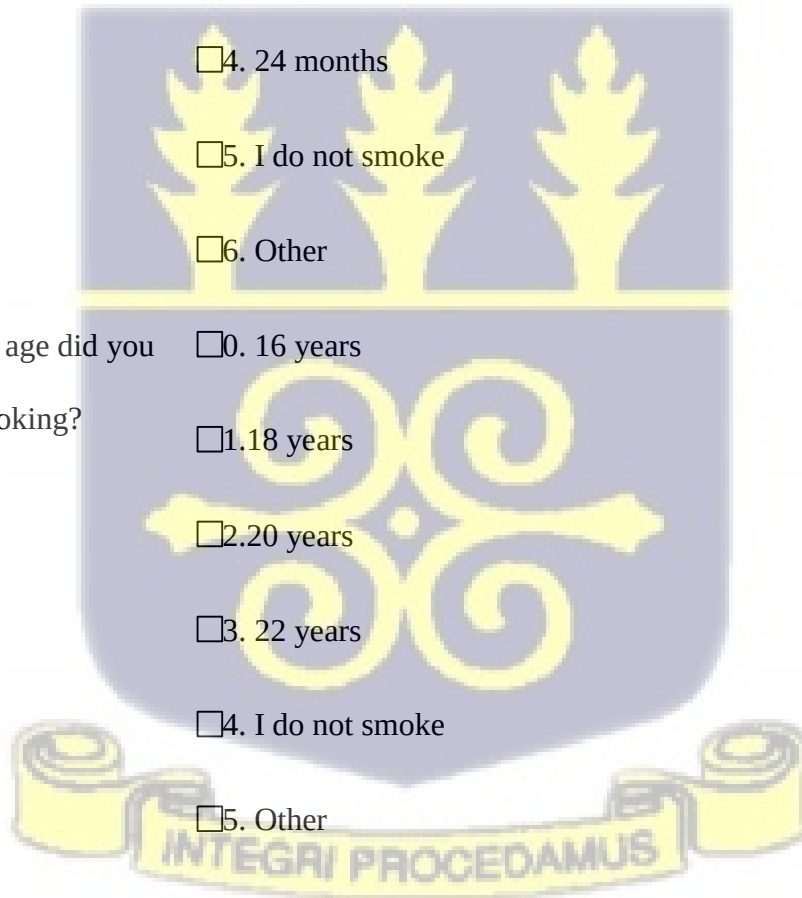
19. Smoking status
- ☐0. Regular smoker
- ☐1.Non-regular smoker
- ☐2.I do not smoke

20. How long have you been smoking?
- ☐0. 1 month
- ☐1. 2 months
- ☐2. 6 months
- ☐3. 12 months

- ☐4. 24 months
- ☐5. I do not smoke
- ☐6. Other

21. At what age did you start smoking?
- ☐0. 16 years
- ☐1.18 years
- ☐2.20 years
- ☐3. 22 years
- ☐4. I do not smoke

- ☐5. Other



22. At what level of education did you start smoking?
- ☐0. Primary
 - ☐1. JHS
 - ☐2. SHS
 - ☐3. Tertiary
 - ☐4. I do not smoke
 - ☐5. Other

23. What lead you to smoke at that period?
- ☐0. I lost a relative
 - ☐1. Peer pressure

☐2. Broken heart

☐3. Parents/ Guardian smoke

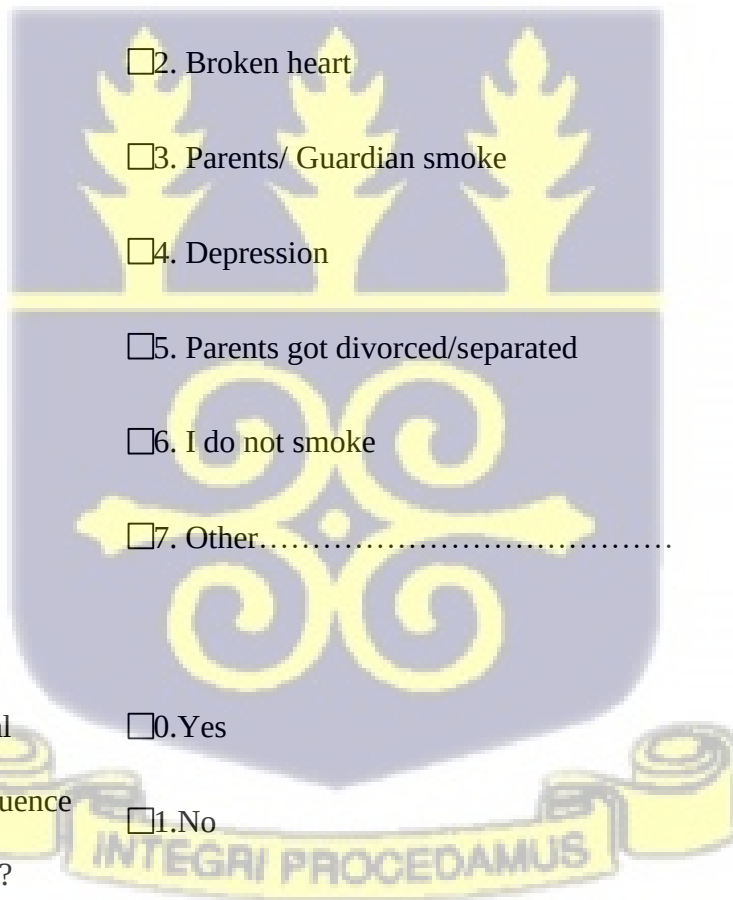
☐4. Depression

☐5. Parents got divorced/separated

☐6. I do not smoke

☐7. Other.....

24. Does financial problems influence you to smoke?
- ☐0. Yes
 - ☐1. No
 - ☐2. I do not smoke



25. Frequency of smoking in a week
- ☐0. Once in a week
- ☐1. Twice in a week
- ☐2. More than twice in a week
- ☐3. Everyday
- ☐4. I do not smoke
- ☐5. Other

26. How many hours do you smoke in a day?
- ☐0. 30 minutes and below
- ☐1. One hour

☐2. More than 2 hours

☐3. I do not smoke

☐4. Other

27. Do you take alcohol?
- ☐0. Yes

☐1. No

28. Do you live with
- ☐0. Yes

your parents/

☐1. No

guardian?

29. Were you raised by
- ☐0. Yes

both parents/

☐1. No

Guardian?

30. Are your parents/
guardian divorced? ☐0.Yes
☐1. No

31. Are any of your
parents/ guardian
deceased? ☐0.Yes
☐1.No

32. Does your father
/male guardian
smoke? ☐0. Yes
☐1. No

33. If “YES”, what does
he smoke? ☐0. Shisha
☐1. Cigarette

☐2. Tobacco

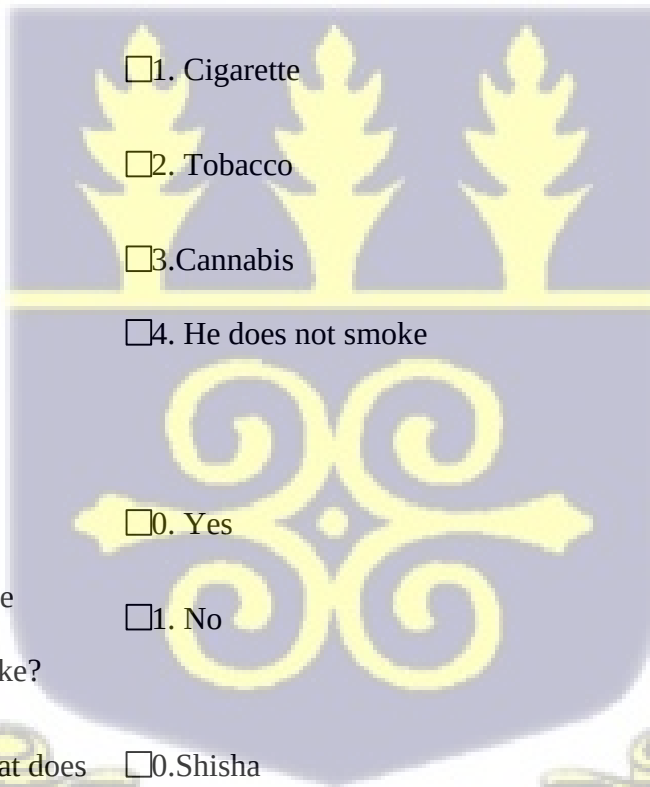
☐3.Cannabis

☐4. He does not smoke

34. Does your
Mother/female
guardian smoke? ☐0. Yes
☐1. No

35. If “YES”, what does
she smoke? ☐0.Shisha
☐1. Cigarette

☐2.Tobacco



☐3.Cannabis

☐4. She does not smoke

36. What is your father's ☐0. Primary

or male guardian's ☐1. Secondary

education level?

☐2. Tertiary

☐3.Post-graduate

☐4. Did not attaned any school

☐5. Other.....

37. What is your
mother's or female
guardian's
educational level?

☐0. Primary

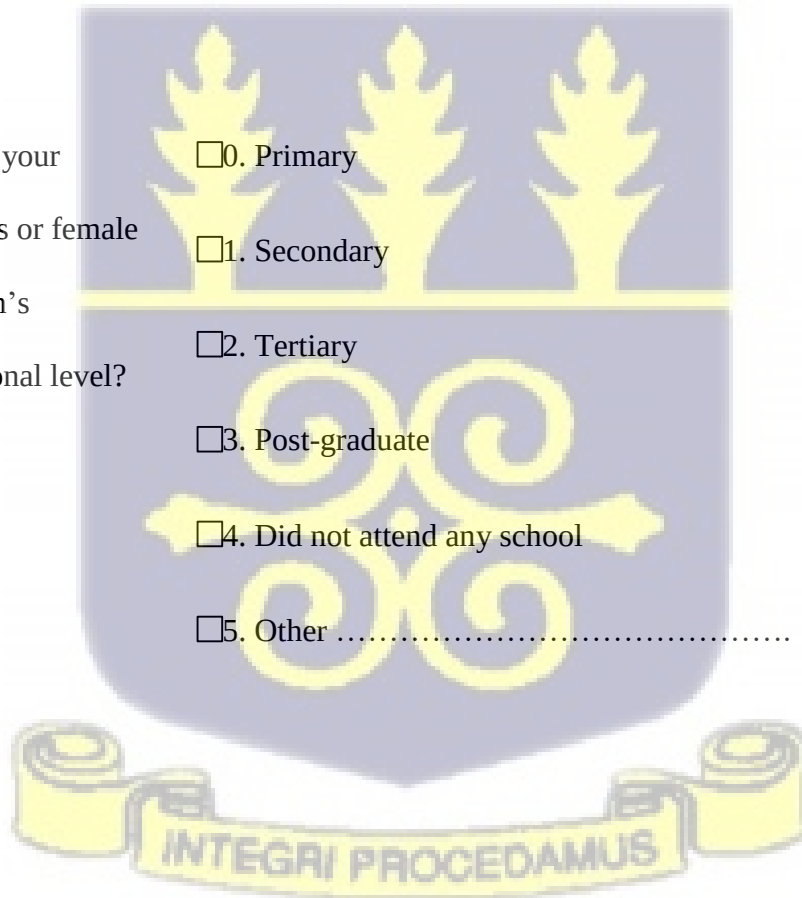
☐1. Secondary

☐2. Tertiary

☐3. Post-graduate

☐4. Did not attend any school

☐5. Other



Section C-Knowledge about Shisha Smoking

No.	Questions	Coding categories	Skip to
38.	How do you know about shisha?	☐ 0. Friends ☐ 1. Family ☐ 2. Social media ☐ 3. Other	

The 5 -Point Likert scale: 1. Strongly Disagree 2. Disagree 3. Neither agree nor disagree 4.

Agree 5. Strongly agree

1. Shisha contains nicotine.
2. Health hazards are associated with habitual mouthpiece sharing such as oral herpes
3. Shisha is more addictive than cigarette
4. Shisha smoking leads to lung cancer
5. Shisha smoking leads to dental problem such as gum disease
6. Habitual Shisha smoking can lead to cardiovascular diseases
7. Shisha smoking reduces weight
8. Stress influences one to start shisha smoking
9. Family problems lead to shisha smoking
10. Problems with friends can lead to shisha smoking
11. Relationship problems with husband or wife or girlfriend can lead to shisha smoking
12. Financial problems can lead to shisha smoking
13. University life stress can lead to shisha smoking
14. Shisha advertisement can lead to its smoking

- 15. Shisha is harmful to health
- 16. Water in shisha apparatus filters toxins from the smoke
- 17. Shisha contains harmful chemicals
- 18. Shisha smoking is addictive

Section D-Factors associated with Shisha smoking (Behavioral, Environmental, Socio-economic)

39. Why do you smoke?

- ☐0. Curiosity
- ☐1. Social trend
- ☐2. Peer influence
- ☐3. Stress and anxiety
- ☐4. To feel strong and bold
- ☐5. Others (Please Specify)

40. What are some of the effects associated with smoking?

- ☐0. Sensitive towards light and sound
- ☐1. Swollen neck or jaw
- ☐2. Pain that worsens with swallowing or talking

- ☐3. Tonsils become swollen and reddish
- ☐4. Hoarse and muffled voice
- ☐5. Pain or scratchy sensation in the throat
- ☐6. Nausea
- ☐7. Headache
- ☐8. Dry throat

41. Does the school environment influence you to smoke shisha?

☐0. Yes

☐1. No

☐2. I do not smoke

42. Does any of your family members or relatives influence you to smoke shisha?

☐0. Yes

☐1. No

43. Where do you mostly smoke shisha?

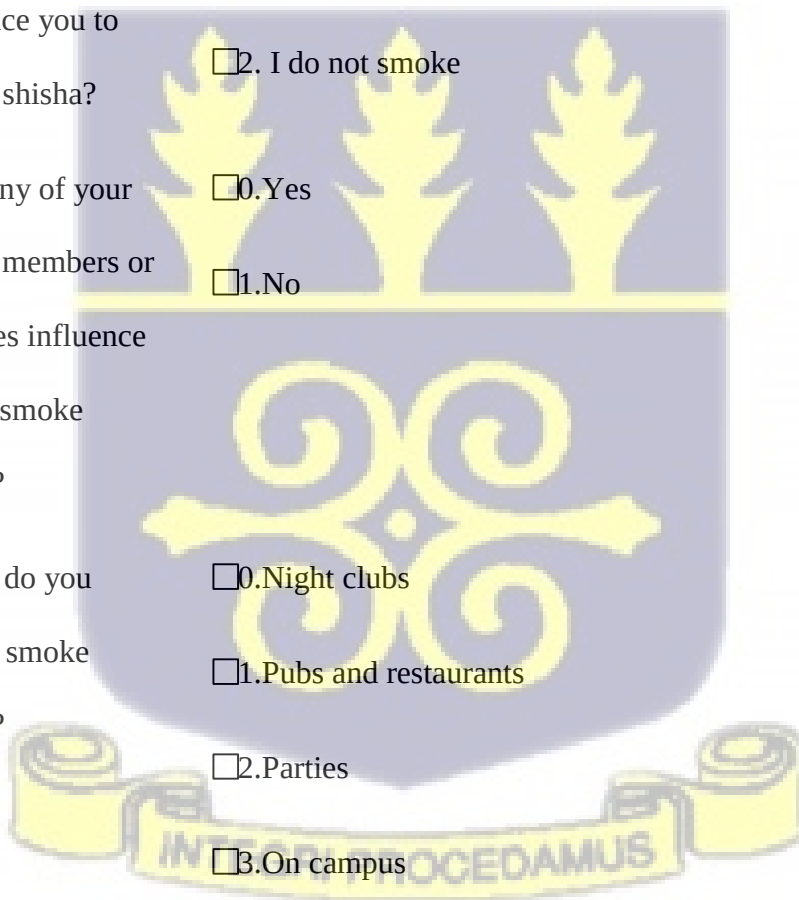
☐0. Night clubs

☐1. Pubs and restaurants

☐2. Parties

☐3. On campus

☐4. I do not smoke



☐5.Others (Please specify)

44. Do you take flavored ☐0. Flavored shisha

shisha or non-

☐1. Non-flavored shisha

flavored shisha?

☐2. I do not smoke

☐3. Other

45. If “YES”, to ☐0.Marijuana

flavored shisha, what

☐1. Gin

type of flavor?

☐2. Rum

☐3. I do not smoke

☐4. Other

46. What benefits do ☐0. It helps me forget my problems

you get from

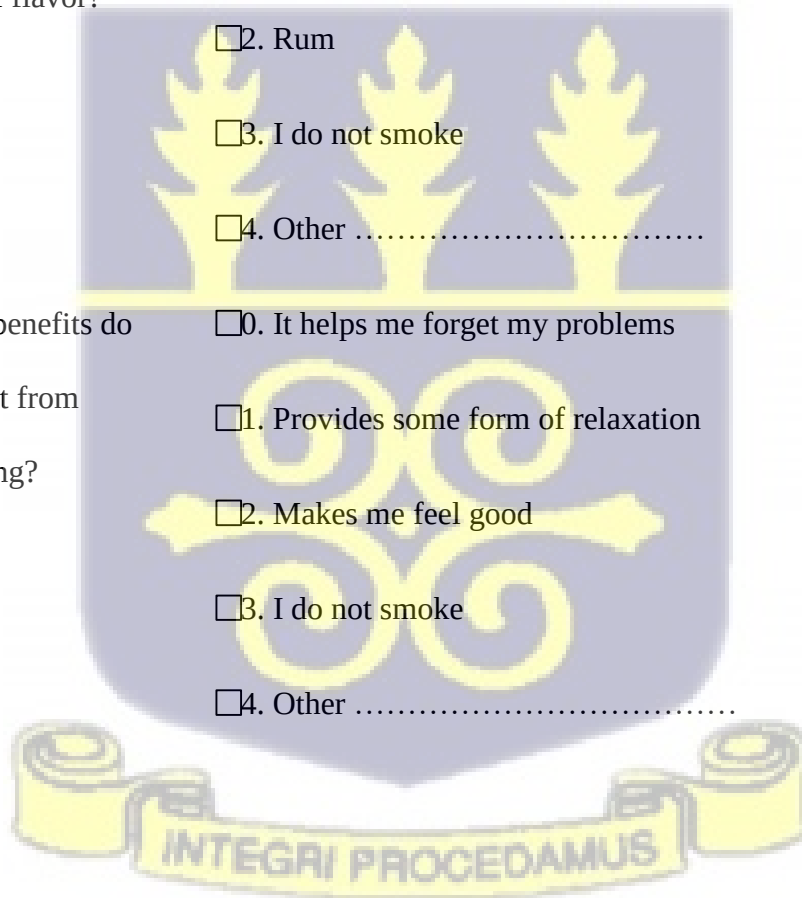
☐1. Provides some form of relaxation

smoking?

☐2. Makes me feel good

☐3. I do not smoke

☐4. Other



The survey is now over. Thank you for your time

APPENDIX C

Table : Variance Inflation Factor
(VIF) Analysis for
Multicollinearity Assessment

Variable	VIF	1/VIF
1.Knowledge	1.16	0.864066
2.Gender	1.57	0.637039
Educational Level		
Level 200	2.05	0.488909
Level 300	2.53	0.394634
Level 400	2.59	0.385822
Post-graduate	2.72	0.36744
Age		
20-29	1.85	0.541344
30-39	1.98	0.505622
40 and above	1.34	0.744593
2.Marital status	1.21	0.828578
Religion		
Muslim	1.05	0.951698
Non	1.07	0.938143
Program college		
College of Education	1.4	0.715939
College of Health Sciences	1.69	0.591939
College of Humanities	1.54	0.651135
Hall affiliation		
Commonwealth Hall	1.51	0.663661
Legon Hall	1.53	0.651482
Mensah Sarbah Hall	1.61	0.622693
Volta Hall	1.64	0.608426
2.Live with parents	1.46	0.68375
2.Raised by both parent	1.74	0.575156
2.Divorced parents	1.56	0.642472
Mean VIF	1.67	



APPENDIX D: ETHICAL CLEARANCE



**UNIVERSITY
OF GHANA**

**NOGUCHI MEMORIAL INSTITUTE
FOR MEDICAL RESEARCH (NMIMR)**
COLLEGE OF HEALTH SCIENCES
INSTITUTIONAL REVIEW BOARD

5th June 2024

ETHICAL CLEARANCE

FEDERALWIDE ASSURANCE FWA 00001824

IRB 00001276

NMIMR-IRB CPN 124/23-24

IORG 0000908

On 5th June 2024, the Noguchi Memorial Institute for Medical Research (NMIMR) Institutional Review Board (IRB) at a full board meeting reviewed and approved your protocol titled:

TITLE OF PROTOCOL : Prevalence and Factors associated with the use of Shisha Among students in the University of Ghana

PRINCIPAL INVESTIGATOR : Quartey Queenly Abigail Naa Oyoo

Please note that a final review report must be submitted to the Board at the completion of the study. Your research records may be audited at any time during or after the implementation.

Any modification of this research project must be submitted to the IRB for review and approval prior to implementation.

Please report all serious adverse events related to this study to NMIMR-IRB within seven days verbally and fourteen days in writing.

This certificate is valid till 4th June 2025. You are to submit annual reports for continuing review.

Signature of Chair:

Dr. Abraham Hodgson
(NMIMR-IRB CHAIR)