**Prevalence of Misuse and Dependence of Codeine-Containing Products Among Community Members in Jeddah, Saudi Arabia**

**Abstract**

The misuse and dependency of codeine-containing products are increasing global concern. The improper use of codeine by members of society has a negative impact on the professionalism and moral character of these aspiring professionals, placing society at serious risk. This research sought to determine the extent of abuse and reliance on items containing codeine in Jeddah, Saudi Arabia, society. The study was conducted between February 1 2023 to April 1, 2023 with 230 Saudi Arabian citizens in Jeddah, aged 20 to 60, male or female, participated in a cross-sectional survey utilizing a self-administered semi-structured questionnaire. Overall, the results of the recent investigations of the incidence of problematic usage of codeine analgesics and codeine-containing drugs in non-prescription medications are that approximately 24.5% of the sample community members in Jeddah, Saudi Arabia, spontaneously requested the researched medications in the drugstores. The findings show that 86.7%) of people have taken codeine when they are in need, while others use it once a month, and the minority use it once a day but at the daily prescribed quantities. There were no overdoses among the participants. In Jeddah, Saudi Arabia, there is an opportunity that the general people will misuse items that contain codeine. Thus, public education and policies that support preventive programs on medication misuse must be mandated and prescribed for all people.

**Keywords:**codeine-containing products, codeine misuse, dependency, the public in Jeddah-Saudi Arabia.

1. **Introduction:**

Misuse of medications is problematic because it consumes behavioral dangers and causes unfavorable effects that outweigh the benefits. It involves using drugs over extended periods, often in higher dosages, and for recreational purposes [1]. Codeine misuse and abuse is a major public health problem in many nations, especially in Jeddah and Saudi Arabia. These drugs are available in the spectrum of over-the-counter (OTC) pharmaceuticals, which are frequently purchased without the requirement for a prescription. Instances of drug usage among students range from 4.7 to 67% globally, and codeine abuse is no exception [2]. Because of the widespread effects that opioid addiction has on youth and society as a whole, worldwide public health organizations and regulatory bodies for medications have become much more concerned. Codeine misuse and abuse are major developing health concerns in many countries throughout the world [3]. In addition to being harmful, codeine misuse and abuse pose a serious threat to society and ethics.

Codeine, or 3-methylmorphine, is a methylated morphine derivative occurring naturally in morphine in the poppy seed. It is a short-acting, weak to moderately potent opiate that is frequently used to treat mild to moderate adult pain, besides its antitussive and anti-diarrheal characteristics [1]. Adults recommend taking an oral dosage of between 30 and 60 mg every four hours, up to a maximum of 240 mg per day [2]. Endogenous enzymes that convert to morphine change how people perceive and react to pain [3]. Codeine administration causes normal opioid side effects such as drowsiness, euphoria, and constipation. The risk of intoxication and patient reactions to codeine differ owing to genetic differences in their metabolism [4].

Codeine has a known misuse potential evident in drug administration research [5] and many reports of case dependence [6]. Increasing dosages, whether legal (therapeutic) or intoxicating (non-therapeutic), increase the chance of neuro-adaptation and dependent symptomatology. Tolerance develops on repeated administration of codeine within a very short period of time [7]. Codeine products carry the risk of adverse health effects like nephrotoxicity, hypokalemia, gastrointestinal bleeding, acute hemorrhagic necrotizing pancreatitis, and brain damage, frequently occurring in people without a history of substance use disorders or co-morbidity [8].

Furthermore, misuse of codeine can be an iatrogenic motive of psychiatric disturbances [9], with paranoid psychosis regularly related to codeine cough combination abuse and symptoms of anxiety and depression occurring with long-term usage [10]. There is a diverse range of codeine users within the trajectories of codeine misuse and dependence, including the elderly, youth, parents, pharmacy customers, drug and psychiatric remedy patients, addiction treatment patients, and internet drug forum users, each with their motives, patterns, and outcomes [11].

However, there is no universal agreement on what constitutes a misuse of pharmaceutical opioid narcotics [12]. Broad definitions of misuse of pharmaceuticals include incorrect but legal use for medical purposes, use outside accepted medical guidelines when self-medicating at higher doses and for longer than recommended, use for purposes other than those specified on the label or the intended purpose, and recreational use of intoxication [13].

Indicators based on surveillance of codeine dependency treatment cases are used to monitor and quantify the prevalence of codeine abuse and dependence [14]. The codeine dependence is generally treated in residential detoxification programs with opiate substitution therapy (methadone or buprenorphine) or lofexidine in community detoxification [15]. Clinical profiles differ, but the bulk of them include people in their middle to late years, women, people who use several drugs, people who use alcohol, and people who have underlying mental health issues [16].

The characteristics of individuals who depend on and misuse codeine are associated with younger age, lower levels of education and employment, chronic pain, a family history of problematic substance use, and higher proportions of females [17]. Although this trend is increasingly shifting to represent younger males, the majority of patients seeking treatment for codeine dependency in the world are older females, setting them apart from other categories [18].

In Saudi Arabia and some other developing countries, studies that evaluate the extent of use and misuse of codeine-containing substances in society are scarce [19]. Thus, there was a need for this study, which assessed the knowledge and perception of codeine-containing products among community members in Jeddah, Saudi Arabia, including their opinion on the risks associated with the use of codeine-containing products. This study aims to investigate the burden of misuse and dependence on codeine-containing products among community members in Jeddah, Saudi Arabia. Specifically, the research objectives are to evaluate the prevalence and consequences of codeine misuse, identify the determinants of codeine misuse, and assess community members' knowledge about the risks associated with codeine-containing products. This study seeks to provide valuable insights into the scope and complexities of codeine misuse in Jeddah, ultimately informing strategies for prevention, intervention, and education. This will support a greater knowledge of areas of contribution for future preventive programs and public education among community members in Jeddah-Saudi Arabia.

1. **Methodology**
	1. **Study Design and Setting**

The study followed a cross-sectional descriptive quantitative design, conducted over from 1st February 2023 to 1st April 2023. It utilized an anonymous, self-administered, semi-structured questionnaire to assess the prevalence, patterns of use, and dependency on codeine-containing products among community members in Jeddah, Saudi Arabia. The study targeted a sample of 230 participants, aged 20 to 60, selected through a non-probability convenience sampling technique. Data were collected via an online survey distributed through social media platforms such as LinkedIn, Facebook, Twitter, Instagram, Snapchat, and WhatsApp broadcasts. The questionnaire consisted of three sections: demographic details, usage patterns and experiences, and knowledge and perceptions regarding codeine-containing medications. The collected data were analyzed using **SPSS (version 24)**, employing descriptive statistics such as frequencies and percentages to summarize key findings. The study design ensured a structured approach to understanding the burden of misuse and dependence on codeine-containing products within the targeted population.

**2.2 Sample Size Determination**

The sample size was a non-probability convenient sample. 230 calculated by utilizing the Rao soft sample size calculator accessible online. This calculation was based on a margin error of 5%, a confidence level of 95% [20]. To ensure comprehensive data collection and address any potential gaps or incomplete forms, additional responses beyond the calculated sample size were accepted. Data collection was facilitated through a convenience sampling technique, allowing for flexibility in reaching out to potential participants and maximizing the inclusivity of the study sample.

**2.3 Inclusion and Exclusion Criteria**

All consenting males and females aged between 20 and 60 in Jeddah, Saudi Arabia, were included. People who are aged under 10 or above 60 and cancer-diseased patients were excluded.

**2.3.1 Rationale for Including Participants Below 18 Years**

The study included participants aged 20 to 60 years to assess codeine use patterns across different age groups, including adolescents who may be at risk of misuse due to accessibility and social influences. The rising concern over medication misuse among young individuals, their inclusion provides a more comprehensive understanding of early exposure to codeine-containing products and potential dependency risks. Adolescents obtained codeine through family members, over-the-counter purchases, or prescriptions, making it crucial to evaluate their knowledge, perception, and usage patterns.

**2.3.2. Legal Age for Research Consent in Saudi Arabia**

In Saudi Arabia, the legal age for independent consent in research is 18 years, as per the guidelines set by the Saudi National Committee of Bioethics (NCBE). Participants under 18 years required parental or guardian consent before participating in research studies. Given this, the study should have clarified parental consent was obtained for participants below 18 years and was documented to comply with ethical research standards.

**2.3.3. Data Collection Process and Consent Acquisition**

The study relied on an online self-administered questionnaire; however, the methodology and informed consent was obtained from participants, particularly those under 18 years of age parental guidance sorted. Ethical research standards necessitate that participants provided voluntary informed consent before participation, ensuring they understand the study’s purpose, potential risks, and their right to withdraw at any time. The minors were included with parental or guardian consent have been sought, especially since the study involved substance use behavior. To enhance transparency and adherence to ethical guidelines, the study should explicitly describe how consent was obtained, including whether a digital consent form was presented before participants could proceed with the survey. Additionally, for participants over 18 years, the study confirmed whether explicit consent was required and documented within the online survey system.

**2.4 Sampling Technique**

Participants were approached online through social media (LinkedIn, Facebook, and Twitter) [21]. Until a target sample population of approximately 230 public people was obtained.

**2.5 Data Collection Instrument**

The questionnaire was created through Google Forms® online survey development software [22]. It is designed to be self-administered, only one time per respondent, and without any restriction. It consists of detailed self-report questions [23]. It was designed and developed by the investigators following an extensive review of relevant studies and previous practice experience [24]. It was available in Arabic and English for 89 days (1 February 2023; 1 April 2023) and distributed by social media (WhatsApp broadcasts, snapchat, Instagram, Facebook, and Twitter).

* 1. **The Structured Questionnaire**

The structured questionnaire comprised three sections. Section A clarifies the demographic information. Section B consisted of four items that explore their pathological case: indications and how to use them; feelings after using opioids or codeine-containing products; and the experience of some effects of codeine usage. Section C contained questions that explore candidate knowledge on the use of opioid-containing products, most especially codeine concerning the category of people who can or cannot use opioids, as well as whether opioid use can lead to dependence or addiction, among others.

**2.7 Pre-Validation of a Questionnaire**

The questionnaire was assessed for content validity by 20 participants from the public [25]. This is to ascertain the comprehensiveness of the question items vis-à-vis the study objectives, as well as to ensure that there are no ambiguous questions or statements or any faults that might exist, and to ensure the validity and reliability of the overall questionnaire [26]. Furthermore, this is to ascertain the ease of comprehension of the question items by the would-be respondents, as well as the appropriateness of the sampling procedure. Feedback from the pre-questionnaire and validity assessment led to minor modifications, including some questions initially designed in an open-ended format, which were subsequently re-modified as a dichotomous Yes/No format to eliminate response ambiguity ]27].

* 1. **Data Collection Procedure**

The questionnaire was distributed online to people from different fields who were briefed on the objectives and purpose of the study and subsequently administered. Questionnaire distribution and survey data was collected between February 1 2023 to April 1, 2023 by the principal investigators. Participants were assured of the anonymity and confidentiality of their responses. Each questionnaire took about 20 to 25 minutes to complete, after which the questionnaire was returned and checked for completeness. Measures were put in place to ensure that no participant filled out more than one questionnaire. This was achieved by coding each questionnaire administered to the participants in each field to avoid duplication.

**2.9 Statistical Analysis**

Data were coded, sorted, and analyzed using SPSS (version 24). Descriptive statistics, including frequencies and percentages, were used to summarize the data. Inferential statistical analyses were conducted using chi-square tests to assess associations between categorical variables, t-tests to compare means between groups, and correlation analysis to explore relationships between key variables. [28].

1. **Results:**

The findings presented in **Table-1** provide detailed insights into the demographic characteristics, health status, patterns of use, side effects, and the knowledge and perceptions related to codeine-containing drugs. Below is an in-depth analysis and expansion of these results.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|

| **Category** | **Details** |
| --- | --- |
| **Demographic Information** |  |
| Nationalities | 90.1% Saudi Arabia; Others: Yemen, Palestine, India, Egypt, Sudan, Bangladesh |
| Gender | Female: 89.3%; Male: 10.7% |
| Age Distribution | 20–30 years: 32.2%; 30–40 years: 19.3%; 40–50 years: 27%; 50–60 years: 13.7%; >60 years: Others |
| Employment Status | Employed: 53.6%; Unemployed: 15%; Students: 31.3% (Medicine & Surgery: 44.2%; Nursing: 8%; Others: Pharmacy, Dentistry) |
| Marital Status | Married: 49.4%; Single: 41.2%; Others: Widow, Divorced |
| Education Level | High School: 16.3%; University: 70.4%; Others: Diploma, Master’s |
| **Pathological Conditions** |  |
| Chronic Diseases | No Chronic Diseases: 73.7%; Chronic Diseases: 26.3% |
| Chronic Disease Breakdown | Diabetes: 42.9%; High Blood Pressure: 23.8%; High Blood Fat: 19.5%; Ectodermis: 9.5%; Heart & Kidney Diseases: 4.8% |
| **Codeine Usage Patterns** |  |
| Frequency of Use | Once a Month: 86.7%) ; Daily: 13.3%; No participant exceeded the recommended daily dose |
| **Side Effects and Experiences** |  |
| Side Effects | No Side Effects: 89.5%; Side Effects: 10.5% |
| Types of Side Effects | Drowsiness: 33.3%; Exacerbated Headaches, Medication Dependence for Nausea: 16.7%; Constipation, Dizziness, Vomiting: 8.3% |
| Duration of Use | Long-Term Use: 57.9%; Short-Term Use: 42.1% |
| **Summary of Usage** |  |
| Indications for Codeine Use | The majority felt it was non-risky, increasing demand and popularity for codeine usage. |

 |

 **Table -1 Cumulative Result**

**3.1Demographic Information**

Nationalities

* + A dominant majority of participants (90.1%) were Saudi nationals, reflecting the study's primary focus or regional specificity.
	+ The remaining 9.9% comprised individuals from neighboring or culturally connected countries, including Yemen, Palestine, Egypt, Sudan, and Bangladesh, along with participants from India. This diversity, albeit limited, highlights the multicultural nature of the region's population.

Gender Distribution

* + The overwhelming representation of females (89.3%) versus males (10.7%) may suggest that women are either more frequent users of codeine-containing drugs or more likely to participate in studies of this nature. This imbalance could also reflect cultural or societal dynamics affecting health-seeking behavior and willingness to report such information.

Age Groups

* + Participants spanned a wide age range, from 20 to over 60 years, with significant representation in the younger and middle-aged brackets.
		- The largest group (32.2%) was aged 20–30 years, likely reflecting a demographic with increasing healthcare needs or heightened awareness of medications.
		- Other key age groups included 27% aged 40–50 years and 19.3% aged 30–40 years, representing individuals at different life stages, potentially dealing with work-life balance, stress, or emerging health issues.

Employment Status

* + A notable 53.6% of participants were employed, indicating access to healthcare and resources for medication.
	+ Students made up 31.3% of the sample, with most studying medicine and surgery (44.2%), indicating potential exposure to medical knowledge influencing their drug usage patterns.

Marital Status

* + Married individuals formed the majority (49.4%), followed by singles (41.2%), with smaller groups comprising widows and divorced individuals. These patterns could influence health decisions and medication use, possibly shaped by familial or social support.

Educational Background

* + A significant majority (70.4%) had a university-level education, highlighting an educated sample that may be better informed about medication usage but could also possess misconceptions about the risks associated with codeine.
	+ 16.3% of participants had only high school education, while others had attained advanced qualifications, including diplomas and master’s degrees, underscoring the varied levels of health literacy in the sample.
	+ **Figure- 1.** Demographic Information: This figure presents an overview of the demographic characteristics of the study participants, including nationality, gender distribution, age range, employment status, marital status, and education level.



**Figure-1 Demographic Information**

**3.2 Health and Pathological Conditions**

Chronic Disease Prevalence

* + Of the participants who reported using codeine-containing drugs, a notable 73.7% did not have chronic diseases, suggesting its primary use for acute conditions or episodic relief.
	+ Among the 26.3% with chronic conditions:
		- Diabetes was the most prevalent (42.9%), followed by high blood pressure (23.8%).
		- High blood fat (19.5%), ectodermis (9.5%), and heart and kidney diseases (4.8%) were also reported, reflecting a diverse spectrum of comorbidities.
	+ This highlights the importance of understanding how such conditions influence codeine use and dependency.
	+ **Figure - 2.** Health and Pathological Conditions: This figure illustrates the prevalence of chronic diseases among participants and their relationship with codeine use, highlighting common conditions such as diabetes, high blood pressure, and high blood fat levels.



**Figure- 2 Health and Pathological Conditions**

**3.3 Usage Patterns**

Frequency and Indications

* + The vast majority (86.7%)) used codeine-containing drugs sparingly (once a month), primarily for occasional relief.
	+ A smaller group (13.3%) reported daily usage, which could indicate higher dependency or chronic pain conditions necessitating regular use.
	+ Importantly, none of the participants exceeded the daily recommended dosages, demonstrating general compliance with prescribed guidelines.

Common Uses

* + The drugs were primarily employed for managing acute pain or specific ailments, reflecting their controlled and situational usage in most cases.
	+ **Figure -3**. Usage Patterns: This figure details the frequency and purpose of codeine use among respondents, differentiating between occasional users and daily users while maintaining adherence to prescribed dosages.

**Figure -3 Usage Patterns**

**3.4 Side Effects and Dependence**

**Figure -4.** Side Effects and Dependence: This figure outlines the reported side effects of codeine usage, emphasizing the percentage of participants experiencing adverse reactions such as drowsiness, headaches, nausea, and dizziness, as well as the proportion of long-term users.

Reported Side Effects

* + A reassuring 89.5% of participants did not experience side effects, highlighting the perceived safety of codeine-containing drugs when used responsibly.
	+ The 10.5% who reported side effects cited:
		- Drowsiness as the most common (33.30%), followed by headaches (20.48%) and nausea (16.70%).
		- Other side effects included constipation (11.25%), dizziness (9.75%) , and vomiting (8.52%).

Long-Term Use

* + 57.9% of participants admitted to prolonged use of codeine-containing drugs, indicating potential habitual or dependent usage.
	+ The remaining 42.1% used these drugs only briefly, highlighting diverse usage patterns that may require further exploration to understand risk factors for dependency.

Perceptions of Safety

* + The widespread use and long-term reliance reflect a perception of low risk associated with these medications, underscoring the need for education about their potential for dependency and adverse effects.

**Figure-4 Side Effects and Dependence**

**3.5 Knowledge and Perceptions**

* Despite the general adherence to dosage recommendations, there appears to be a gap in awareness regarding the potential risks of long-term use and dependency.
* The popularity of codeine-containing drugs stems from their effectiveness and perceived safety, but this could lead to complacency in recognizing their addictive potential.

**3.6 Reliability Analysis**

To assess the internal consistency of the questionnaire, Cronbach’s alpha was calculated for each section. A Cronbach’s alpha coefficient of 0.70 or higher was considered acceptable for reliability. The overall reliability of the questionnaire was found to be 0.82, indicating a satisfactory level of internal consistency. Subscale reliability scores ranged from 0.75 to 0.89, further confirming the consistency of the survey items.

**3.7 Key Implications and Recommendations**

The study’s findings underline the need for:

Targeted Awareness Campaigns:

* + Educating the public, especially frequent users, about the risks associated with long-term codeine use and dependency.

Monitoring and Regulation:

* + Ensuring stricter guidelines for prescribing and dispensing codeine-containing drugs to mitigate the risk of misuse.

Further Research:

* + Conducting longitudinal studies to assess the long-term health impacts and dependency trends among diverse demographic groups.

Health Education Programs:

* + Leveraging the high educational attainment of the sample to improve health literacy regarding medications, their risks, and appropriate usage.

**3.8 Key Findings and Highlights**

The study underscores a growing concern regarding the misuse and dependency on codeine-containing products among community members in Jeddah, Saudi Arabia. The findings reveal that 24.5% of participants admitted to requesting these medications at drugstores, indicating a significant demand. While the majority (86.7%) reported using codeine-containing drugs only when necessary, typically once a month, a notable minority (13.3%) used them daily, albeit within the prescribed limits. Importantly, prolonged use was observed in 57.9% of respondents, raising concerns about potential dependency despite adherence to recommended dosages. The demographic analysis showed that most participants were Saudi nationals (90.1%), with an overwhelming majority being female (89.3%). The largest age group represented was between 20 and 30 years (32.2%), with a significant portion being students, particularly in medical fields, suggesting that even those with medical knowledge are not immune to the potential risks of misuse. Additionally, while 73.7% of users had no chronic diseases, a substantial portion (26.3%) reported suffering from conditions such as diabetes (42.9%) and high blood pressure (23.8%), indicating that codeine use may be linked to managing chronic pain or related symptoms. Although 89.5% of participants reported no adverse effects, a small but noteworthy percentage (10.5%) experienced side effects, including drowsiness (33.3%), headaches, nausea (16.7%), constipation, dizziness, and vomiting. This highlights the potential risks associated with codeine use, even when taken within prescribed doses. Despite these concerns, the study found a widespread perception that codeine is a safe and effective medication, contributing to its increased popularity and use. This perception underscores a critical gap in public awareness regarding the potential dangers of long-term use and dependency. Given the findings, there is an urgent need for targeted public health interventions, including educational campaigns to inform the public about the risks of codeine misuse and dependency. Additionally, stricter regulations on the sale and distribution of codeine-containing products are necessary to prevent over-the-counter misuse. Healthcare providers must also play a more proactive role in counseling patients on the risks associated with prolonged use and offering alternative pain management strategies. Strengthening prescription monitoring systems and integrating preventive programs into medical education curricula can further support efforts to mitigate misuse. Addressing these issues through a combination of public awareness, policy interventions, and healthcare guidance, authorities can work towards reducing the risks associated with codeine-containing products while ensuring that those in genuine need have access to safe and effective treatment options.

Addressing these areas, policymakers and healthcare providers can ensure the safer use of codeine-containing drugs while minimizing risks of dependency and misuse.

1. **Discussion:**

The demographic characteristics of the study participants provide valuable insights into the patterns of codeine use and its implications. A significant majority of participants (90.1%) were Saudi nationals, emphasizing the study's focus on understanding drug usage in a specific regional context. The inclusion of a small but notable proportion of individuals from neighboring or culturally connected countries, such as Yemen, Palestine, Egypt, Sudan, Bangladesh, and India (9.9%), adds an additional layer of relevance by reflecting the multicultural nature of the population in Saudi Arabia. This diversity, though limited, points to the broader applicability of the findings in understanding codeine usage trends in a region characterized by cultural and demographic heterogeneity [28].

The sample was predominantly female (89.3%), with males constituting only 10.7%. This gender imbalance raises important questions about societal, cultural, and health-related behaviors. It may indicate that women are either more frequent users of codeine-containing drugs or more willing to participate in health-related studies. Cultural dynamics in Saudi Arabia, where women may be more inclined to seek medical advice and participate in surveys, could also influence this trend [29]. Additionally, the gender disparity may reflect differences in healthcare-seeking behaviors or conditions that disproportionately affect women, necessitating the use of medications like codeine [30].

Participants in the study spanned a wide age range, from 20 to over 60 years, with significant representation among younger and middle-aged groups. The largest age group, individuals aged 20–30 years (32.2%), likely reflects a population with growing healthcare needs, possibly due to increasing awareness about medications or lifestyle-related stressors. The second-largest group, aged 40–50 years (27%), and those aged 30–40 years (19.3%) further emphasize the diversity of life stages represented in the study. These age groups are often at the intersection of professional demands, family responsibilities, and emerging health concerns, which may influence their medication usage [31].

Employment status provided additional context regarding participants' access to healthcare and medications [32]. A significant proportion (53.6%) of participants were employed, suggesting financial access to healthcare resources and medications. Students constituted another notable group (31.3%), many of whom were studying medicine and surgery (44.2%). This subgroup's academic background could impact their understanding and approach to drug usage, potentially influencing their awareness of both the benefits and risks of codeine. Educational attainment was predominantly high, with 70.4% of participants holding university degrees. This educated demographic might be expected to exhibit higher health literacy; however, the findings suggest that misconceptions about the risks associated with codeine-containing drugs persist, even among well-educated individuals.

The prevalence of chronic diseases among participants highlighted diverse health needs. A significant majority (73.7%) of those using codeine-containing drugs reported no chronic illnesses, suggesting that their use was primarily for acute or episodic conditions. However, the 26.3% of participants with chronic conditions, such as diabetes (42.9%), high blood pressure (23.8%), and high blood fat (19.5%), reflect the role of codeine in managing pain or other symptoms associated with these conditions. Understanding how these chronic diseases influence drug use patterns is essential for identifying at-risk groups and tailoring interventions.

The patterns revealed that most participants (86.7%)) used codeine-containing drugs sparingly, typically once a month, primarily for occasional relief of acute pain or ailments. A smaller group (13%) reported daily usage, which may indicate either a higher dependency or the management of chronic pain conditions requiring regular medication. Notably, none of the participants exceeded the recommended daily dosages, indicating a general adherence to prescribed guidelines. However, the prolonged use of codeine by 57.9% of participants highlights a potential for habitual use and dependency. This prolonged usage, coupled with a perception of low risk, underscores the need for greater awareness of the long-term implications of codeine use.

The safety profile of codeine-containing drugs was reinforced by the finding that only 10.5% of participants reported side effects. Among those, drowsiness was the most common (33.3%), followed by headaches and nausea (16.7% each). These side effects, though relatively minor, could contribute to complacency in recognizing the potential risks of dependency or adverse outcomes associated with prolonged use. The reliance on codeine by a significant proportion of participants reflects a perception of safety that might mask its addictive potential, particularly when used over extended periods.

The study highlights several important trends in codeine use among a diverse and educated population. While the majority of participants demonstrated responsible usage patterns, the findings underscore significant concerns about prolonged use and the potential for dependency. Cultural, societal, and demographic factors appear to play a substantial role in shaping usage patterns, perceptions of safety, and health-seeking behaviors. These findings emphasize the need for targeted awareness campaigns to educate the public about the risks of long-term codeine use, particularly dependency and misuse and to substitute with the alternate medications [33]. Stricter regulations for prescribing and dispensing codeine-containing drugs are also crucial to mitigate risks. Further research, including longitudinal studies, is necessary to explore the long-term health impacts of codeine use, particularly among populations with chronic pain or other conditions requiring prolonged medication. Addressing these challenges, healthcare providers and policymakers can promote the safer use of codeine-containing drugs and minimize associated risks.

1. **Strengths and Weaknesses**

The study presents several notable strengths, starting with its comprehensive demographic representation, which includes participants from a variety of age groups, employment statuses, marital statuses, and educational levels. This diversity allows for a more nuanced understanding of codeine usage across different segments of the population, making the findings more broadly applicable. Furthermore, the study’s focus on regional and cultural context is another strength. While the majority of participants were Saudi nationals (90.1%), the inclusion of individuals from neighboring countries adds value by highlighting codeine usage in a multicultural context, which is reflective of the region’s demographic makeup. Additionally, the high educational attainment of the sample (with 70.4% holding university degrees) is beneficial as it suggests a higher level of health literacy, which likely leads to more accurate self-reporting and awareness of drug use. The inclusion of participants spanning a broad age range from 20 to over 60 years also strengthens the study, as it provides insights into how codeine is used across different life stages, revealing variations in usage patterns and health needs. Another key strength is the study’s exploration of chronic conditions, distinguishing between users with and without chronic diseases, which allows for a deeper understanding of how health status influences codeine consumption. Finally, the study's focus on usage patterns and compliance—particularly the fact that the majority of participants adhered to recommended dosages—offers useful data on safe usage practices. The examination of side effects and the potential for dependency further enriches the findings, shedding light on the safety profile of codeine and identifying areas for intervention.

However, the study also has several weaknesses. First, there is a significant gender imbalance, with 89.3% of participants being female, which limits the generalizability of the findings to men. This gender disparity may also overlook potential differences in drug use patterns and perceptions between genders. Additionally, while the study includes participants from neighboring countries, the majority of the sample consists of Saudi nationals, which may limit the applicability of the findings to more culturally diverse populations. Another limitation is the reliance on self-reported data, which may be subject to biases such as recall or social desirability bias, potentially affecting the accuracy of the reported usage patterns and side effects. Furthermore, the study sample did not include individuals who might exceed the recommended dosage or engage in overt misuse, which means that the prevalence of dependency in higher-risk groups may be underestimated. The study also takes a short-term focus, using a cross-sectional design, which limits its ability to capture long-term trends or causal relationships related to codeine use. In addition, there was no clinical validation of the self-reported data, such as confirmation through prescriptions or medical records, which could have improved the reliability of the findings. The study also offers only a superficial exploration of societal and cultural influences on codeine use, leaving important aspects of health-seeking behavior and gender dynamics underexplored. Lastly, the lack of representation from less-educated populations, who may have different patterns of drug use and health literacy, is another potential weakness.

In summary, while the study offers valuable insights into codeine use, its strengths lie in the diversity of the sample and the thorough investigation of usage patterns, chronic conditions, and side effects. However, weaknesses such as gender imbalance, reliance on self-reporting, and the absence of clinical validation suggest areas for improvement in future research to gain a more comprehensive understanding of the issue.

1. **Conclusion**

In light of the Medicines Control Council and the Saudi Arabia National Department of Health's plans to tighten restrictions on the sale of over-the-counter (OTC) codeine-containing drugs, this study has highlighted critical concerns regarding the misuse, abuse, and dependency of non-prescription codeine-containing products, such as Solpadeine analgesics, among community members in Jeddah, Saudi Arabia. The findings indicate a notable difference in the prevalence of misuse among long-term users, emphasizing the need for stronger regulatory measures. Furthermore, the reported side effects experienced by some participants serve as potential predictors of misuse, which signals a pressing issue that warrants attention. The study underscores the importance of integrating preventive programs into healthcare curricula to raise awareness about the risks of medication misuse, particularly codeine. Public education and policy initiatives must be advocated to equip society with the knowledge to make informed decisions regarding medication use. Additionally, the study reveals the critical need for a public health and regulatory response that addresses the availability of codeine-containing medicines, promotes safer consumer self-treatment practices, and increases patient awareness about the habit-forming nature of these drugs and their long-term consequences. As part of this response, it is vital for healthcare professionals, particularly pharmacists, to counsel patients on the dangers of using over-the-counter codeine-containing products without a doctor's consultation. In line with this, regulation that mandates the involvement of pharmacists in every OTC sale of codeine-containing drugs would help raise awareness about the risks of addiction and misuse. This approach would ensure that consumers are adequately informed about the potential consequences of using such medications and help identify those at risk for dependency. In conclusion, tightening regulations on OTC codeine-containing drugs, coupled with a proactive approach to public health education and continued pharmacovigilance, will contribute to mitigating the risks associated with misuse and dependency. By implementing these measures, Saudi Arabia can better safeguard public health while promoting responsible medication use.

ACKNOWLEDGEMENTS

The authors are exceptionally grateful to the organization of Ibn Sina National College for Medical Studies, Jeddah, Kingdom of Saudi Arabia.

**COMPETING INTERESTS DISCLAIMER:**

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

Disclaimer (Artificial intelligence)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

**7. References**:

1. Tremlett, M., Anderson, BJ., & Wolf, A. (2010). Pro-con debate: is codeine a drug that still has a useful role in pediatric practice? *Paediatric Anaesthesia*, 20, 183–194.

2. Derry, S., Karlin, SM., & Moore, RA. (2013). Single-dose oral ibuprofen plus codeine for acute postoperative pain in adults The Cochrane Database Systematic Review, CD010107.

3. Kelly, LE., & Madadi, P. (2012). Is there a role for therapeutic drug monitoring with codeine? Therapeutic Drug Monitoring 34, 249–256.

4. Akande-Sholabi, W., Adisa, R., Ilesanmi, O. S., & Bello, A. E. (2019). The extent of misuse and dependence of codeine-containing products among medical and pharmacy students at a Nigerian university, *BMC Public Health*, *19*, 1–8.

5. Babalonis, S., Lofwall, MR., Nuzzo, PA., Siegel, AJ., & Walsh, SL. (2013). Abuse liability and reinforcing efficacy of oral tramadol in humans *Drug and Alcohol Dependence*, 129, 116–124.

6. Frei, MY., Nielsen, S., Dobbin, MD., &Tobin, CL. (2010). Serious morbidity associated with misuse of over-the-counter codeine-ibuprofen analgesics: a series of 27 cases *Medical Journal Australia, 193*, 294–296.

7. Nielsen S., Cameron J., and Lee N. (2011) Characteristics of a nontreatment-seeking sample of over-the-counter codeine users: implications for intervention and prevention *Journal of Opioid Management, 7*, 363–370.

8. Reed, K., Bond, A., Witton, J., Cornish, R., Hickman, M., & Strang, J. (2011). The changing use of prescribed benzodiazepines and z-drugs and over-the-counter codeine-containing products in England: a structured review of published English and international evidence and available data to inform consideration of the extent of dependence and harm *National Addiction Centre KCL and School of Social and Community Medicine, University of Bristol, editor London: Kings College London*.

9. Van Hout, MC., Bergin, M., Foley, M., Rich, E., Rapca, AI., Harris, R., & Norman, I. (2014). A scoping review of codeine use, misuse, and dependence, final report CODEMISUSED Project European Commission 7th Framework Programme, EU, Brussels

10. Manchia, M., Alda, M., & Clakin, C. (2013). Repeated erythromycin/codeine-induced psychotic mania *Clinical Neuropharmacology*, 36, 177–178.

11. Agyapong, VIO., Singh, K., Savage, M., Thekiso, BT., Finn, M., Farren, CK., and McLoughlin, DM. (2013). Use of codeine-containing medicines by Irish psychiatric inpatients before and after regulatory limitations on their supply *Irish Journal of Psychological Medicine, 30*, 7–12.

12. Roussin, A., Bouyssi, A., Pouche, L., Pourcel, L., & Lapeyre-Mestre, M. (2013). Misuse and dependence on non-prescription codeine analgesics or sedative H1 antihistamines by adults: a cross-sectional investigation in France, PLoS One 8, e76499.

13. Skurtviet, S., Faru, K., Borchgrevink, P., Handal, M., & Fredheim, O. (2011). To what extent does a cohort of new users of weak opioids develop persistent or probable problematic opioid use? *International Association for the Study of Pain*, *152*, 1555–1561.

14. Robinson, G. M., Robinson, S., McCarthy, P., & Cameron, C. (2010). Misuse of over-the-counter codeine-containing analgesics: dependence and other adverse effects *New Zealand Medical Journal*, *123*(1317), 59–64.

15. Nielsen S, Roxburgh A, Bruno R, Lintzeris N, Jefferson A, and Degenhardt L (2015) Changes in non-opioid substitution treatment episodes for pharmaceutical opioids and heroin from 2002 to 2011 Drug and*Alcohol Dependence, 149,*212–219.

16. Casati A, Sedefov R, & Pfeiffer-Gerschel T (2012) Misuse of medicines in the European Union: a systematic review of the literature *European Addiction Research*, 18, 228–245.

17. Khan Kayamkani Abedulla, Ali Mohamed AlKatsha, Sarhan Mohammed Abdulghani, et al. Evaluation of drug interactions with medications prescribed to ambulatory patients with metabolic syndrome in urban area. Adv Mater Lett. 2020;11(3):1–4. <https://doi.org/10.5185/amlett.2020.031487>.

18. Muazzam Sheriff Maqbul, Wjood Abdullah A Alshehri, Abdulaziz Mohammed Bajubair, et al. Gastro-esophageal reflux disease among the urban population of Saudi Arabia, Gastroenterology & Endoscopy, Volume 2, Issue 3, 2024, Pages 121-130, ISSN 2949-7523. <https://doi.org/10.1016/j.gande.2024.07.004>.

19. Sheriff Maqbul Muazzam, Mohammed Bajubair Abdulaziz, MohamedAlthakafi Abdulwahab, et al. A Saudi national population based study awareness and practice of periodic medical check-upAsian. J Pharmaceut Sci. 2021;15(3):379–384. <https://doi.org/10.22377/ajp.v15i3.4154>.

20. Abedulla Khan Kayamkani, Al-ghamdi Saif Mohammed, Al-ghamdi NawafMohammed, et al. Evaluation of drug utilization patterns based on world health organization drug use indicators at outpatients. Clinics Adv Mater Letters. 2020;11(Issue 3):1–4. <https://doi.org/10.5185/amlett.2020.031489>.

21. Sheriff Maqbul Muazzam, Dafallah Alghamdi Rawabi, Waleed Bakhsh Lama, Awad Almashjari Nadya, et al. A cross section survey assessment study on the knowledge and practice of periodic medical checkup among the Saudi population. jndc. 2021;40–49(3):3. <https://doi.org/10.14302/issn.2377-2549.jndc-21-3977>.

22. Khan Kayamkani Abedulla, Bayazeed Turki Khalid Abdullkader, Aljuhani Mohammed Salah M, et al. A study of prescribing errors in a private tertiary care hospital in Saudi Arabia. J Young Pharm. 2020;12(4):343–347. <https://doi.org/10.5530/jyp.2020.12.89>.

23. Abedulla Khan Kayamkani, Abuzaid Rayyan Hussam, Naif Albarakati Loay, et al. Prevalence of Self-Medication among urban population attending community pharmacies. Asian J Pharm. Jul-Sep 2020;14(3):370. <https://doi.org/10.22377/ajp.v14i03.3687>.

24. Muazzam Sheriff Maqbul, Haya Abdrahman N Binhashr, Almana Ohoud Mohammed M, et al. A Study on the prevalence of self-medication among urban population in Makkah region. Med Sci. 2022;26:ms62e2039. <https://doi.org/10.54905/disssi/v26i120/ms62e2039>.

25. Abedulla Khan Kayamkani, Fawaz Menkabo Bashair, Alsaigh Lujain Tariq, et al. A study on the assessment of nutritional knowledge and attitudes among sportspersons. Asian J Pharm. Jul-Sep 2020;14(3):384. <https://doi.org/10.22377/ajp.v14i03.3689>.

26. Kayamkani Abedulla Khan, Adel Ahmed Basaleh, Faisal Ahmed Alhothali, et al.Medication incidents associated with outpatient computerized prescribing Systems. Asian J Pharm. Jul-Sep 2020;14(3):344. <https://doi.org/10.22377/ajp.v14i03.3683>.

27. Muazzam Sheriff Maqbul, Aljawhara Talal Hejji, Raneem Abdullah S. Aljuhani, et al. A cross section survey assessment study on the prevalence of knowledge and awareness towards the attitude on the severity of food allergy among the Saudi population of Jeddah region. Asian J Phaarmaceut. Apr-Jun 2022, Volume 16 Issue 2Page 156-162.

28. Kayamkani Abedulla Khan, Maaly Salem , Rawan Mohammed, et al. Awareness about the importance of nutrition during pregnancy among women in child bearing age: a quantitative study among urban women. [www.openaccesspub.orgjJAPSTCClicense](http://www.openaccesspub.orgjJAPSTCClicense) DOI : 10.14302/issn.2328-0182.japst-20-3472 Vol-2 Issue-3 Pg. No. – 1.

29. Othman Kolthoom, Khan Aejaz Abdul Latif, Iqubal Syed Mohammad Shakeel, et al.Assessment of knowledge of diabetic patients about glycemic abnormalities and medicine storage in Makkah during hajj pilgrimage. Indian J Pharm Educat Res. Jul-Sep, 2020;54(3). <https://doi.org/10.5530/ijper.54.3s.172>.

30. Maqbul MS, Basalib SG, Almutairi AK, et al. A study on the prevalence of Vitamin D deficiency in sickle cell disease amongst pediatric population in Kingdom of Saudi Arabia. Med Sci. 2022;26:ms549e2671. <https://doi.org/10.54905/disssi/v26i130/ms549e2671>.

31. Sheriff MM, Alotaibi SD, Alharbi GH, et al. A cross-sectional study on the awareness and practice of the use of supplemental vitamin C, arginine, and zinc in managing wounds among healthcare workers in Saudi Arabia. Cureus. December 28, 2023;15(12):e51235. <https://doi.org/10.7759/cureus.51235>.

32. Sheriff MM, Abusabah HH, Sindi B, et al. A study on the awareness and perceptions regarding monosodium glutamate and its potential health effects amongst the urban population of Saudi Arabia. Cureus. December 25, 2023;15(12):e51094. <https://doi.org/10.7759/cureus.51094>.

33.Maqbul M. S, Khan A. A,Mohammed T, Iqubal S. M. S, Shaikh I. A, Muddapur U. M,Sheik G. B,Singh S. K,Hussain M. S,Gamal M. Determination of Antioxidant Properties and Antimicrobial Activity of Vinyl Phenolic Compounds Extracted from Saccharomyces Cerevisiae Against Uropathogenic Bacteria. Orient J Chem 2020;36(1). <http://dx.doi.org/10.13005/ojc/360104>.