http://dx.doi.org/10.18623/rvd.v23.4958

PREDICTORS OF SUBSTANCE USE AMONG ADOLESCENTS AND YOUNG POPULATION IN SAUDI ARABIA: A SYSTEMATIC REVIEW

PREDITORES DO USO DE SUBSTÂNCIAS ENTRE ADOLESCENTES E A POPULAÇÃO JOVEM NA ARÁBIA SAUDITA: UMA REVISÃO SISTEMÁTICA TÍTULO PRINCIPAL

Article received on: 11/3/2025
Article accepted on: 2/2/2026

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The authors declare that there is no conflict of interest

Abstract
Substance use remains a significant public health concern among adolescents and young people in Saudi Arabia. This systematic review synthesizes available evidence on the prevalence and predictors of substance use in this population. It critically appraises study quality to identify gaps and future research needs. Following PRISMA guidelines, a systematic search of PubMed, ScienceDirect, and Google Scholar was conducted for English- and Arabic-language articles published between 2015 and 2025. Eligible studies were independently reviewed and analyzed. Qualitative synthesis generated thematic findings, while meta-analysis estimated pooled prevalence and odds ratios. Study quality was assessed using the Newcastle–Ottawa Scale. A total of 24 studies were included, encompassing psychiatric patients or individuals

Resumo
O uso de substâncias permanece como uma importante preocupação de saúde pública entre adolescentes e jovens na Arábia Saudita. Esta revisão sistemática sintetiza as evidências disponíveis sobre a prevalência e os fatores preditores do uso de substâncias nessa população, além de realizar uma avaliação crítica da qualidade dos estudos para identificar lacunas e necessidades de pesquisas futuras. Seguindo as diretrizes PRISMA, foi realizada uma busca sistemática nas bases PubMed, ScienceDirect e Google Scholar por artigos publicados em inglês e árabe entre 2015 e 2025. Os estudos elegíveis foram revisados e analisados de forma independente. A síntese qualitativa permitiu a identificação de temas recorrentes, enquanto a meta-análise estimou a prevalência combinada e as razões de chances.

with Substance Use Disorders (SUDs), students, and population-based samples. The pooled prevalence of substance use was 26.0% (95% CI: 14.5–42.4%) among psychiatric patients and 18.9% (95% CI: 9.2–31.0%) among students. Amphetamines, cannabis, alcohol, and heroin were most common among patients, whereas alcohol, tobacco, hallucinogens, and inhalants predominated among students. Predictors of substance use spanned six domains: demographic factors, comorbidities and psychopathology, smoking behavior, family factors, peer influence, and attitudes toward substance use. Peer influence, smoking, family conflict, and comorbidities consistently increased risk, while parental support was protective. Methodological limitations included a lack of longitudinal designs and theoretical frameworks. These findings inform targeted prevention and policy initiatives addressing youth substance use in Saudi Arabia.

Keywords: Substance Use. Drug Addiction. Factors. Predictors. Adolescents. Saudi Arabia.

A qualidade metodológica dos estudos foi avaliada por meio da Escala Newcastle–Ottawa. Ao todo, 24 estudos foram incluídos, abrangendo pacientes psiquiátricos ou indivíduos com transtornos por uso de substâncias (TUS), estudantes e amostras populacionais. A prevalência combinada do uso de substâncias foi de 26,0% (IC 95%: 14,5–42,4%) entre pacientes psiquiátricos e de 18,9% (IC 95%: 9,2–31,0%) entre estudantes. Anfetaminas, cannabis, álcool e heroína foram as substâncias mais utilizadas entre os pacientes, enquanto álcool, tabaco, alucinógenos e inalantes predominaram entre os estudantes. Os fatores preditores do uso de substâncias abrangeram seis domínios: fatores demográficos, comorbidades e psicopatologia, comportamento de tabagismo, fatores familiares, influência dos pares e atitudes em relação ao uso de substâncias. A influência dos pares, o tabagismo, conflitos familiares e comorbidades aumentaram consistentemente o risco, enquanto o apoio parental mostrou-se um fator protetor. Entre as limitações metodológicas destacam-se a ausência de delineamentos longitudinais e de arcabouços teóricos. Esses achados contribuem para o desenvolvimento de estratégias direcionadas de prevenção e políticas públicas voltadas ao uso de substâncias entre jovens na Arábia Saudita.

Palavras-chave: *Uso de Substâncias. Dependência de Drogas. Fatores. Preditores. Adolescentes. Arábia Saudita.*

1 INTRODUCTION

Substance use is among the main health concerns affecting adolescents and young adults worldwide. Substance use refers to the persistent use of substances, illegal drugs, or misuse of over-the-counter or prescribed drugs with adverse outcomes (National Institute on Drug Abuse. Monitoring the Future, 2019). According to the World Health Organization, drug use accounted for 12.4% of mortality globally in 2020, with the Global Burden of Disease Project estimating that substance use is among the six fastest-growing causes of global deaths from 2002 to 2030 (World Health Organization, 2020). Several individuals start using drugs in adolescence, with one-fourth of young adults experiencing SUD before the age of 20 (Tucker *et al*., 2020).

Adolescence and young adulthood are characterized by stages of identity exploration, such as gender identity, sexual orientation, and sensation seeking, which may increase the risk of substance use (Brumback *et al*., 2021). In this context, substance use initiation during these periods commences by experimenting and exploring substance effects, followed by problematic use characterized by recurrent exposure (Martins *et al*., 2013). The multifaceted developmental changes, ranging from biological to sociocultural aspects, that occur during adolescence and emerging adulthood can be disrupted by substance use (Alavi *et al*., 2016). As a result, early substance users are more likely to experience psychosocial problems, psychiatric disorders, and poor peer relationships (Gomes *et al*., 2018; Nargiso *et al*., 2015).

Saudi Arabia is a country with values and societal norms that are deeply rooted in Islam. Accordingly, the consumption of narcotic substances and alcohol is strongly prohibited based on religious and legal grounds; nevertheless, a significant portion of Saudis use drugs and consume alcohol (Bassiony, 2013; Tobaiqy and Al-Asmari, 2024). Approximately 7 to 8% of Saudis have reportedly used drugs, with young individuals aged 12 to 22 years accounting for 70% of all Persons Who Use Drugs (PWUDs) (Alshmrani, 2023). Heroin, amphetamines, cannabis, and alcohol are the most prevalent substances abused among Saudis, and the majority of PWUDs are addicted to several substances (Ibrahim *et al*., 2018). The use of volatile substances and heroin has decreased in the last decade, whereas the consumption of amphetamines and cannabis has increased significantly (Ibrahim *et al*., 2018; Alshmrani, 2023). Besides, recent findings suggest the usage of drugs among Saudi females, with evidence of a rising trend, especially the use of volatile substances such as shisha and gasoline (Khalawi *et al*., 2017).

SUD seems to be on the rise in Saudi Arabia, given the high number of centers in the major cities for managing such disorders, as well as the huge budg*et al*located (1 billion dollars/year) for the treatment and rehabilitation of affected individuals (Alqarni, 2013). Therefore, to effectively manage SUD in the Saudi Arabian context, a multidimensional understanding of the problem is necessary. The key aspects or dimensions include the factors associated with substance use and SUD, treatment and rehabilitation, PWUDs' perspectives, and the effects on family members.

It is crucial to elucidate the predictors of substance use among youngsters, especially during the development period – a transition phase in an individual's life where

behavioural patterns and lifestyle activities are shaped. Recent studies highlighted that initiation and persistent drug use are associated with several social, demographic, psychological, family, and personality issues (Alhyas *et al*., 2015; Saquib *et al*., 2020). For instance, family and religious values are key protective factors against substance use (Staff *et al*., 2010), peer pressure, curiosity, and relaxation are familiar facilitators of drug use (Tobaiqy and Al-Asmari, 2024). On the other hand, users' age and educational level are determinants of knowledge about drugs and their effects (Alhyas *et al*., 2015). Substance use also elicits financial, emotional, and physical burdens on family members (Choate, 2018; Saquib *et al*., 2020).

In terms of risk factors for substance use, it is important to delineate the events that contribute to initiating drug use for recreational use and those that favor clinical misuse or substance abuse among adolescents. In other words, different factors may shape the initiation of drug abuse in young adults with and without clinical conditions. However, such analyses are currently lacking in substance use research, particularly studies conducted in Saudi Arabia and the Middle East countries. This represents an important research gap given the rising concern of substance use in this vulnerable population.

Exploring substance use patterns in Saudi Arabia is challenging because of limited data and the lack of well-designed, comprehensive studies. Robust records of substance use and SUDs are lacking in many regions and cities, combined with varying reporting practices. Thus, it is difficult to gather a holistic understanding of substance use prevalence and trends among the young population. Efforts to improve research designs, data collection, and reporting are pertinent to developing effective interventions and public health mitigation strategies.

A few reviews have been conducted to understand the factors contributing to substance use in Saudi Arabia (Nargiso *et al*., 2015; Young, 2012), but none of the reviews focused on adolescents and the young population, despite available evidence suggesting this high-risk group represents the key driver of rising drug abuse in the country. A previous review identified critical knowledge gaps but did not explore the factors influencing substance use (Saquib *et al*., 2020). Al-Jerani *et al*. (2019) provided only descriptive results of the prevalent substances used by Saudis. Hence, a systematic analysis is timely and essential for a nuanced understanding of the predictors of substance use among Saudi adolescents, and the specific factors that shape this phenomenon in

clinical use and recreational or non-medical misuse. Furthermore, a robust analysis of substance use research designs, data collection process, and reporting is equally warranted to guide future interventions and public health strategies.

This systematic review aims to provide actionable insights into the prevalence of substance use and its predictors among the young population in Saudi Arabia, including clinical use and non-medical misuse, and to appraise the quality of available studies to identify strengths, limitations, and future research directions.

2 FORMULATION OF THE RESEARCH QUESTIONS

The research questions for this systematic review were developed using the Research Question Development Tool (RQDT), known as PICO. The PICO method is a framework for evidence-based practice in medicine and healthcare that helps formulate a health-related question. PICO is an acronym for population (P), intervention (I), comparison (C) and outcome (O). Young adults and adolescents who are substance users were considered the population of interest, whereas non-substance users were the comparison group. In the present study, the definitions of adolescence and young adulthood were adopted from Fisher's description (Fisher *et al*., 2001). Adolescence is a developmental stage from puberty to age 18, characterized by significant emotional and physical changes. Young adulthood, on the other hand, refers to the period immediately after adolescence, usually starting around 18 and extending into the late 20s, characterized by increased responsibility, independence, and ongoing cognitive maturation. The outcome of interest is the factors. The outcome of interest was factors associated with substance use. Thus, the research questions for this systematic review were as follows:

1. What is the prevalence and predictors of substance use among adolescents and the young Saudi population?
2. Is there a variation in the predictors of substance use between adolescents involved in clinical and non-medical substance misuse?
3. What are the strengths and weaknesses of available studies on substance use among the young Saudi population?

3 METHOD

The PRISMA guidelines were strictly followed in developing this systematic review. PRISMA statement aims to assist researchers in developing a robust, accurate and transparent review (Page *et al*., 2020). The guidelines assist in gathering empirical evidence, identifying research gaps, and guiding future research (Shamseer, *et al*., 2015). In this study, the systematic literature search involved three broad phases: identification, screening, and eligibility. The procedures assisted the authors in identifying and screening the relevant articles and summarizing the findings. This systematic review is registered with PROSPERO under the registration number CRD42023474135.

3.1 Searching strategy

A detailed literature search was performed in three electronic databases: ScienceDirect, PubMed, and Google Scholar. These databases were selected for their extensive collections of relevant journals, support for advanced search customization, and storage of retrieved articles. The literature search was performed from July 4 2023, to July 10, 2023. Only original research articles written in English and published between 2015 and 2022 were considered in the search process. Specifically, the keywords used for the literature search process comprised the following: “Factors,” “substance use,” “adolescence,” “Saudi Arabia,” “drug abuse,” and “substance use disorders.” These keywords were combined with Boolean operators ‘AND’ and ‘OR’ as shown in Table 1.

Table 1

Search String Used in Each Database and the Corresponding Dates

Database	Search String	Date Performed
PubMed	"Factors" OR "Predictors" OR "Determinants" AND "substance use*" OR "adolescence" OR "Patients" OR "Psychiatric" AND "young population" AND "Saudi Arabia" OR "drug abuse" OR "drug misuse" OR "substance use disorders"	20/06/2025
Google scholar	"Factors" OR "Predictors" OR "Determinants" AND "substance use*" OR "adolescence" OR "Patients" OR "Psychiatric" AND "young population" AND "Saudi Arabia" OR "drug abuse" OR "drug misuse" OR "substance use disorders"	21/06/2025
Scopus	"Factors" OR "Predictors" OR "Determinants" AND "substance use*" OR "adolescence" OR "young population" AND "Saudi Arabia" OR "drug abuse"	22/06/2025

3.2 Study selection

Specific inclusion and exclusion criteria were considered during the study selection process. Specified keywords were used to perform a comprehensive search on the selected electronic databases. Irrespective of study design, all relevant articles written in English or Arabic that reported the prevalence, risk factors, and consequences of substance use among adolescents or the young population were initially retrieved. Studies involving the general population were included if they conducted separate analyses and reported results for young adults (18-40 years old).

Subsequently, only original research articles were considered for further review, while conference papers, reviews, and book chapters were excluded. Studies without full text, languages other than English, review articles, and irrelevant studies were removed from the list by filtering tools available in each database. During the second screening stage, the findings were moved from the electronic database to systematic screening documents, and all redundant, duplicated, and irrelevant articles were removed. The shortlisted articles were reviewed and filtered based on titles, abstracts, and keywords. Thereafter, the full texts of the remaining articles were read, and the primary inclusion criterion for the studies was substance use and its associated factors.

3.3 Data extraction

The first author specified the information and empirical data to be extracted from the included studies. A data extraction form was used to document the manuscript and study information, including the author, year of publication, study location, study design, population, and main findings (prevalence and patterns of substance use, associated factors, and consequences). The data extraction was performed independently, and discrepancies were resolved (Orwin and Vevea, 2009).

3.4 Quality appraisal and assessment

All relevant articles were first assessed for reporting style using the Standard Reporting Tools for Observational Studies (STROBE). The STROBE tool comprises 30 items, categorized into the abstract, introduction, methods, results, and discussion sections of the articles. Quality appraisal was then assessed using the Newcastle Ottawa Scale (NOS) – a well-established tool for investigating the risk of bias in observational studies. The scale comprises 3 main domains: selection, comparability, and outcome. Under the selection domain, the items include case representation, sample size, non-response rate, and ascertainment of the screening/surveillance tool. Comparability examines possible confounders, whereas outcome considers the methods used to assess the outcome measures and the appropriateness of the statistical test. The possible maximum and minimum scores for each study were 8 and 0, respectively. Scores of 0-3 were considered high risk, 4-5 moderate risk, and 6-8 low risk. Study quality was evaluated using predefined quality indicators and assigned scores. In the event of any disagreement, the differences were resolved by consensus among the authors of the manuscript.

3.5 Data synthesis and analysis

Thematic analysis was performed to synthesize the data extracted from the retrieved studies. Themes were generated from the findings, specifically factors associated with substance use in the study population. Thematic analyses have been used

in several scoping and systematic reviews on related research topics (Saquib *et al*., 2010). Since this review is exploratory, an inductive approach was employed to synthesize themes directly from the data. The extracted data were examined to gain a better understanding. Next, systematic data coding was performed, followed by the generation of themes based on the assigned codes. Any discrepancy was resolved by discussion. We also conducted a meta-analysis to compute the pooled prevalence of substance use among youngsters and those with SUDs by using the Comprehensive Meta-Analysis software (CMA). Pairwise comparisons between closely related studies were performed to obtain Odds Ratios (ORs).

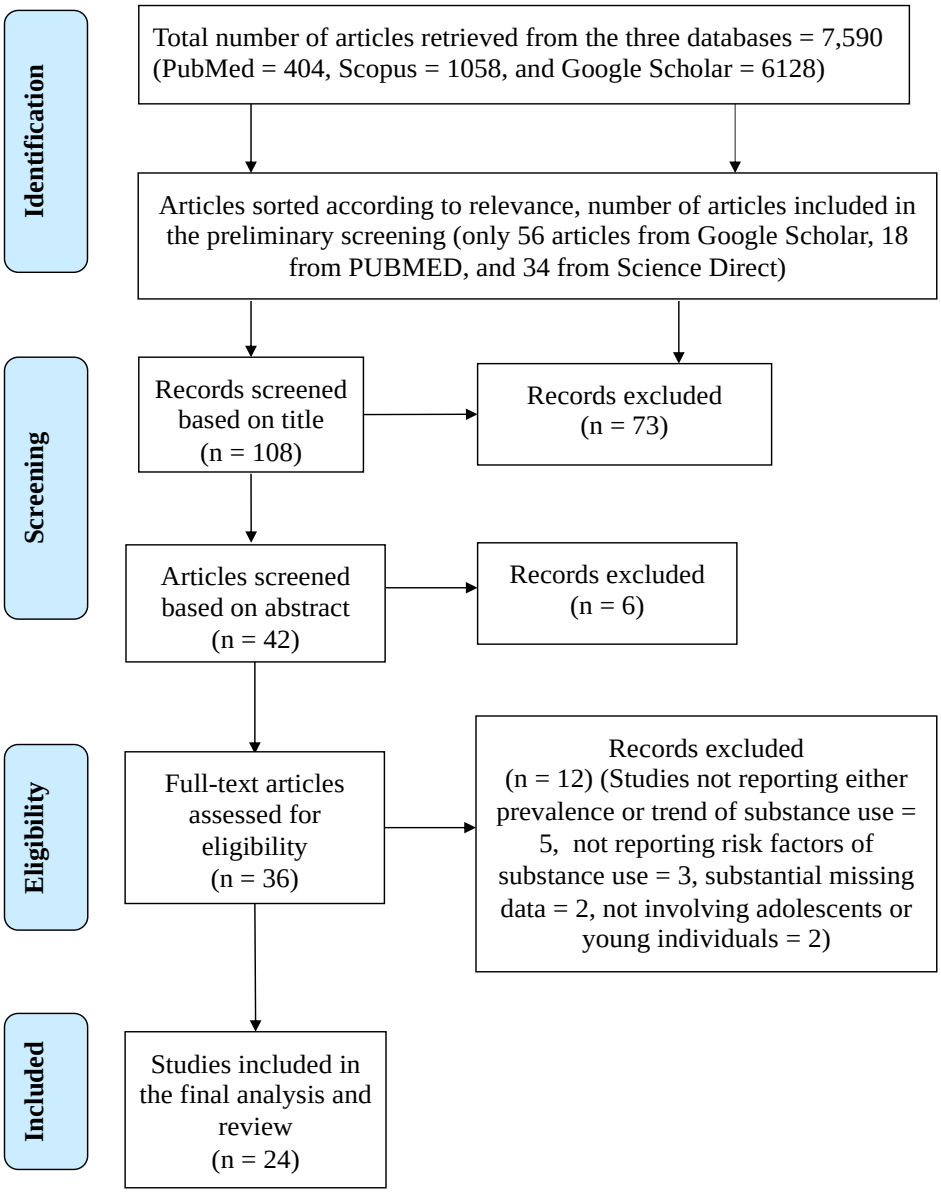
4 RESULTS

4.1 Search outcome

Following the initial search, a total of 7,590 articles were identified across the three databases: PubMed (n = 404), Scopus (n = 1,058), and Google Scholar (n = 6,128). Since Google Scholar returned thousands of articles, the results were sorted by relevance, and only the first 200 were assessed for eligibility. Following the preliminary screening of the titles, only 56 articles from Google Scholar, 18 from PubMed, and 34 from Scopus aligned with the inclusion criteria. The titles of these 108 articles were screened, yielding 35 for abstract screening. In the last stage, 24 articles were selected and included in the final analysis (Figure 1).

Figure 1

Literature Search Process and Flow Diagram Using the PRISMA Guideline



4.2 Characteristics of the studies and study population

Overall, 13 articles were published between 2020 and 2025, and the remaining 11 between 2015 and 2019 (Table 2). All studies (n = 16) were empirical and quantitative, with a cross-sectional design as the predominant design (n = 18; 75.0%). The sample sizes differed across studies: 11 studies enrolled 101-500 participants, 6 enrolled 501-900

participants, and 7 enrolled more than 900 participants. Most studies were performed in school (n = 14) and hospital or rehabilitation settings (n = 10).

Regarding the studied population, most studies (n = 15; 62.5%) involved students, followed by psychiatric patients and substance users (n = 10) and population-based samples (n = 3). Comprehensive information for all the articles included in this systematic review is provided in Table 3.

Table 2

Descriptive Information of the Studies, Frequencies, and Percentages.

Variables	**Frequency**	**%**
Year of publication		
2015-2019	11	45.9
2020-2025	13	54.1
Study designs		
Cross-sectional	18	75.0
Case-control	2	8.3
Retrospective	4	16.7
Sample size		
10-100	0	0.0
101-500	11	45.8
501-900	6	25.0
>900	7	29.1
Type of studied population		
Psychiatric patients	6	25.0
Substance users/SUDs	4	16.7
Students	15	62.5
General population	3	12.5
Gender of the studied population		
Male	6	25.0
Female	1	4.2
Both	17	70.8
Study Location		
Hospital/Patient rehabilitation centeres	10	41.6
Schools	14	58.4

Note: the total number and % of studies for some variables are > 16 and 100%, respectively, because some articles were counted more than once.

Table 3

Characteristics of the Included Studies, the Main Findings and Emerging Themes

	Reference	Study Design	Study Location	Sample Size	Main Findings	Risk factors and emerging themes
1.	Ibrahim *et al*., 2018	Retrospective	Psychiatric Rehabilitation Centre (PRC), Buraidah	612 male patients	Most patients (73%) were aged 21–40 years. Only 6.5% were adolescents aged 20 or younger. Drug abusers' mean age was 33.4 (9.9) years. The majority were polysubstance users (60%) and amphetamine users (24%). No significant association between positive family history of substance abuse or mental type of substance abuse.	Family history, comorbidity or psychopathology (family-related factor and comorbidity/ psychopathology)
2.	Almarhabi *et al*., 2018	Cross-sectional	Al-Amal hospital addiction centre in Jeddah	101, Substance users admitted for rehabilitation	Patients' mean age (SD) was 33.3 (9), and the mean age during first substance use was 18.8 (4.9) years. Current substance use: Amphetamines (38.6%), Cannabis (24.8%). Amphetamines (56.0%) and alcohol (25.7%) were the choices of drugs for initiation. Univariate regression depicted a positive relationship between younger age at substance use initiation and higher risk of driving under the influence of an abused substance. No risk factor was identified in the multivariate regression.	Types of substance use and the younger age of substance use initiation
3.	Khalawi *et al*., 2017	Case-control	Al-Amal Hospital, Jeddah	207 cases 416 controls,	Presence of family conflicts, substance abuse by husband (OR = 28.3; 95% CI	Family conflicts, substance abuse by

				Cases: substance users. Controls: visitors at the primary health center	11.1-72.1), substance abuse by peers (OR = 8.9; 95% CI 4.1-18.9), substance abuse by mother (OR = 3.1; 95% CI 2.7-3.5), substance abuse by father (OR = 10.4; 95% CI 3.5-31.1), history of sexual abuse (OR = 2.6; 95% CI 1.4-5.0), history of physical abuse (OR = 2.4; 95% CI 1.5-3.8), any form of abuse by father (OR = 2.2; 95% CI 1.1-4.6).	husband, substance abuse by peers, substance abuse by siblings, sexual abuse, low family income (family-related factors)
4.	Youssef *et al*., 2016	Case-control	Al-Baha Psychiatric Hospital	239 cases, 117 controls Cases: 18–45 years 31.35 (6.25) Controls 31.66 (7.84), Cases: patients admitted for substance use; Control: Non-drug users (M)	Amphetamine (87.7%) and cannabis 70.49%) were the most abused substances. Depression and suicide probability are common consequences of substance abuse.	Mental health (Psychopathology)
5.	Alzahrani *et al*., 2015	Cross-sectional	Public health hospital in Jeddah	165, male inpatients admitted for substance use disorders (M)	High prevalence of depression (95.2%) among substance users (100% in heroin users, 80% in amphetamine users). Prevalence and comorbidity were significantly associated with duration of substance abuse. Engaging in substance use for more than 10 years increased the risk of depression (OR = 2.2; 95% CI 1.1-9.1) and those who abused substances for 5-10 years had a 3-fold increased risk of depression compared to those who a history of	Prevalence and duration of substance abuse, risk factors (comorbidity and psychopathology)

					substance abuse of less than 5 years (OR = 3.1; 95% CI 1.2-43.6).	
6.	Siddiqui and Salim, 2016	Cross-sectional	Male secondary school students in Jizan, Saudi Arabia	1022 secondary school students	Age, scholastic year, subject (science), and non–Saudi status were positively associated with good awareness. Parental education, family income, and parental status (living together) had significant associations with students' awareness levels.	Parental education, family income and parental status of living together (socio-demographic and family-related factors)
7.	Alenazi *et al*., 2023	Cross-sectional	Male high school students in Riyadh, Saudi Arabia.	400 high school male students	The prevalence of smoking, alcohol intake, and drug abuse was 27.8%, 11.5%, and 9.5%, respectively.	Knowledge and attitude towards substance use
8.	Alodhayani *et al*., 2022	Retrospective analysis	Psychiatric unit in Jeddah, Saudi Arabia	200 female students with a history of SU	The most common and widely used substances were psychoactive substances (58%), Central Nervous System (CNS) depressants (22%), and cannabinoids (9.5%). The highest substance use was the Amphetamine-Cannabis-Nicotine (ACN) (46.6%), heroin-alcohol-benzodiazepine (16.4%), and benzodiazepine-nicotine (1.7%).	Age, smoking behaviour, age at the onset of drug abuse, past smoking behavior (Socio-demographic factors)
9.	Syed *et al*., 2022	Cross-sectional	pharmacy and nursing students	316 nursing students Used a modified instrument.	Age ($p = 0.001$), smoking behavior ($p = 0.001$), patient history ($p = 0.005$), and age of the patient at the start of drug use ($p = 0.005$) influenced single and polydrug usage The family size and fathers' education significantly affected the students' attitudes ($F = 5.188$; $p = 0.0001$) toward the use of illicit drugs.	Family size and father's education (family-related factor)

10	Aljerian *et al*., 2024	Cross-sectional	Students in health colleges	391 students in health colleges Used a validated instrument, but it was not described in detail	The prevalence of substance use was 20.2%. Strongest predictor of substance misuse was smoking habits (OR = 6.3; 95% CI 2.7 – 14.7), sleeping patterns (i.e., history of sleep disorders, poor sleep quality and long hours before sleeping) (OR = 4.3; 95% CI 2.1-8.8), Large family size was protective (OR = 0.86; 95% CI 0.74-0.99) Low academic performance was only significant in the univariate model	Prevalence and risk/protective factors
11	Elzyat *et al*., 2025	Cross-sectional	General population	360 participants from the general population Validated Arabic version of the Drug Abuse Screening Test-10 (DAST-10)	Prevalence of substance use was 44% Predictors of substance use were smoking and having a close friend with substance abuse. Sharing aspects of life with the family was protective.	
12	Ibrahim *et al*., 2025	Descriptive and retrospective	Patients	5,639 patients with substance use	The commonly abused single drugs were amphetamine (40%), cannabis (11%), and alcohol (7%). The number of high school students' cases has been steadily rising over the years.	A growing trend in the use of polysubstance and the combination of two substances. There is a high incidence of drug abuse among high schoolers and patients aged 10–30 years.

13	Khader *et al*., 2019	Cross-sectional	935 students aged 15-25 years in Riyadh	High school and college students	Overall prevalence of drug abuse was 18.9%, 8.1 % among high school students and 24.1% among college students. Most widely used were alcohol (44.5%) and cannabis (40.2%)	Main reasons for substance use were boredom, fun seeking and as a coping mechanism for ongoing problems.
14	Altwaijri *et al*. 2025	Large-scale cross-sectional	SNMHS – a nationally representative cross-sectional epidemiological household survey 4,004 participants aged 15–65.	Used a stratified multistage clustered sampling design and the WHO CIDI 3.0.	Lifetime, 12-month, and 30-day prevalence of substance use disorder were 4.0%, 1.9%, and 0.8%. Drug use disorders were more prevalent than alcohol use disorders. SUDs were significantly associated with younger age, low income, lower education, exposure to traumatic events, childhood adversities and family burden. Substance users demonstrated high psychiatric comorbidity and role impairment. Only 45% of participants with lifetime SUDs demonstrated treatment seeking	Prevalence and risk factors
15	Kamel *et al*. (2021)	Cross-sectional	259 students from both universities. Correlational descriptive design using two-stage cluster sampling techniques	Egyptian and Saudi University students Used three main instruments: Perceptions of Parents Scales/College-Student Scale (POPS), Brief Sensation Seeking Scale (BSSS) and the Adolescent Alcohol and Drug	Cigarette smoking was the first substance used. A lower risk of drug use among Saudi students, with a higher percentage of supportive parent relationships (OR = 0.148; 95% CI: 0.05-0.49). Male students (OR = 5.7; 95% CI: 3.2-10.2) had a higher risk of drug use compared to female students.	Prevalence and risk factors for tobacco use

				Involvement Scale (AADIS)		
16	Habbash *et al*. (2023)	Cross-sectional	1160 undergraduate students		17% of the university students were current smokers	Prevalence
17	Al-Musa and Al-Montashri (2016)	Cross-sectional	350 Secondary male school students	Used a validated instrument	9.3% consume alcohol, and 8.8% were substance abusers. The predominant substances abused were cannabis (51.4%), glue/solvents (48.6 %), amphetamine (45.7 %), and Khat chewing (4%). Positive correlation between the prevalence of substance abuse and students' age	Prevalence of substance use and risk factors
18	Alageel *et al*. (2023)	Retrospective	582 patients in King Saud University Medical City, Riyadh	Used a validated instrument, but it was not described in detail	Cannabis was used by 60% of patients. 15.3% of patients had various clinical conditions, such as medical illnesses and traumatic injuries. Males were more likely to have medical illness presentations compared to females	Prevalence of substance use and risk factors
19	Aldlgan *et al*. (2019)	Cross-sectional	197 patients at Al-Amal Hospital	Used a validated instrument, but it was not described in detail	Amphetamines (30.9%), cannabis (30.1%), ethyl alcohol (22.9%), alprazolam (5.1%), clonazepam (2.1%), tramadol (2.1%), heroin (1.3%), and cocaine (0.4%). 4.7% of patients were polydrug users	Prevalence of substance use

20	El Dalatony *et al*., 2025	Cross-sectional	5610 Saudi male and female intermediate school students aged 13–15 years old	Used a validated instrument	8.8% of the respondents engaged in tobacco use, 7.5% in females and 10% in males. Age and lower spending were associated with smoking. Predictors of smoking behavior included exposure to second-hand smoke (OR 1.85, CI 1.45–2.36). Males showed a notable increase in both current (OR 1.349, 95% CI 1.118–1.627) and ever-smoked categories (OR 1.352, 95% CI 1.207–1.516).	Prevalence of substance use and risk factors (age, gender, and exposure to second-hand smoke)
21	Ansari *et al*. (2020)	Cross-sectional	866 male children are studying in public and private schools.	Used a validated instrument, but it was not described in detail	The prevalence of cigarette smoking was 27.8%.	Prevalence of substance use
22	Algorinees *et al*. (2016)	Cross-sectional	287 adolescent students	Used a validated instrument, but it was not described in detail	19.5% were current smokers.	Prevalence of substance use
23	Al-Zalabani & Kasim (2015)	Cross-sectional	3322 adolescents from schools in Medinah	Used a validated instrument	15.17% (95% CI = 13.95-16.39) were current smokers. The most important predictor was smoking by most or all friends (OR = 12.5; 95% CI = 9.40-16.8).	Prevalence of substance use and risk factors (peer influence and friends who smoke)
24	Shubayr *et al*. (2024)	Cross-sectional	5610 Saudi students aged 13–15 years.	Used a validated instrument	The lifetime and current prevalence of tobacco use were 31.3% and 8.78%, respectively. Predictors include negative attitudes toward tobacco usage (OR=0.97; 95% CI: 0.970–0.974). Subjective norms (i.e., perceived social pressure) (OR=1.17; 95% CI: 1.170–	Prevalence of substance use and risk/protective factors (attitudes/perception toward substance use)

	1.176), perceived behavioral control (OR=1.87; 95% CI: 1.85–1.88), and stronger behavioural intentions to use tobacco (OR=1.24; 95% CI: 1.23–1.25).	

4.3 Quality assessment results

Based on the quality assessment of all studies (n = 24), only 4 received a high-quality rating (Table 4). These 2 studies m*et al*most all the assessment criteria, as evidenced by well-documented sample size calculations, sampling techniques, representativeness of the study samples, data analysis, and outcome assessment. One of the high-quality studies also used a theoretical framework, the theory of planned behavior (Shubayr *et al*., 2025). Most studies received a moderate quality rating (n = 11), with the predominant weakness being limited information on sample size, sampling technique, and adjustment for confounders and missing data. Nine studies received a low-quality rating for failing to meet most of the criteria, except for the representativeness of the samples and the outcome assessment tools used.

Table 4

Quality Assessment of the 24 Studies

	Selection			Comparability		Outcome Assessment		Quality Appraisal	
Reference	D1	D2	D3		D5	D6	D7		
Ibrahim *et al*. (2018)	√	NA	NA	√	√	√	NA	Low	Retrospective design, sample size not estimated, risk factor analysis was not comprehensive
Almarhabi *et al*., (2018)	√	NA	√	√	NA	√	√	Moderate	Sample size estimation and sampling methods were well described. Outcome assessment
Khalawi *et al*. (2017)	√	NA	NA	NA	NA	√	√	Low	Limitations associated with the case-control design. Large sample size, but not supported with sample size calculation and sampling techniques. Risk factor analysis – not comprehensive and well-documented
Youssef *et al*. (2016)	√	√	√	√	NA	√	√	Moderate	Sample size was estimated, and the method was explained. Data analysis was not comprehensive.
Alzahrani *et al*., 2015	√	√	√	√	√	√	√	High	Sample size was estimated, and the sampling method was explained. Data analysis was performed comprehensively.
Siddiqui and Salim (2016)	√	NA	NA	NA	√	NA	√	Low	Sample size calculation and sampling technique were not described; no information on response rate or confounding adjustment was provided. Risk factor analysis was not comprehensive
Alenazi *et al*., 2023	√	√	√	NA	NA	√	√	Moderate	Risk factor analyses were not performed. Limited information on response rate and confounding adjustment.
Alodhayani *et al*., 2022	√	NA	NA	NA	√	NA	√	Low	Lack of a comprehensive data analysis, only descriptive analysis was performed, and the sample size and sampling were not explained
Syed *et al*., 2022	√	√	√	NA	NA	√	√	Moderate	No comprehensive data analysis, only descriptive. Sample size and sampling were explained

Aljerian *et al*., 2024	√	√	√	NA	NA	NA	√	Moderate	Sample size and sampling were not well explained. Limited information on confounder adjustment
Elzyat *et al*., 2025	√	NA	√	NA	NA	√	√	Moderate	Sample size was calculated, but the sampling method was not explained. Regression analysis was not performed, and odds ratios were not reported.
Ibrahim *et al*., 2025	√	NA	√	√	NA	√	√	Moderate	Large sample size, but the sampling method was not explained. Regression analysis was not performed, and odds ratios were not reported.
Khader *et al*., 2019	√	NA	NA	NA	√	NA	√	Low	Sample size and sampling were not explained. Regression analyses were not performed; only descriptive statistics.
Altwaijri *et al*. 2025	√	√	√	√	√	√	NA	High	All domains were well-described, except for risk factor analysis, which was not comprehensive
Kamel *et al*., 2021	√	√	√	√	√	√	NA	High	All domains were well-described, but no theoretical background was provided
Habbash *et al*. (2023)	√	NA	√	√	NA	√	√	Moderate	Large sample size, but the sampling method was not explained. Regression analysis was not performed, and odds ratios were not reported.
Al-Musa and Al-Montashri (2016)	√	NA	NA	NA	NA	√	√	Low	Sample size and sampling were not explained. Regression analyses were not performed; only descriptive statistics were.
Alageel *et al*. (2023)	√	NA	NA	√	√	√	NA	Low	Sample size and sampling were not explained. Regression analyses were not performed; only descriptive statistics.
Aldlgan *et al*. (2019)	√	NA	√	√	NA	√	√	Moderate	Large sample size, but the sampling method was not explained. Regression analysis was not performed, and odds ratios were not reported.
El Dalatony *et al*., 2025	√	NA	NA	√	√	√	NA	Low	Sample size and sampling were not explained. Regression analyses were not performed; only descriptive statistics.
Ansari *et al*. (2020)	√	NA	√	√	NA	√	√	Moderate	Large sample size, but the sampling method was not explained. Regression analysis was not performed, and odds ratios were not reported.

Algorinees *et al*. (2016)	√	NA	NA	NA	NA	√	√	Low	Sample size and sampling were not explained. Regression analyses were not performed; only descriptive statistics.
Al-Zalabani and Kasim (2015)	√	√	√	√	NA	√	√	Moderate	Sample size and sampling were not explained. Only descriptive statistics.
Shubayr *et al*. (2024)	√	√	√	√	√	√	√	High	All domains were well described, except for the risk factor analysis. The only study that provided a theoretical model

Note: D1 = Representatives of the cases, D2 = sample size and non-response rate, D3 = ascertainment of the screening/surveillance tool, D4 = investigation of possible confounders, D5 = information on missing data, D6 = outcome assessment methods, D7 = appropriateness of the statistical test. NA = not available

4.4 Prevalence of substance use

Since the main groups of the studied population comprised patients in psychiatric hospitals, students and the general adolescent/young adult population, we computed the prevalence of substance use, polydrug use and specific substances consumed for each category where possible. The overall pooled prevalence of substance use was 26.0% (95% CI 14.5-42.4%) in patients and 18.9% (9.2-31.0%) in students, and was unavailable for the general population (Table 5). The individual reports in the general population include lifetime, 12-month, and 30-day SUD prevalence of 4.0%, 1.9%, and 0.8%, respectively (Alwaijri *et al*., 2025), and a substance use prevalence of 44.0% (Elzyat *et al*., 2025). The prevalence of polydrug use was only computed for patients in psychiatric hospitals, amounting to 31.8% (95% CI 20.3-50.2).

For the patient population, the pooled prevalence of individual substances was 31.2% for amphetamine, 36.9% for cannabis, 8.4% for alcohol, and 4.6% for heroin. Meanwhile, 14.6%, 18.9%, 3.3% and 0.3% of the student population abused alcohol, tobacco, hallucinogens and inhalants, respectively. In the general population, only Youssef *et al*. (2016) reported the prevalence of specific substances, whereby 87.7% of cases of substance use involved amphetamine and 70.5% involved cannabis.

Furthermore, subgroup analysis was conducted for substance use among secondary/high school students (male and mixed-sex education) and undergraduates. The pooled prevalence of tobacco use was 19.6% among male students and 24.8% among undergraduates. Meanwhile, 11.9% of students in mixed-sex education were tobacco users. One study involved only female students in psychiatric hospitals and reported a substance use prevalence of 32.5%, 53.5% for polysubstance use (Alodhayani *et al*., 2022).

Table 5

Pooled Prevalence of Substance Use Among Adolescents and Young Adults in Psychiatric Hospitals/ Patients, Students and the General Population

	Patients	**Students**
Substance	Prevalence (95% CI)	Prevalence (95% CI)
Polydrug use	31.8 (14.2-57.2)	
Amphetamine	31.2 (10.4-62.1)	
Cannabis	36.9 (18.5-56.9)	
Alcohol	8.4 (5.7-11.2)	14.6 (7.1-28.5)
Tobacco	NA	18.9 (6.2-32.0)
Cocaine	0.4	
Heroine	4.6 (1.2-9.5)	
Hallucinogens	NA	3.3 (0.9-5.5)
Inhalants	NA	0.3 (0.1-0.9)
Khats	NA	
Overall substance use	26.0 (14.5-42.4)	18.9 (9.2-31.0)

NA = not available

4.5 Risk and Protective factors for substance use

4.5.1 Demographic factors

4.5.1.1 Age

Age was explored in 1 study of male young students (Ansari *et al*., 2020), female students in psychiatric hospitals (Alodhayani *et al*., 2022), and 2 studies focusing on patients with SUD (Ibrahim *et al*., 2018; Ibrahim *et al*., 2025), and 1 study in the general population (Alwaijri *et al*., 2024). The odds of substance use increased significantly with the age of young male students (OR = 2.08, 95% CI 1.47–2.95), and female students aged 18-30 were more likely to be polysubstance users relative to younger age groups (Alodhayani *et al*., 2022). The pooled estimates are shown in Table 6. Polysubstance abuse was also significantly higher among SUDs aged 20-30 relative to older age groups (Ibrahim *et al*., 2018; 2025; Alwaijri *et al*., 2024).

Table 6

Pairwise Comparisons for the Risk/Protective Factors of Substance Use Among Adolescents and Young Adults

Factors	OR (95% CI)	P-value	Number of Studies
Gender			
Male students	4.8 (2.9-11.2)	0.03	4
Female students	Reference		
Age			
18-30	2.2 (1.1-3.4)	0.02	3
30-40	Reference		
Marital status (only for patients)			
Single	1.09 (0.44-5.3)	0.58	5
Married	Reference		
Employment status(only for patients)			
Employed	1.35 (0.84-7.21)	0.36	5
Not employed			
Friends with substance use/SUD			
Yes	4.5 (2.1-10.4)	0.001	4
No	Reference		
Perception/attitudes towards substance use			
Positive	1.35 (1.2-5.8)	0.001	4
Negative	Reference		

4.5.1.2 Educational qualification

Educational level was sparingly explored in the reviewed studies, as the focus was on adolescents, comprising mostly school-aged children and young adults in higher education and community settings. In this category, three studies conducted among young patients in psychiatric hospitals (Alodhayani *et al*., 2022; Ibrahim *et al*., 2018) and one study in the general adolescent population (Alwaijri *et al*., 2024) were available for qualitative analysis. Only the study by Alwaijri *et al*. (2024) found a significant association between lower educational status and substance use. In contrast, Ibrahim *et al*. (2018) reported a positive correlation between high school dropouts and the abuse of polysubstance and amphetamine.

4.5.1.3 Gender

Gender was investigated as a predictor of substance abuse in five studies, comprising 2 studies each in psychiatric patients (Ibrahim *et al*., 2018; 2025), young students (Kamel *et al*., 2021; El Dalatony *et al*., 2025) and the general population (Alwaijri *et al*., 2025; Elzyat *et al*., 2025). Gender had no significant influence on substance use among patients in psychiatric hospitals, but most of the participants were male patients (Ibrahim *et al*., 2018; 2025). Meanwhile, pairwise comparisons revealed that young male students were more likely to use substances (OR = 4.8; 95% CI 2.9-11.2) compared to young female students (Kamel *et al*., 2021; El Dalatony *et al*., 2025). As for the general population, Elzyat *et al*. (2025) found a significantly higher proportion of male respondents being substance users, whereas Altwaijri *et al*. (2025) reported no difference. As for the remaining articles, no further analyses could be performed since most studies involved male patients or students.

4.5.1.4 Marital status and Employment status

Marital status and employment status were only explored in studies involving young patients admitted to psychiatric hospitals, since other studies recruited respondents who were still single and mostly students. Pooled analyses of five studies revealed no significant association ($P< 0.05$) between marital status and substance use (Ibrahim *et al*., 2018; 2025; Almarhabi *et al*., 2018; Alageel *et al*., 2023; Aldlgan *et al*., 2019). Nevertheless, Ibrahim *et al*. (2025) found significant differences for specific substances between married and unmarried patients (amphetamine: 22% vs 16.5%, cannabis: 3.6% vs 7.4%, and polysubstance: 3.7% vs 9.8%). Pooled estimates for employment status also demonstrated no association between the variable and substance use. Only one study reported that unemployed patients had a higher prevalence of using amphetamine and cannabis relative to employed patients (Ibrahim *et al*., 2025).

4.5.2 Comorbidity and psychopathology

Comorbidity was reported in 3 studies, involving psychiatric female students (Alodhayani *et al*., 2022), male psychiatric patients (Alzaharani *et al*., 2015), and the general adolescent population (Khalawi *et al*., 2017). Pooled analysis was not performed given the different studied populations; however, all the studies found a significant influence of having a comorbidity and substance use with corresponding odds as follows; OR = 3.17, 95% CI 1.81-12.33 (Alodhayani *et al*., 2022), OR = 2.6; 95% CI 1.4-5.0 (Khalawi *et al*., 2017) and OR = 3.6; 95% CI 1.2-6.4 (Alzahrani *et al*. (2015).

In terms of psychopathology, two studies highlighted the potential relationship between substance use and depression, as well as suicidal risk (Alzahrani *et al*., 2015; Youssef *et al*., 2016). Depression and suicide probability were reported as common consequences of substance abuse from cases retrieved in a psychiatric hospital (Youssef *et al*., 2016). A high prevalence of depression (95.2%) was observed among male substance users (Alzahrani *et al*., 2015). Engaging in substance use for more than 10 years increased the risk of depression (OR = 2.2; 95% CI 1.1-9.1) and those who abused substances for 5-10 years had a 3-fold increased risk of depression compared to those who had a history of substance abuse of less than 5 years (OR = 3.1; 95% CI 1.2-43.6) (Alzahrani *et al*., 2015). Perceived stress was also a predictor of substance use in young adolescents (Alwaijri *et al*., 2025), but was insignificant among female students (Alodhayani *et al*., 2022), probably due to low prevalence of substance use.

One study found that sleeping patterns (i.e., history of sleep disorders, poor sleep quality and long hours before sleeping) increased the odds of substance use (OR = 4.3; 95% CI 2.1-8.8) among the general population, but such a relationship was lacking in psychiatric patients (Ibrahim *et al*., 2025). A history of physical abuse, traumatic events or childhood adversities is also considered a potential cause of psychopathological states. Two studies reported increased odds of substance use among undergraduate students (OR = 2.4; 95% CI 1.5-3.4) and the adolescent population ($P<0.05$) exposed to childhood adversities and physical abuse.

4.5.3 Smoking behaviour

Six studies reported the relationship between smoking behaviour/habits and substance use, comprising 3 studies among students (Aljerian *et al*., 2024; Alodhayani *et al*., 2022; Elzyat *et al*., 2025), one study in psychiatric patients (Ibrahim *et al*., 2025) and one study in the general population (Elzyat *et al*., 2025). Pooled analyses revealed that being a smoker was identified as the strongest predictor of substance use among high school and college students (OR = 6.3; 95% CI 2.7 – 14.7) (Alodhayani *et al*., 2022; Aljerian *et al*., 2024; Elzyat *et al*., 2025). Being a current smoker increased the odds of substance use in the general population (Elzyat *et al*., 2025). Meanwhile, the variable was not significant in patients admitted to psychiatric centers (Ibrahim *et al*., 2025).

4.5.4 Family-related factors

The family-related factors included family size, parental education, family burden (Siddiqui and Salim, 2016*;* Alwaijri *et al*., 2025), presence of family conflicts, support from the family, and substance use by family members such as husband, father, mother and siblings (Khalawi *et al*., 2017; Elzyat *et al*., 2016; Ansari *et al*., 202*0;* Kamel *et al*., 2021). Aljerian *et al*. (2024) found that large family size was protective (OR = 0.86; 95% CI 0.74-0.99) against substance use among high school and college students. Two studies reported increased odds of substance use among young Saudi students (OR = 8.3; 95% CI 4.1-16.2) and the young population (P< 0.05) exposed to family conflicts (Siddiqui and Salim, 2016). A similar outcome was reported by Alwaijri *et al*. (2025), as family burden was identified as a predictor of substance use in the young Saudi population.

Pooled analyses of 2 studies revealed higher odds of substance use among young students having a father who is a substance user (OR = 10.4; 95% CI 3.5-31.1; OR = 1.16; 95% 1.01-1.36) (Khalawi *et al*., 2017; Ansari *et al*., 2020). A lower risk of drug use (OR = 0.148; 95% CI: 0.05-0.49) was observed among Saudi students with a higher percentage of supportive parent relationships (Kamel *et al*., 2021), reflecting the importance of parental attachment. Likewise, sharing life aspects with the family was protective against substance use in the general population (Elzyat *et al*., 2025).

4.5.5 Peer influence

Five studies examined the association between peer influence and substance use, comprising 3 among students (Ansari *et al*., 2020; Al-Zalabani & Kasim, 2015; Shubayr *et al*., 2024) and 2 in the general population (Khalawi *et al*., 2017; Elzyat *et al*., 2025). Pooled analyses for student population revealed higher odds of substance use among students (OR = 5.40; 95% 1.3-14.0) and young adolescents (OR = 8.9; 95% CI 4.1-18.9) who have friends affected with SUDs or engaged in substance abuse (OR = 5.40; 95% 1.3-14.0).

4.5.6 Attitudes and perceptions toward substance use

Three studies, involving Saudi young students, reported how attitudes/perceptions toward substance use influence the propensity of using illicit drugs and substances (Ansari *et al*., 2020; Shubayr *et al*., 2024; El Dalatony *et al*., 2025). Pooled analyses revealed that positive attitudes toward substance use increased the odds of being a substance user with odds ranging from (OR 1.32, CI 1.02–1.71). In other words, a negative attitude or perception towards substance use was protective against engaging in drug abuse.

5 DISCUSSION

Substance use is highly prevalent among adolescents and is considered an epidemic in several countries worldwide. Accumulated evidence from recent reports suggests a rising trend of SUD among young individuals in Saudi Arabia. The findings from 24 articles were comprehensively reviewed and analyzed in this study to present an assessment of substance use patterns and their associated factors among a diverse demographic spectrum of the young Saudi population, including healthy individuals in the general population, students, and youngsters in psychiatric hospitals. We also conducted a robust quality appraisal to identify current research gaps that need to be addressed for future work. These studies collectively provide insight into the multifaceted

nature of substance use among various groups of adolescents and young adults in the country.

Most studies were conducted in the last five years (2020-2025) compared with those conducted between 2015 and 2019. This finding reflects the growing interest among local researchers to address the recent rising trend of substance use and SUD in Saudi Arabia. Schools and hospital settings were the predominant study locations, as expected, given that the review focuses on young adults and adolescents. Male participants were recruited in most studies, likely due to socio-cultural characteristics and religious restrictions on interacting with females in Saudi Arabia (Saquib *et al*., 2020).

As for the main findings, both patients admitted to rehabilitation centers and students demonstrated a high pooled prevalence of substance use at 26.0% and 18.9%, respectively. Meanwhile, pooled prevalence could not be computed for the population-based samples. These prevalence estimates are similar to those reported in the systematic review for youth from Western and European countries (26%) (Cadigan *et al*., 2019; de Longe *et al*., 2022) and for young people in sub-Saharan Africa (18%) (Ebrahim *et al*., 2022). Likewise, a high prevalence of polydrug use (31.8%) was observed among young patients in Saudi psychiatric hospitals, which mirrors the high-level substance engager class reported in youths with SUDs in Denmark, the United States, Australia, Germany, Iran and Brazil (De Longe *et al*., 2022). In comparison to previous reports in Saudi Arabia, the present findings reflect a possible increasing prevalence and trend of substance use and SUD in the country. Different factors have been linked to this disturbing trend, such as drug smuggling from neighbouring countries such as Yemen, Syria and Lebanon (Tobaiqy and Al-Asmari, 2024), which are currently battling with massive drug influx and conflicts.

Further analyses revealed that amphetamine and cannabis were the predominant substances used by young patients with SUDs and non-medical misuse in population-based samples. On the other hand, alcohol and tobacco were the most reported substances among students, demonstrating the variation in specific substances consumed by different groups of the young population. Overall, heroin, hallucinogens and inhalants were relatively less abused. These findings are consistent with previous reviews conducted in Saudi Arabia and Middle East countries, whereby amphetamines and cannabis were the most commonly abused illicit drugs among Saudis and other nationals, particularly in

addiction treatment settings (Al-Asmari *et al*., 2024). Research has also shown an increase in the use of amphetamine during the last 2 decades in Saudi Arabia (Al-Jerani *et al*., 2019). About 40% of individuals with SUDs in Saudi Arabia are amphetamine users (AL-Imam *et al*., 2017). The severe impacts of amphetamine have been consistently reported in addiction hospitals across several regions of the country (Alibrahim *et al*., 2012; Al-Asmari *et al*., 2022), including incidents of driving under the influence of drugs and post-mortem investigations. A review article also found that the most commonly abused substances were amphetamines, alcohol, and cannabis (Lafaye *et al*., 2017), indicating a slight difference in the trend of substances abused by the young Saudi population in the last decade.

Alcohol consumption has also led to hazardous and fatal events among young populations in Saudi Arabia, evidenced by 26% of hospitalized young drivers experiencing impairment due to alcohol use (Alrmarhabi *et al*., 2018). About 11% of admissions to the emergency department were related to alcohol intoxication (Wahba *et al*., 2021), and one-third (32%) of deaths in Jeddah city were associated with positive test results for alcohol use before death (Al-Asmari and Al-Amoudi, 2020). Although these consequences were not investigated in this review, the high prevalence of alcohol use among the students highlights the need for effective preventive and mitigation strategies.

This review uncovers six broad dimensions or factors that have been consistently reported as predictors of substance use among the Saudi young population; demographic, (age, educational qualification, gender, marital status, employment status), comorbidity and psychopathy (chronic disorders, sleep disorders, depression, perceived stress, suicidal risk, and physical abuse/traumatic events/childhood adversities), smoking behavior, family-related (family size, parental education, family burden, family conflicts, family support, and substance use by family members), peer influence**,** and attitude/perception towards substance use.

Demographic factors include age, with adolescent female and male students (18-30) having a higher risk of substance use relative to younger groups (< 18 years), whereas patients aged 20-30 were more likely to be polysubstance users compared to older groups. This finding may reflect varying motives, ranging from medical misuse to pain and relaxation. Access to substances among different age groups may equally contribute to this finding. Younger age has been associated with substance use and opioid misuse in

prior studies (Amirabadizadeh *et al*., 2018; Salazar *et al*., 2019). Moreover, the onset of substance use is usually at a young age (less than 20 years). It may lead to persistent use in late adulthood (Amirabadizadeh *et al*., 2018). The underlying reasons for substance use among younger individuals are sensation seeking and getting high, which differ from those of elderly patients or late adults (Brumback *et al*., 2021). On the contrary, marital and employment status had no significant influence on substance or polysubstance use, except for Ibrahim *et al*. (2025), who found that these factors increased the likelihood of drug abuse among psychiatric patients.

As for gender, the evidence was mixed as the variable had no influence on substance use among patients in psychiatric hospitals, whereas male students and those from population-based studies demonstrated greater odds relative to female counterparts. Male adolescents usually display externalizing behaviours such as rule-breaking and aggression, which could heighten the risk of engaging in drug use (Altwaijri *et al*., 2024; Khader *et al*., 2019). The female gender is a protective factor against substance use and SUD (Mahsoon *et al*., 2023). A family history of substance use can increase the predisposition towards substance use, particularly among males, leading to intergenerational use and abuse (Mahsoon *et al*., 2023). The reluctance to report substance use may also contribute to this finding since substance-related behaviors are widely considered dishonoring for women.

Educational qualification or status played no significant role in substance use among students, except for a few studies involving population-based samples and young patients (Alodhayani *et al*., 2022; Ibrahim *et al*., 2018**).** Educational attainment was reported as a predictor of substance use among students in both developing and developed countries (Khader *et al*., 2019; Olsson *et al*., 2019). For instance, a school's socio-economic profile was a predictor of proneness to engage in substance use, as youths in socioeconomically disadvantaged schools demonstrated higher odds of the act relative to those in socioeconomically advantaged school settings (Olsson *et al*., 2019). Olajide *et al*. (2014) also found that school dropouts in Canada displayed significantly more substance use-related problems compared to those who eventually graduated. Therefore, educating students and adolescents on the adverse effects of substance use may assist in addressing the problem. This aligns with the position of (Nair *et al*., 2022; Olsson *et al*., 2019), who suggested that Indiana communities in the USA will benefit from educational

interventions to identify and monitor substance use among teenagers, as well as strategies to communicate with them about substance use.

Having a comorbidity strongly increased the odds of substance use among female psychiatric students (Alodhayani *et al*., 2022), male psychiatric patients (Alzaharani *et al*., 2015), and population-based samples (Khalawi *et al*., 2017). Also, psychological disorders such as depression, perceived stress, and suicidal attempts, and a history of physical abuse or childhood adversities, were associated with substance use among the aforementioned youngsters. Aligning with global results (Martins *et al*., 2013; Wallace, 2015), this review depicts that substance use and SUD are highly comorbid with other psychiatric disorders. Self-medication has been hypothesized as a strong event that mediates the link between substance use and mental comorbidity. This assumes that the unhealthy consumption of substances is utilized as a maladaptive coping mechanism to reduce the severity and clinical manifestations of mental disorders (Cragg *et al*., 2019; Fenton *et al*., 2012). Conversely, psychological strains may stem from SUDs, thereby increasing susceptibility to internalizing disorders (Cragg *et al*., 2019). Adolescents facing psychological problems, mood disorders, and psychosocial stress are more likely to engage in substance use (Martins *et al*., 2013). Similar findings were reported among Australian young adults (Marel *et al*., 2019), young prisoners in Southwest Ethiopia (Yitayih *et al*., 2018) and students studying health-related courses in Nepalese universities (Panthee *et al*., 2017). These events may also affect the cognitive and mental state of young adults, leading to mental illness if not effectively addressed at an early age. Nevertheless, despite the strong evidence of a higher risk of substance use among patients with mental disorders, there is limited information to elucidate the underlying mechanisms. Given the cross-sectional design of the reviewed studies, the exact direction and sequence of the events cannot be determined.

Smoking behavior, being a smoker, was a strong predictor of substance use among young students and the general population. Nonetheless, it was not significant among psychiatric patients, thereby reflecting how this factor might play out in medical and non-medical misuse. The association between substance use and addictive behaviors, such as smoking behavior, has also been reported in previous systematic reviews and research articles (Kamba *et al*., 2021). These studies found that addictive behaviors such as alcohol consumption and tobacco smoking were significantly associated with a higher prevalence

or incidence of substance use disorders. Other factors, such as peer influence, duration of substance use, and criminal records, may also contribute to these addictive behaviors either directly or indirectly, thereby influencing the risk of substance use.

We found that factors such as family size, father's occupation, parental education, family income and status of living together, presence of family conflicts, substance use by family members, as predictors of adolescents' substance use in Saudi Arabia. Accordingly, studies conducted in developed and developing countries revealed that substance use is more prevalent among adolescents whose immediate family members also indulge in such consumption (Srivastava *et al*., 2021). Generational continuity and perception towards drinking and substance use in the family were associated with a higher risk of engaging in such behaviours in adolescents (Li *et al*., 2022). A systematic review also reflected that family members' smoking use heightens the odds of adolescents' smoking behavior. The risk of substance use among younger siblings also increased with the rate of substance use by older siblings (Wallace, 2015).

In line with global findings, parental attachment, which is exemplified by strong affection and high levels of support for adolescent children, was protective against substance use in this review. Adolescents with feelings of neglect by their parents are likely to engage in substance use (Lander *et al*., 2013). Studies conducted in different parts of the world resonate these findings, as adolescents depicted that not feeling supervised and never feeling understood by parents were linked to illicit drug use (Daley *et al*., 2013). Parents who monitor their children were also a strong predictor of mitigating polydrug use among adolescents (McLafferty *et al*., 2022).

Peer influence contributed significantly to substance use among Saudi students and the young adolescent population. This finding is consistent with global studies. Peer pressure, family dynamics and social stressors are factors that shape adolescent substance use (Ismail *et al*., 2024). Peer pressure is strongly experienced by adolescents who display externalizing behaviors, as they feel compelled to conform to their friends' expectations and behaviours that revolve around substance use (Norbayusri *et al*., 2020). Accordingly, naïve youths are vulnerable to an increased sensation-seeking personality trait that gravitates them to the fun and risks associated with drugs, especially for novelty and stimulation effects (LaSpada *et al*., 2020). By viewing newly found friends as role models coupled with the urge to adopt their behaviours and attitudes, immature adolescents may

engage in drug use to gain peer acceptance (Shafie *et al*., 2023). Peers may also play the role of direct sources of substances by having direct connections with pushers, thereby introducing adolescents to substance abuse (Stickland and Smith, 2023). In addition, recreational activities and social gatherings with peers usually create a conducive setting for the acceptance and normalization of drug use (Ismail *et al*., 2024; Van Hout, 2010), leading to higher odds of experimentation by youngsters.

6 GAPS IN THE CURRENT LITERATURE

The quality appraisal of the reviewed articles also highlights the need for more robust research designs. It approaches the gathering of evidence-based data to improve the reliability of the findings. The vigor and strength of future observational studies on substance use in Saudi Arabia can be enhanced by addressing methodological flaws in sample size estimation, sampling techniques, confounder adjustment, handling of missing data, and statistical tests. These limitations may be considered by researchers attempting to update the current body of literature.

Although a plethora of evidence suggests substance use is associated with demographic characteristics, family-related factors, comorbidity and psychological disorders, peer influence, smoking behavior, and attitude/perceptions, there are important research gaps that require attention. There is a dearth of longitudinal or prospective studies investigating the relationship between protective and risk factors for substance use and SUDs among the young population in Saudi Arabia. Most studies are cross-sectional, so the sequential order of variables cannot be determined. Research approaches to examine directionality will assist in addressing this knowledge gap about substance use in adolescent and emerging adults. Furthermore, prospective studies may help elucidate the consistent protective and risk factors across this developmental period and their temporal changes. As a result, the trend of substance use can be better understood.

Several studies have explored some factors (e.g., demographic characteristics, peer influence, and smoking behavior). In contrast, other critical factors remain understudied, making it difficult to determine which variables have the most decisive influence on medical and non-medical misuse of substances. For instance, comorbidities and psychological disorders such as depression, anxiety, and perceived stress were only

investigated in a few studies, making it challenging to pool the results. Further research is needed to ascertain whether these factors are consistent predictors of substance use in the Saudi young population.

Another limitation in the literature is the lack of specificity regarding the pattern of substance use. Many studies assessed substance use within the past month or past year without measuring the frequency and dose typically consumed. Therefore, the potential alterations in risk and protective factors according to different patterns of substance use remain poorly understood. Moreover, the various definitions of substance use in these studies should also be considered. For instance, Alodhayani *et al*. (2022) defined substance use as the ongoing use of illicit substances, alcohol, or prescription or over-the-counter medications with adverse side effects. Others see it as drug abuse, substance abuse, and SUD, which is defined as a curable mental illness that impacts a person's brain and behaviour, causing them to lose control over their use of substances such as alcohol, narcotics, or prescription pharmaceuticals (Saquib *et al*., 2020). This gap results in a limited understanding of which factors strongly influence a regular misuse pattern compared with infrequent or occasional use. Bridging this gap could facilitate evidence-based and well-informed prevention efforts. More strategized and primary prevention measures can be designed to target the onset of substance use. In contrast, other factors are prioritized for addressing youth with riskier use patterns.

The ethical approval procedures involved in SUD studies, as well as data privacy and security concerns, are also important limitations to a nuanced understanding of the research topic. SUDs are viewed primarily as a sensitive topic; as a result, researchers face significant barriers when investigating them. As a result, most reports rely on research instruments such as surveys and questionnaires, with limited qualitative data and little direct information from SUD-affected individuals.

Finally, of the 24 reviewed articles, only one study, which focused on tobacco use among Saudi adolescent students (Shubayr *et al*., 2024), used a theoretical framework (the theory of planned behavior). In other words, most studies lacked a theoretical background to elucidate the underlying mechanisms that shape youths' engagement in substance use. This critical gap underscores the need for well-designed research grounded in relevant theories to inform more effective public health strategies.

7 LIMITATIONS OF THE REVIEW

Certain inclusion criteria were applied during the literature search, and only three databases were used, potentially leading to relevant articles being excluded from the final results. However, this is unlikely given that databases such as Google Scholar yield numerous results and provide an exhaustive list of articles relevant to the search topic. A comprehensive meta-analysis could not be performed due to heterogeneity in study designs and insufficient statistical data. Only basic meta-analysis, such as pooled estimates of substance use prevalence and pairwise comparisons of risk and protective factors, was conducted. All the articles used observational study designs, such as cross-sectional, prospective cohort, and retrospective designs, which only helped the researchers document the predictors and factors associated with substance use. Therefore, a causal inference could not be deduced from this systematic review.

8 CONCLUSION

This review revealed a high prevalence of substance use among the youth population in Saudi Arabia, with a slightly higher proportion in patients (26.0%) relative to young and adolescent students (18.9%). Patients commonly used amphetamine, cannabis, alcohol, and heroin, whereas tobacco, alcohol, hallucinogens and inhalants were predominantly reported among students. Nevertheless, the actual prevalence remains inconclusive due to the wide range of estimates reported in the reviewed studies and the heterogeneity of the study populations. The results across demographics underscore the importance of early prevention and effective management. Diverse factors ranging from demographic to family-related, smoking behavior, comorbidity/psychological disorders, peer influence, and attitudes toward substance use seem to shape the initiation and persistent use of substances in patients with SUD and the apparently healthy young population (students). These findings have important implications for policymakers, particularly towards developing effective preventive and control measures against substance use. Hence, coordinated efforts between policymakers and healthcare professionals are recommended to address substance abuse and its associated consequences effectively. Research gaps limiting a nuanced understanding of

the underlying events that contribute to substance use also need to be bridged in future studies. Such information is pertinent to developing comprehensive and culturally tailored strategies to mitigate the impact of substance abuse.

ACKNOWLEDGMENT

The authors extend their appreciation to Universiti Kebangsaan Malaysia for providing a conducive environment and access to the materials used in this study. The authors further appreciate the University of Tabuk, Saudi Arabia, for sponsoring the student for the PhD program.

FUNDS

The authors declare that the review has no funding or sponsorship.

ETHICS OF THE STUDY

The author declares that the study adheres to and respects all ethical considerations in conducting the systematic review. Therefore, all the processes followed were clearly explained in the study.

ABBREVIATIONS

The following abbreviations are used in this manuscript:

MMAT	Mixed-method appraisal tool
PRISMA	Preferred reporting items for systematic reviews and meta-analyses
PWUDs	Persons who use drugs
RQDT	Research question development tool
SUD	Substance use disorder
STROBE	Standard reporting tool for observational studies

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Authors' Contribution

Conception and design: GA, NA.; Analysis and interpretation of the data: GA, NA.; Drafting of the article: GA, NA.; Critical revision of the article for important intellectual content: GA, NA, SEG, PS.; Final approval of the article: NA, SEG, PS.

Data availability

All datasets relevant to this study's findings are fully available within the article.

How to cite this article (APA)

Alonazi, G., Amit, N., Ghazali, S. E., & Subramaniam, P. PREDICTORS OF SUBSTANCE USE AMONG ADOLESCENTS AND YOUNG POPULATION IN SAUDI ARABIA: A SYSTEMATIC REVIEW. Veredas Do Direito, e234958. https://doi.org/10.18623/rvd.v23.4958