



Patterns of Illicit Substance use Among Children in Western Province of Sri Lanka – A Cross-Sectional Study

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Abstract

Introduction: Illicit substance use among children is a significant public health concern with profound impacts on their physical, mental, and social well-being. Understanding the demographic and geographic patterns of substance use is crucial for targeted interventions. This study aims to analyse the prevalence, age and gender patterns, and geographic distribution of illicit substance use among children aged 12 - 17 years in the Western Province of Sri Lanka.

Methods: A cross sectional study was conducted among 69 children who tested positive for substances through urine toxicology screening in the Western Province. Data were collected from four institutes in Sri Lanka from February 2020 to February 2024. Statistical analysis, including Pearson correlation, assessed the impact of age and gender on substance use.

Results: The mean age was 16 years, with a positive correlation between age and substance use ($R = 0.409$, $P = 0.0004$). Males constituted 91.3% of users, and gender significantly influenced substance use patterns ($R = 0.393$, $P = 0.0008$). Tetrahydrocannabinol (THC), methamphetamine and opioid were the most common substances abused. Multiple substances abuse was seen in 16%. Colombo and Gampaha districts seem to be most affected.

Conclusions: The study reveals that THC is the commonest substance abused. There is significant age and gender disparities in substance use, with older males at higher risk. Geographic patterns highlight greater use in urban areas.

Introduction

Illicit substance use among teenagers is a significant public health concern worldwide, affecting them physically, psychologically, emotionally as well as socially.¹⁻⁴ Studies have shown that substances such as cannabis, methamphetamines, heroin, cocaine, and benzodiazepines are commonly abused by teenagers.² Urine toxicology testing is a widely used method for detecting the presence of illicit substances in the body.³

Literature regarding substance abuse patterns amongst Sri Lankan teenagers are scant and are relied on self-reports of substance abuse by adolescents.^{4,5} However, the validity of self-reports of substance abuse is limited. Previous systematic reviews have reported that the associations between self-reported substance use and substance use confirmed by biospecimen analysis range from low to moderate.⁶ This underpins the need for studies with more robust evidence and use of biospecimens to confirm the toxicants in order to report the patterns of substances used by the adolescents.

Illicit substance use among teenagers is not just a localized problem but a pervasive issue across South Asia. Neighbouring countries including India, Bangladesh, and

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Pakistan have reported similar trends among adolescents.⁷⁻¹¹ Comparing regional patterns enables a comprehensive understanding of the shared and unique challenges, providing valuable insights for collaborative interventions to combat this escalating public health crisis. In this background, the current study aimed to study the specific trends and factors associated with teenage substance use in Western province of Sri Lanka.

Methods

This cross sectional multi-center study was conducted to investigate patterns of biospecimen confirmed illicit substance use among Sri Lankan children aged 12 - 17 years over a period of four years (2020 February – 2024 February). Ethical approval for the study was granted by Ethics Review Committee, Post-graduate Institute of Medicine, University of Colombo (ERC/PGIM/2024/08). Since no direct interaction with participants was involved, formal parental consent and adolescent assent were not required. However, the study ensured that all data used were anonymized and that participant confidentiality was maintained, in line with ethical research standards. The minimum sample size required for the study was 50. The sample size was calculated based on epidemiological data from previously published studies using the sample size calculation software.⁸ All children who underwent urine toxicology testing in the study settings were included in the study. Total 69 teenagers who underwent testing at four referral centers within Western province were included. The referral centers included National Dangerous Drug Control Board (24 cases), Base Hospital Wathupitiwala (20 cases), Base Hospital Avissawella (18 cases) and North Colombo Teaching Hospital (Seven cases). All urine samples were collected in sterile, sealable containers to prevent contamination. Each sample was labelled with a unique identifier corresponding to the participant's study code, date, and time of collection. Multi-Drug Testing Panels were employed for screening for urinary excretion of toxicological substances which included tetrahydrocannabinol (THC), opioids (including heroin), methamphetamines and amphetamines, cocaine, benzodiazepines and propoxyphene. The EIA panels had a sensitivity of > 95% and specificity of > 98% for the substances tested and the cut-off concentrations THC: 50 ng / mL, opioids: 300 ng / mL, methamphetamines: 500 ng / mL, cocaine: 300 ng / mL, benzodiazepines: 300 ng/mL, and propoxyphene: 300 ng / mL. A structured questionnaire was used to gather contextual data on the participants' demographic background such as age, gender and area of permanent residence, together with the results of the urine toxicology screening studies. Residential status was defined as either 'urban' or 'rural' based on the population density of the town region / village within which the teenager was permanently residing. An 'Urban' region was recognised when the population density exceeded 500 per km.^{2,9} The patterns and trends in use of abusing substances were analysed

over the four year study period. SPSS version 16 was used for descriptive statistical analysis.

Results

Sixty-nine teenagers comprised the study sample. The participants had been permanently resident in one of eight administrative districts of the country (Gampaha - 30, Colombo - 27, Anuradhapura - 3, Kandy - 2, Monaragala - 2, Matara - 2, Hambantota - 2, Rathnapura -1). Thus, 17.4% of teenagers were temporary residents of the Western province. Sixty-six teenagers (95.7%) were permanently residing in urban geographic regions of the country. The mean age of teenagers abusing illicit substances was 16 years (Range - 12 - 17 years) (Figure 1). Heroin and methamphetamines were used predominantly by older teenagers; however, the association was not significant ($P > 0.05$). Similarly, use of multiple illicit substances did not correlate with increased age ($P > 0.05$).

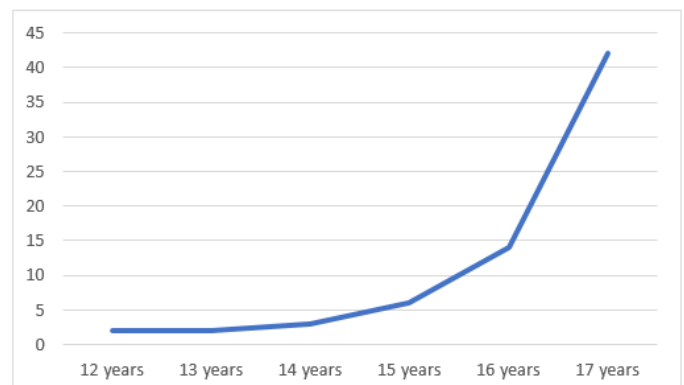


Figure 1: Frequency of illicit substance use amongst teenagers

The frequency of illicit substance use correlated positively with increasing age of the teenagers. Application of Pearson correlation test revealed that increasing age was a significant determinant in illicit substance use among teenagers ($R = 0.409$, $P = 0.0004$). The majority of illicit substance users were male teenagers - 63 (91.3%) (Figure 2). Use of benzodiazepines were seen similar in both genders (Four cases each). However, all other substances were more commonly used by males - THC (45 cases, 100%), opioids including heroin (Five cases, 100%), methamphetamines and amphetamines (16 cases, 88.9%), cocaine (Two cases, 100%), and propoxyphene (One case, 100%).

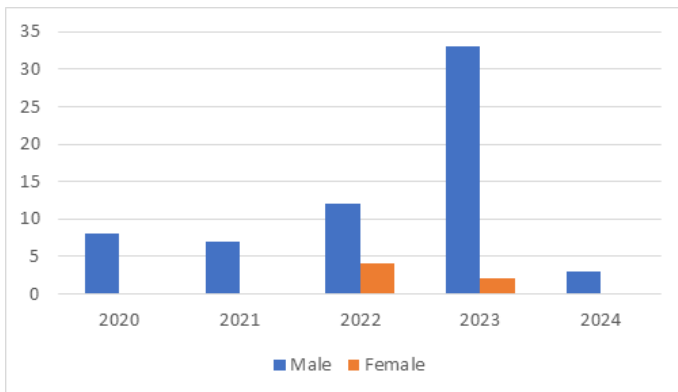


Figure 2: Gender based patterns of illicit substance use

Application of Pearson correlation test revealed that male gender was a significant determinant in illicit substance use among teenagers ($R = 0.393$, $P = 0.0008$).

Table 1: Patterns of use of illicit substances (2020 Feb - 2024 Feb)

Year	Illicit substance	N (%)
2020	THC	8 (100%)
2021	THC	5 (71.4%)
	Methamphetamines	1 (14.3%)
	Propoxyphene	1 (14.3%)
2022	THC	7 (35%)
	Methamphetamines	7 (35%)
	Opioids	2 (10%)
	Cocaine	2 (10%)
2023	THC	24 (54.5%)
	Methamphetamines	10 (22.7%)
	Opioids	5 (11.4%)
	Benzodiazepines	5 (11.4%)
2024	THC	3 (100%)

THC was the most commonly used illicit substance by teenagers in all four years (2020 Feb – 2024 Feb). There had been increased numbers of positive detections in 2022 and 2023 compared to the preceding two years. Notably, methamphetamines and opioids showed increasing trends for positive detections over recent years. Almost all cases of opioids (including heroin) and methamphetamine use were reported among teenagers permanently residing within Colombo and Gampaha districts. Teenagers living outside of these two districts were noted to use THC as the most common illicit substance.

Seven teenagers in 2022 and four teenagers in 2023 were using multiple illicit substances. The commonly detected combinations of illicit substances were THC and methamphetamines (Six cases), heroin and methamphetamines (Three cases), THC, heroin and benzodiazepines (One case) and amphetamines and benzodiazepines (One case). Nine cases of multiple illicit substance users were males (81.8%) whilst two were females (18.2%).

Discussion

Substance use typically escalates with age during adolescence. Older teenagers are more likely to experiment with and regularly use a variety of substances.¹⁰ This trend can be attributed to increased exposure to social environments where drug use is prevalent, greater autonomy, and psychological factors such as the search for identity and coping mechanisms for stress and peer pressure. The findings of the current study are consistent with existing literature that indicates older adolescents are more likely to engage in substance use. It is notable that specific substances like heroin and methamphetamines, although used predominantly by older teenagers, did not show a significant age association. This may indicate that while age is a general factor for substance use, specific drugs may have unique influencing factors, such as availability, social circles, or individual predispositions. Additionally, the lack of correlation between age and the use of multiple substances suggests that poly-drug use may be influenced more by other factors, such as social environment or psychological issues, rather than simply age.

Gender plays a significant role in substance use patterns. Males are generally more likely to use illicit substances compared to females.¹² However, the types of substances and the reasons for use can differ between genders.¹³ Males often engage in substance use due to peer influence and risk-taking behaviours, whereas females may use substances as a coping mechanism for psychological stress.¹⁴ The overwhelming majority of illicit substance users in this study were male (91.3%). This significant gender disparity aligns with global trends where males are more likely to use and abuse substances than females. The Pearson correlation test further reinforced this finding. While benzodiazepine use was equally prevalent among both genders, all other substances were predominantly used by males. This gender disparity could be attributed to a variety of factors including societal norms that may tolerate or even encourage substance use among males, higher levels of risk-taking behaviour, and differential peer influences. The equal usage of benzodiazepines among both genders may point to their use as a coping mechanism for stress or anxiety, which affects both male and female adolescents.

Geographic location also influences substance use patterns. Urban areas tend to have higher rates of substance use due to greater availability and accessibility of drugs, socio-economic disparities, and the influence of urban culture.¹⁵ Conversely,

rural areas might show different patterns due to limited access to certain substances but could have higher use of locally available drugs. This geographic distribution of the current study highlights the potential impact of urban environments on substance use among teenagers. Urban areas often provide easier access to drugs, higher levels of anonymity, and greater peer pressure, which can contribute to higher rates of substance use. Conversely, the lower numbers from rural (less densely populated geographic regions as per the study definition) suggest potential barriers to access or differences in social norms and enforcement practices in these areas.

The analysis of urine toxicology results from Feb 2020 to Feb 2024 revealed notable trends. THC was consistently the most commonly used substance over the four year study period, with increased detections in 2022 and 2023. This rise could reflect growing accessibility or changing perceptions of cannabis use among teenagers. Additionally, methamphetamines and opioids showed increasing trends, particularly in urban town regions within Colombo and Gampaha districts. These trends might be indicative of shifting drug markets or changing patterns of drug distribution and availability. The higher prevalence of methamphetamines and opioids in urban areas could be related to the more developed drug distribution networks and higher disposable incomes, facilitating the purchase of more expensive drugs. The findings of the patterns of substance use by adolescents were comparable to other studies from different geographic regions.¹⁶

The study also identified a number of teenagers using multiple illicit substances. The combinations of substances detected suggest a pattern of poly-drug use involving THC and methamphetamines, heroin and methamphetamines, and combinations involving benzodiazepines. Poly-drug use is particularly concerning due to the compounded health risks and potential for more severe addiction.¹⁷ Nine out of 11 poly-drug users were males, further highlighting the gender disparity in substance use.

The findings of this study have significant implications for public health and policy. The clear age and gender patterns in substance use highlight the need for targeted prevention and intervention programs. Programs aimed at younger adolescents can focus on delaying the onset of substance use, while interventions for older teenagers can address the risks of specific substances and poly-drug use. Gender-specific approaches are also warranted, given the higher prevalence among males. Additionally, the geographic disparities underscore the need for region-specific strategies that consider local socio-economic and cultural contexts. Urban pockets with congested living conditions, in particular, may benefit from enhanced surveillance, law enforcement, and accessible treatment services. Collaborative efforts between healthcare providers, educators, law enforcement, and community

organizations are essential to effectively address and mitigate the impact of illicit substance use among teenagers. Additionally, strengthening law enforcement on illicit substance distribution and providing accessible mental health services for adolescents can prevent substance misuse. Support for community-based programs and parental involvement should also be prioritized to create a holistic prevention approach.

The study is however, limited by the geographic distribution of participants, which may not be representative of the broader teenage population in Sri Lanka. Additionally, the reliance on urine toxicology for substance detection may not capture all instances of substance use. It is therefore, recommended that more rigorous country-wide studies are conducted with increased testing facilities for those teenagers with substance abuse so that the needy teenagers could be directed for psychosocial rehabilitation enabling faster reintegration in to the society.

Conclusions

The study reveals that THC is the commonest substance abused among teenagers in Western Province of Sri Lanka. There is significant age and gender disparities in substance use, with older males at higher risk for abuse. Poly substance abuse is also a major concern in Sri Lanka, especially among males. Geographic patterns highlight greater substance abuse in urban areas than rural areas.

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