

SPORTS PARTICIPATION AND SUBSTANCE USE AMONG YOUTH IN KERALA: A CROSS-SECTIONAL STUDY OF BEHAVIORAL AND SOCIAL RISK FACTORS

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ABSTRACT

Background: Substance use among young people is influenced by behavioural, social, and environmental factors. Participation in organised sport may provide a structured setting that supports healthier behaviours, but evidence among youth in Kerala remains limited. This study examined the association between sports participation and substance-use involvement among youth in Kerala. **Methods:** A cross-sectional comparative study was conducted among **150 youth aged 18–25 years** recruited from Thiruvananthapuram, Ernakulam, Kozhikode, and Malappuram using a non-probability snowball sampling technique. Participants were classified as sports participants ($n = 67$) or non-sports participants ($n = 83$). Substance use was assessed using the **Alcohol, Smoking and Substance Involvement Screening Test–Lite (ASSIST-Lite)**. Group differences were examined using chi-square tests and the Mann–Whitney U test. Binary logistic regression was used to evaluate the association between sports participation and recent substance use after adjustment for demographic and social factors. **Results:** Recent substance use was reported by **52.0%** of the total sample. Prevalence was significantly lower among sports participants than non-sports participants (**20.9% vs. 77.1%**; $\chi^2(1) = 46.93$, $p < 0.001$; Cramer's $V = 0.559$). Sports participants also showed lower high-risk tobacco (**13.4% vs. 43.4%**), alcohol (**9.0% vs. 45.8%**), and cannabis involvement (**1.5% vs. 15.7%**). The number of substance classes used was significantly lower among sports participants ($U = 1132.50$, $Z = -6.81$, $p < 0.001$). Peer substance-use exposure was significantly associated with recent substance use ($p < 0.001$). After adjustment, non-sports participants had **12.69 times higher odds** of recent substance use than sports participants (**95% CI: 4.86–33.15**, $p < 0.001$). **Conclusion:** Regular sports participation was strongly associated with lower substance-use involvement among the youth studied. Structured sport may have value as one component of broader youth substance-use prevention strategies, although longitudinal research is required to establish temporal and causal relationships.

Keywords: *Sports participation; substance use; youth; ASSIST-Lite; peer influence; alcohol; tobacco; Kerala*

INTRODUCTION

Substance use among young people remains an important public-health concern because initiation during adolescence and early adulthood can progress into persistent patterns of alcohol, tobacco, and drug use. This period is particularly sensitive to peer influence, experimentation, social environment, and lifestyle behaviours that may either increase or reduce the likelihood of substance use. In Kerala, previous studies have documented meaningful levels of alcohol and tobacco use among adolescents and young adults, highlighting the need to identify modifiable protective factors rather than focusing only on treatment after substance use has become

established (Jaisoorya et al., 2016; Jaisoorya et al., 2017).

Evidence from Kerala indicates that substance use can begin relatively early. Jaisoorya et al. (2016) reported a lifetime alcohol-use prevalence of 15% among school-going adolescents aged 12–19 years, with a mean age of initiation of 13.6 years. Tobacco use has also been reported among adolescents in the state, with higher use observed with increasing age and with other adverse behavioural and psychosocial factors (Jaisoorya et al., 2016; Jaisoorya et al., 2017). These findings suggest that preventive strategies should target the broader behavioural and social environment surrounding young people.

Participation in sport may represent one such modifiable factor. Regular sport provides structured use of leisure time, opportunities for social integration, achievement-oriented goals, supervision, and engagement in health-related behaviours. However, the relationship between sport and substance use is not uniform across substances. Earlier longitudinal evidence has suggested that sports participation may be associated with lower illicit-drug use, while associations with alcohol use have been more variable (Kwan et al., 2014). More recent evidence also suggests potential benefit from physical-activity-based interventions: a systematic review found that 17 of 28 included studies reported significant improvements in tobacco-, alcohol-, or other substance-use outcomes among young people at increased risk of problematic substance use, although the authors emphasised limitations in the certainty of evidence (Klamert et al., 2023).

Substance use is also shaped by social exposure. Peer behaviour, family environment, socioeconomic circumstances, and educational or employment status can influence the likelihood of initiation and continued use. Kerala-based evidence has linked tobacco and alcohol use with several demographic and psychosocial correlates, while tobacco use has also shown strong coexistence with alcohol and illicit-drug use (Jaisoorya et al., 2016; Jaisoorya et al., 2017). Therefore, the association between sport and substance use should be examined alongside relevant social and demographic factors.

Despite growing interest in sport as a potential protective behaviour, evidence specifically comparing substance-use patterns between sports participants and non-participants among youth in Kerala remains limited. The present study therefore aimed to examine the association between regular sports participation and substance use among youth in Kerala and to determine whether this relationship remained significant after accounting for demographic, peer, and family-related factors. It was hypothesised that youth participating in organised or regular sport would demonstrate lower substance-use involvement than non-participants.

METHODOLOGY

Study Design and Participants

A cross-sectional comparative study was conducted among youth aged **18–25 years** in Kerala, India. A total of **150 participants** were included from Thiruvananthapuram, Ernakulam, Kozhikode, and

Malappuram districts. The sample comprised both male and female participants from urban and rural settings. Among the participants, **67 (44.7%)** were currently involved in organised or regular sports, while **83 (55.3%)** were non-participants.

Participants were eligible if they were aged 18–25 years and were residing, studying, or working in Kerala. Sports participation was defined as current involvement in organised or regular sporting activity. Individuals not engaged in regular or organised sport were classified as non-sports participants.

Sampling Technique and Recruitment

A **non-probability snowball sampling technique** was used for participant recruitment. Initial eligible participants were approached through personal, educational, community, and sporting networks. They were subsequently requested to refer other eligible individuals from their social networks. Recruitment continued until the required sample size was obtained.

This approach enabled recruitment of both sports participants and non-participants from different educational, occupational, residential, and socioeconomic backgrounds.

Study Variables

The primary exposure variable was **sports participation status**, categorised as sports participant or non-participant. Additional sports-related variables included type of sport, organised participation, competition level, years of sports involvement, number of participation days per week, duration of each sports session, weekly sports participation time, and age at initiation of regular sport.

Sociodemographic variables included age, sex, district, residential setting, educational status, employment status, and family-income category. Social factors included self-reported substance use among close peers and immediate family members.

The primary outcome was recent substance use. Additional outcomes included recent drug use, substance-specific risk, number of substance classes used, and high-risk substance involvement.

Assessment of Substance Use

Substance use was assessed using the **Alcohol, Smoking and Substance Involvement Screening Test–Lite (ASSIST-Lite)**. ASSIST-Lite is a brief screening instrument developed to identify substance-related risk across commonly used psychoactive substances, including tobacco, alcohol,

cannabis, stimulants, sedatives, and opioids (Ali et al., 2013).

Responses were scored according to the ASSIST-Lite scoring framework and used to classify substance-specific risk. Separate risk classifications were obtained for tobacco, alcohol, cannabis, stimulants, sedatives, and opioids.

Derived variables were subsequently generated to identify:

- any substance use during the preceding three months;
- any drug use during the preceding three months;
- number of substance classes used; and
- presence of high-risk substance involvement.

This allowed both overall substance-use behaviour and substance-specific patterns to be examined.

Data Collection Procedure

Data were collected using a structured questionnaire containing four components: sociodemographic characteristics, sports-participation characteristics, peer and family substance-use exposure, and ASSIST-Lite items.

Participants completed the questionnaire after receiving an explanation of the study purpose and data-collection procedure. Sports participants provided additional information regarding their sport, competition level, duration of involvement, weekly participation frequency, and session duration.

Completed responses were reviewed for completeness before data entry. Participant information was coded numerically, and no directly identifying information was included in the analytical dataset.

Statistical Analysis

Data were analysed using **IBM SPSS Statistics**. Descriptive statistics were used to summarise demographic, sports-participation, and substance-use characteristics. Categorical variables were presented as **frequencies and percentages**, while continuous variables were summarised using **mean and standard deviation** or **median and interquartile range**, as appropriate.

RESULTS

Participant Characteristics

A total of **150 youth aged 18–25 years** were included in the study, with a mean age of **21.58 ± 2.37 years**. The sample comprised 80 males (53.3%) and 70 females (46.7%). Most participants were undergraduates (72.7%), students (74.7%), and from urban areas (57.3%). Participants were recruited from Thiruvananthapuram (44.0%), Ernakulam (28.7%), Kozhikode (18.0%), and Malappuram (9.3%).

The distribution of continuous variables was examined using histograms, Q–Q plots, and the Shapiro–Wilk test. Several sports-exposure and substance-use variables showed non-normal distributions; therefore, non-parametric procedures were used where appropriate.

The association between sports participation and categorical substance-use outcomes was examined using the **Pearson chi-square test**. Fisher's exact test was considered when expected cell frequencies were insufficient. The strength of categorical associations was assessed using **Phi or Cramer's V**.

The number of substance classes used was compared between sports participants and non-participants using the **Mann–Whitney U test**. Associations between peer and family substance-use exposure and participants' substance-use behaviour were also evaluated using chi-square analysis.

A **binary logistic regression analysis** was performed to examine whether sports participation was independently associated with recent substance use after controlling for potential demographic and social factors. The model included sports participation, age, sex, residence, education, employment status, family-income category, peer substance use, and family substance use as predictors.

Model performance was evaluated using the omnibus likelihood-ratio test, Hosmer–Lemeshow goodness-of-fit test, Nagelkerke R^2 , and classification accuracy. Associations were expressed as **odds ratios with 95% confidence intervals**. Statistical significance was set at **p < 0.05**.

Ethical Considerations

The study did not undergo review by a formal institutional ethics committee. Participation was voluntary, and participants were informed about the purpose of the study before providing consent. They were free to decline participation or withdraw without consequence.

Confidentiality and anonymity were maintained throughout the study. No personally identifying information was included in the analytical dataset, and the collected information was used solely for research purposes.

Regular or organised sports participation was reported by **67 participants (44.7%)**, while 83 (55.3%) were non-sports participants. Among the sports participants, 39 participated in team sports and 28 in individual sports. Peer substance-use exposure was reported by 62 participants (41.3%), whereas only 10 participants (6.7%) reported substance use within their immediate family.

Table 1. Sociodemographic and sports-participation characteristics of the study participants

Characteristic	Category	n (%)
Age, years	Mean $\pm$ SD	21.58 $\pm$ 2.37
	Range	18–25
Sex	Male	80 (53.3)
	Female	70 (46.7)
Residence	Urban	86 (57.3)
	Rural	64 (42.7)
Education	High school	31 (20.7)
	Undergraduate	109 (72.7)
	Postgraduate	10 (6.7)
Employment	Student	112 (74.7)
	Employed	24 (16.0)
	Unemployed	14 (9.3)
Family income	Low	47 (31.3)
	Middle	70 (46.7)
	High	33 (22.0)
District	Thiruvananthapuram	66 (44.0)
	Ernakulam	43 (28.7)
	Kozhikode	27 (18.0)
	Malappuram	14 (9.3)
Sports participation	Yes	67 (44.7)
	No	83 (55.3)
Peer substance use	Yes	62 (41.3)
	No	88 (58.7)
Family substance use	Yes	10 (6.7)
	No	140 (93.3)

SD, standard deviation.

Substance-Use Profile

Overall, **78 participants (52.0%)** reported substance use during the preceding three months, while **14 participants (9.3%)** reported recent drug use. Tobacco and alcohol represented the most prominent substance-related risks. High-risk tobacco involvement was identified in **45 participants (30.0%)**, high-risk alcohol involvement in **44 (29.3%)**, and high-risk cannabis involvement in **14 (9.3%)**. No participants were classified as high risk for stimulants, sedatives, or opioids.

Table 2. Prevalence and substance-specific risk profile

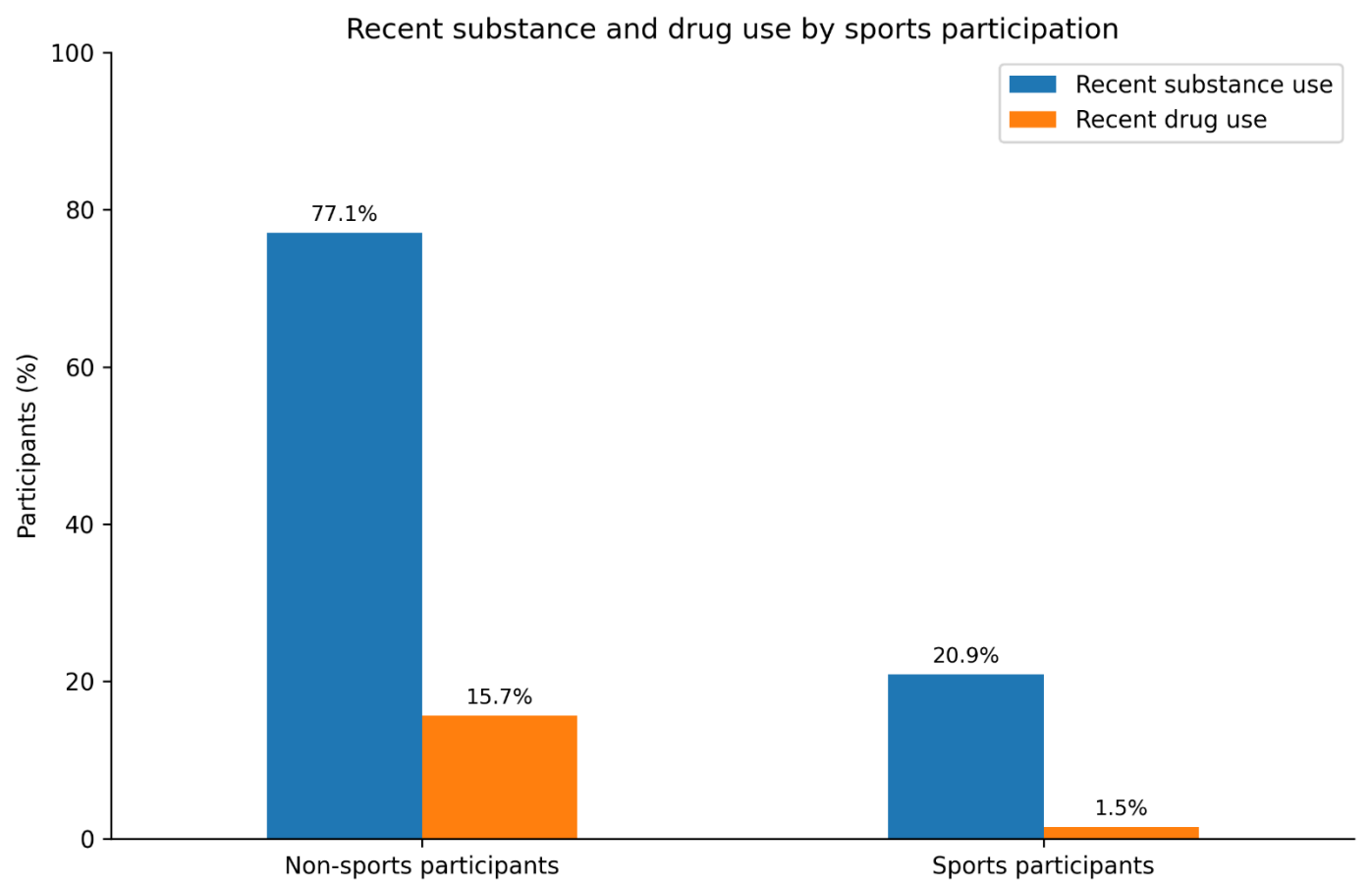
Outcome	Category	n (%)
Recent substance use	Yes	78 (52.0)
	No	72 (48.0)
Recent drug use	Yes	14 (9.3)
	No	136 (90.7)
Tobacco risk	High	45 (30.0)
	Low	105 (70.0)
Alcohol risk	High	44 (29.3)
	Low	106 (70.7)

Cannabis risk	High	14 (9.3)
	Low	136 (90.7)
Stimulant risk	High	0 (0.0)
Sedative risk	High	0 (0.0)
Opioid risk	High	0 (0.0)

Association Between Sports Participation and Recent Substance Use

A clear difference in recent substance use was observed between sports participants and non-sports participants. Among the **83 non-sports participants**, **64 (77.1%)** reported recent substance use. In contrast, only **14 of 67 sports participants (20.9%)** reported recent substance use. The association between sports participation and recent substance use was statistically significant, $\chi^2(1) = 46.93$, $p < 0.001$. The corresponding **Cramer's V of 0.559** indicated a large association. All expected cell frequencies exceeded five, satisfying the assumptions of the Pearson chi-square test.

Figure 1. Recent substance use and drug use according to sports participation



Recent drug use showed a similar pattern. Among non-sports participants, **13 of 83 (15.7%)** reported recent drug use compared with only **1 of 67 sports participants (1.5%)**. This association was statistically significant, $\chi^2(1) = 8.80$, $p = 0.003$, with a **Cramer's V of 0.242**.

Table 3. Association between sports participation and substance-use outcomes

Outcome	Non-sports participants n (%)	Sports participants n (%)	χ^2	p	Cramer's V
Recent substance use	64 (77.1)	14 (20.9)	46.93	<0.001	0.559
Recent drug use	13 (15.7)	1 (1.5)	8.80	0.003	0.242

Substance-Specific Risk According to Sports Participation

Substance-specific analysis demonstrated consistently lower high-risk classifications among sports participants.

High-risk tobacco involvement was observed in **36 non-sports participants (43.4%)**, compared with **9 sports participants (13.4%)**. The difference was statistically significant, $\chi^2(1) = 15.83$, $p < 0.001$, Cramer's V = 0.325.

For alcohol, **38 non-sports participants (45.8%)** were classified as high risk compared with **6 sports participants (9.0%)**. This represented a significant association, $\chi^2(1) = 24.26$, $p < 0.001$, with a Cramer's V of 0.402.

High-risk cannabis involvement was identified in **13 non-sports participants (15.7%)**, compared with only **1 sports participant (1.5%)**. The difference was also statistically significant, $\chi^2(1) = 8.80$, $p = 0.003$, Cramer's V = 0.242.

Figure 2. High-risk tobacco, alcohol, and cannabis involvement according to sports participation

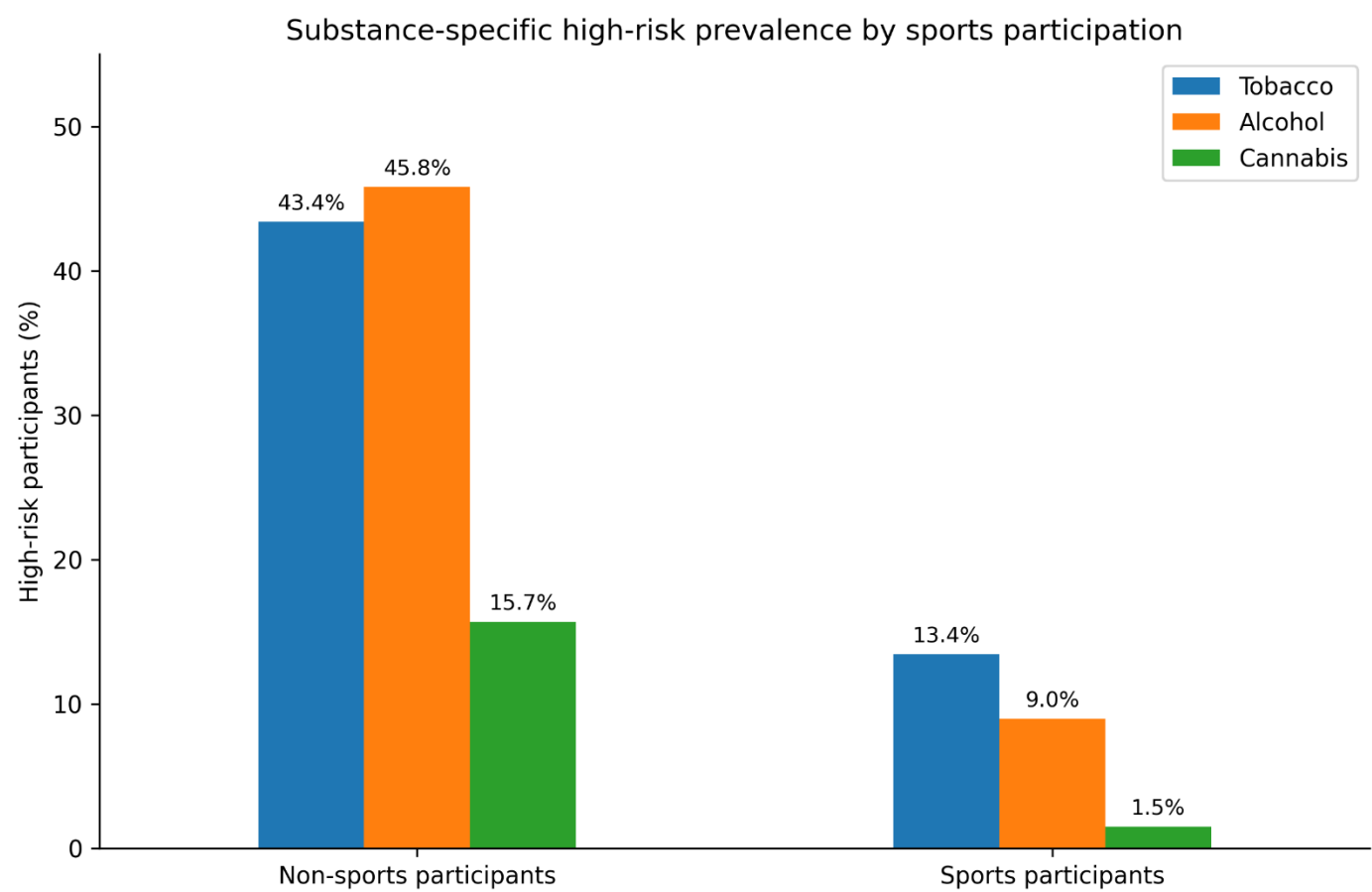


Table 4. Substance-specific high-risk involvement according to sports participation

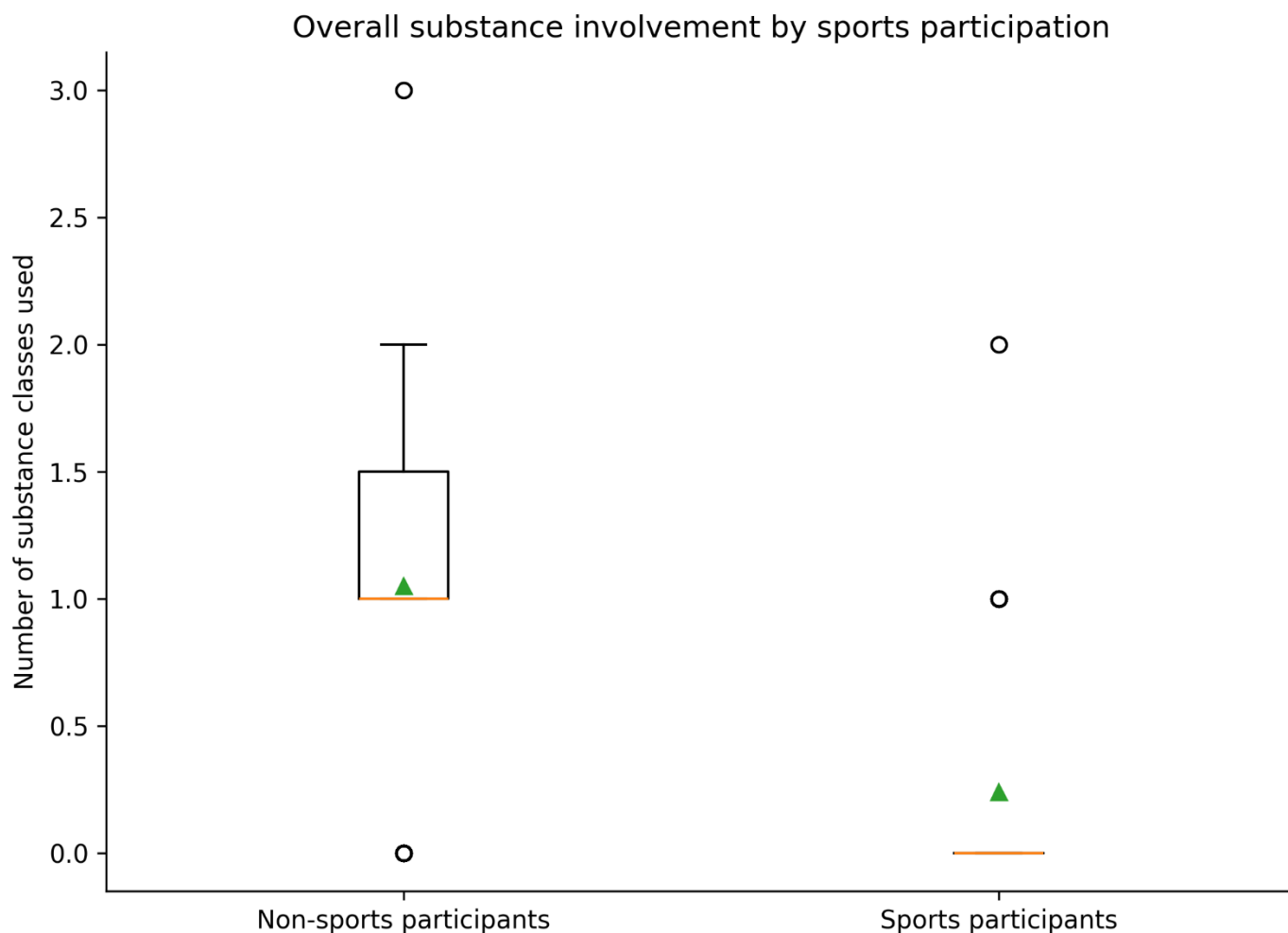
Substance	Non-sports participants n (%)	Sports participants n (%)	χ^2	p	Cramer's V
Tobacco	36 (43.4)	9 (13.4)	15.83	<0.001	0.325
Alcohol	38 (45.8)	6 (9.0)	24.26	<0.001	0.402
Cannabis	13 (15.7)	1 (1.5)	8.80	0.003	0.242

No between-group statistical comparisons were performed for stimulant, sedative, or opioid risk because all participants were classified in the low-risk category.

Overall Substance Involvement

The number of substance classes used also differed significantly between the two groups. Non-sports participants demonstrated a substantially higher mean rank (**95.36**) than sports participants (**50.90**). The Mann–Whitney U test confirmed a significant difference in overall substance involvement between the groups, $U = 1132.50$, $Z = -6.81$, $p < 0.001$. The calculated effect size was $r = 0.56$, indicating a large group difference.

Figure 3. Distribution of the number of substance classes used among sports participants and non-sports participants

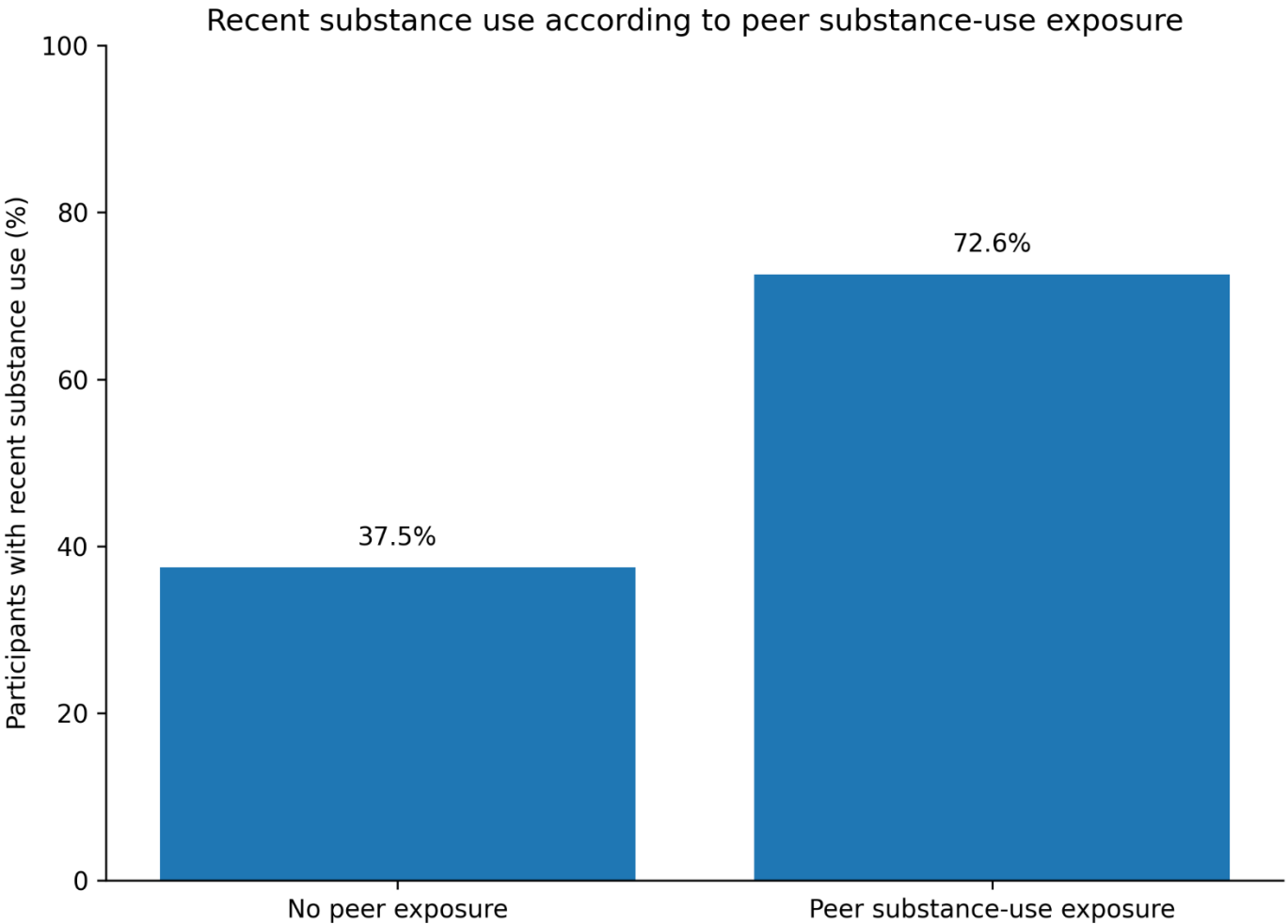


Peer and Family Substance-Use Exposure

Peer substance-use exposure was significantly associated with participants' own substance-use behaviour. Among participants whose close peers used alcohol, tobacco, or drugs, **45 of 62 (72.6%)** reported recent substance use. In comparison, **33 of 88 participants (37.5%)** without peer substance-use exposure reported recent substance use.

This association was statistically significant, $\chi^2(1) = 17.93$, $p < 0.001$, with a Cramer's V of 0.346, indicating a moderate association.

Figure 4. Prevalence of recent substance use according to peer substance-use exposure



Family substance-use exposure was not significantly associated with recent substance use. Among the 10 participants reporting substance use within the immediate family, 4 (40.0%) reported recent substance use, compared with 74 of 140 participants (52.9%) without family exposure. The Pearson chi-square test was non-significant, $\chi^2(1) = 0.62$, $p = 0.432$. As one expected cell frequency was below five, Fisher's exact test was also considered and remained non-significant ($p = 0.522$).

Multivariable Logistic Regression

Binary logistic regression was performed to examine whether the association between sports participation and recent substance use remained significant after adjustment for demographic and social factors. The model included sports participation, age, sex, residence, education, employment status, family-income category, peer substance use, and family substance use. The overall model was statistically significant, $\chi^2(12) = 59.11$, $p < 0.001$, demonstrating that the included predictors collectively improved prediction of recent substance use. The model yielded a **Cox and Snell R^2 of 0.326** and a **Nagelkerke R^2 of 0.434**. The Hosmer–Lemeshow test was non-significant, $\chi^2(8) = 12.56$, $p = 0.128$, indicating acceptable model calibration. Overall classification accuracy was **79.3%**, with 76.4% of participants without recent substance use and 82.1% of participants with recent substance use correctly classified. Sports participation remained strongly associated with recent substance use after adjustment. SPSS used **sports participants as the reference category**; therefore, the estimated odds ratio represents non-sports participants relative to sports participants. Non-sports participants had approximately **12.7 times higher adjusted odds of recent substance use** than sports participants (**adjusted OR = 12.69, 95% CI 4.86–33.15, $p < 0.001$**). Equivalently, when expressed in the protective direction, the reciprocal odds ratio is approximately **0.079**, indicating substantially lower odds of recent substance use among sports participants relative to non-sports participants.

Table 5. Multivariable logistic regression for recent substance use

Predictor/Model characteristic	Result
Non-sports participation vs sports participation, adjusted OR	12.69
95% CI	4.86–33.15
p-value	<0.001
Omnibus model χ^2 (df = 12)	59.11
Model p-value	<0.001
Cox and Snell R ²	0.326
Nagelkerke R ²	0.434
Hosmer–Lemeshow χ^2 (df = 8)	12.56
Hosmer–Lemeshow p-value	0.128
Overall classification accuracy	79.3%

OR, odds ratio; CI, confidence interval. The model was adjusted for age, sex, residence, education, employment status, family-income category, peer substance use, and family substance use.

Summary of Principal Findings

The principal finding was the markedly lower prevalence of recent substance use among youth involved in regular or organised sport. Recent substance use was reported by **20.9% of sports participants compared with 77.1% of non-sports participants**, representing a large bivariate association. Similar patterns were observed for tobacco, alcohol, cannabis, recent drug use, and the overall number of substance classes used. Importantly, the association persisted after adjustment for demographic and social factors, with non-sports participants demonstrating approximately **12.7-fold higher adjusted odds of recent substance use**.

DISCUSSION

The present study found a strong association between regular sports participation and lower substance-use involvement among youth in Kerala. Recent substance use was reported by 77.1% of non-sports participants compared with 20.9% of sports participants, and the association showed a large effect size. Sports participants also demonstrated substantially lower high-risk involvement with tobacco, alcohol, and cannabis and used fewer substance classes overall. Importantly, this relationship remained significant after adjustment for demographic and social factors, with non-sports participants showing approximately 12.7 times higher odds of recent substance use than sports participants. The lower substance-use involvement observed among sports participants is broadly consistent with evidence suggesting that structured sport and physical activity can contribute to healthier behavioural patterns. Zuckerman et al. (2021), in a systematic review and meta-analysis of team-sport participation, reported lower odds of cigarette/tobacco use and alcohol/drug use among sport participants. Similarly, Klamert et al. (2023) found that 17 of 28 studies evaluating physical-activity interventions among young people at increased risk of problematic substance use reported improvements in tobacco-, alcohol-, or other substance-related outcomes. Together with the present findings, this suggests that

structured physical activity may represent one component of a broader behavioural environment associated with reduced substance involvement. Several mechanisms may explain this association. Regular sport creates structured use of leisure time, establishes performance-related goals, and places young people within environments where physical fitness and recovery have immediate relevance. Participation may also provide routine, supervision, social connection, and alternative sources of achievement and identity. These factors could reduce opportunities or motivation for substance use. However, the present cross-sectional data cannot establish that sport itself produced the lower substance-use rates. It is also possible that young people who already follow healthier lifestyles are more likely to remain involved in sport. The substance-specific findings require some nuance. The lower tobacco and cannabis risk among sports participants agrees with much of the previous literature. Kwan et al. (2014), reviewing longitudinal studies, found that sports participation was generally associated with reduced illicit-drug use, particularly non-cannabis illicit drugs, while approximately half of the studies examining marijuana reported an inverse association. However, the literature on **alcohol** is less consistent. The same review found that many longitudinal studies reported greater alcohol use among sport participants, while another review of young athletes similarly identified alcohol as a

behaviour that may remain common within sporting populations (Kwan et al., 2014). Therefore, the markedly lower alcohol-risk classification among sports participants in the present Kerala sample should not be generalised to all sporting populations. Cultural context, type and level of sport, age, competitive environment, and peer norms may modify this relationship.

The present findings are particularly relevant within the Kerala context. Previous Kerala-based studies have demonstrated that substance use is already evident during adolescence and young adulthood. Jaisoorya et al. (2016) reported lifetime alcohol use in 15% of school-going adolescents in Ernakulam, with initiation occurring at a mean age of 13.6 years. Tobacco use among Kerala adolescents has also been associated with concurrent alcohol and illicit-drug use and several adverse psychosocial outcomes (Jaisoorya et al., 2017). Studies among college students in Kerala have similarly identified tobacco and high-risk alcohol use as important health concerns. Direct prevalence comparisons with the present study should nevertheless be made cautiously because previous studies differed in age group, sampling strategy, substance definitions, and measurement instruments.

Peer exposure emerged as another important finding. Nearly three-quarters (72.6%) of participants who reported substance use among close peers also reported recent substance use themselves, compared with 37.5% among participants without peer exposure. This significant bivariate relationship is consistent with substantial evidence identifying substance-using peers as an important correlate of youth substance use. Longitudinal evidence has shown that affiliation with alcohol-using peers predicts subsequent drinking behaviour, while a recent systematic review of social-network studies found friends' cannabis use to be one of the most consistent correlates of adolescent cannabis use (Leung et al., 2014; Torrejón-Guirado et al., 2024).

Interestingly, peer substance use was no longer independently significant after the other variables were entered into the multivariable model. This does not mean that peer exposure is unimportant. Rather, its association may overlap with sports participation and other demographic or social characteristics represented in the model. Because the study was cross-sectional, it is also impossible to distinguish **peer influence** from **peer selection**—young people may adopt behaviours from their friends, but young

people with similar behaviours may also form friendships with one another. Previous longitudinal research has identified evidence for both processes.

Family substance-use exposure was not significantly associated with recent substance use in this sample. This result should be interpreted cautiously because only 10 participants reported substance use within their immediate family, providing limited statistical power to detect an association. It would therefore be inappropriate to conclude that family influences are unimportant. Kerala research has previously shown that family context can contribute to early exposure; for example, Jaisoorya et al. (2016) reported that initiation of alcohol use among adolescents frequently occurred through family members during family celebrations.

From a practical perspective, these findings support considering organised sport as one element within youth substance-use prevention strategies. Sport should not be presented as a stand-alone treatment or guaranteed protective factor. Rather, accessible and well-supervised sports programmes may provide a structured setting in which health education, peer-support initiatives, early identification of risky substance use, and positive social norms can be integrated. This may be particularly relevant because peer-led preventive interventions have shown modest reductions in smoking, alcohol use, and cannabis use among young people (MacArthur et al., 2016). Combining structured sport with evidence-based peer and behavioural approaches may therefore be more appropriate than relying on participation alone.

Strengths and Limitations

A strength of the study was the simultaneous assessment of sports participation, multiple substance categories, peer and family exposure, and relevant sociodemographic factors. The use of both bivariate analyses and multivariable logistic regression also allowed the association with sports participation to be examined after statistical adjustment. The consistent direction of findings across recent substance use, drug use, tobacco, alcohol, cannabis, and number of substance classes further strengthens the observed pattern.

Several limitations should nevertheless be acknowledged. First, the **cross-sectional design prevents causal inference**; sports participation cannot be concluded to prevent substance use, and reverse selection remains possible. Second, the use of **non-probability snowball sampling** may have introduced selection bias and limits the

representativeness of the sample. Third, all substance-use information was self-reported and may therefore be affected by recall or social-desirability bias. Fourth, participants were recruited from four Kerala districts, and the results should not automatically be generalised to all youth in the state. Fifth, the number of recent drug users was small, and no high-risk stimulant, sedative, or opioid involvement was identified, limiting substance-specific analysis for these categories. Finally, although the adjusted association with sports participation was strong, the relatively wide 95% confidence interval for the odds ratio (**4.86–33.15**) indicates uncertainty regarding the precise magnitude of the effect.

Overall, the findings demonstrate a consistent association between regular sports participation and lower substance-use involvement among the youth studied. The strength of this relationship after adjustment for demographic and social factors suggests that sports participation deserves further investigation as a potentially relevant component of youth substance-use prevention. Longitudinal and prospective studies using probability-based samples are required to determine whether sustained sports participation contributes directly to reduced initiation or progression of substance use.

CONCLUSION

Regular sports participation was strongly associated with lower substance-use involvement among youth in Kerala. Sports participants reported markedly lower recent substance use, drug use, and high-risk tobacco, alcohol, and cannabis involvement than non-sports participants. This association remained significant after adjustment for demographic and social factors, with non-sports participants showing substantially higher odds of recent substance use.

Peer substance-use exposure was also associated with greater substance use, emphasising the importance of the wider social environment. These findings suggest that organised sport may have value as one component of youth substance-use prevention strategies, particularly when combined with peer-focused health education and behavioural support. However, because of the cross-sectional design and non-probability sampling method, causality cannot be established. Prospective and longitudinal studies are needed to determine whether sustained sports

participation directly reduces the initiation or progression of substance use among young people.

Practical Implications

The findings indicate that structured sports participation may provide a useful setting for youth substance-use prevention. Sports clubs, colleges, universities, community organisations, and local sporting bodies could incorporate brief substance-use education, peer-support activities, and early-risk screening within existing sports programmes.

The strong association between peer substance-use exposure and participants' own substance use also highlights the importance of addressing peer environments. Prevention strategies should therefore extend beyond individual awareness and include peer-led education, positive team norms, mentorship, and opportunities for sustained engagement in structured recreational and sporting activities.

Sports participation should not be considered a stand-alone intervention for substance-use prevention. Rather, it may function as one component of a broader strategy combining physical activity, behavioural education, peer support, counselling, and referral services for young people at increased risk.

Recommendations

Based on the present findings, organised and accessible sports opportunities should be encouraged among young people, particularly within colleges, universities, and community settings. Substance-use prevention programmes may benefit from integrating sporting activities with structured health education and peer-support initiatives.

Young people reporting substance use among close peers may require particular attention during screening and prevention programmes. Educational institutions and sports organisations should consider periodic awareness programmes focusing on tobacco, alcohol, cannabis, and other substance-related risks.

Future research should employ larger and more representative samples across multiple districts of Kerala. Longitudinal studies are particularly needed to determine whether sustained sports participation precedes and contributes to reductions in substance-use initiation and progression. Further research should also examine whether the relationship varies according to sport type, competitive level, frequency of participation, duration of sports involvement, and sex.

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REFERENCES

1. Ali, R., Meena, S., Eastwood, B., Richards, I., & Marsden, J. (2013). Ultra-rapid screening for substance-use disorders: The Alcohol, Smoking and Substance Involvement Screening Test (ASSIST-Lite). *Drug and Alcohol Dependence*, 132(1–2), 352–361. <https://doi.org/10.1016/j.drugalcdep.2013.03.001>
2. Jaisoorya, T. S., Beena, K. V., Beena, M., Ellangovan, K., Jose, D. C., Thennarasu, K., & Benegal, V. (2016). Prevalence and correlates of alcohol use among adolescents attending school in Kerala, India. *Drug and Alcohol Review*, 35(5), 523–529. <https://doi.org/10.1111/dar.12358>
3. Jaisoorya, T. S., Beena, K. V., Beena, M., Jose, D. C., Ellangovan, K., Thennarasu, K., & Benegal, V. (2016). Prevalence & correlates of tobacco use among adolescents in Kerala, India. *Indian Journal of Medical Research*, 144(5), 704–711. https://doi.org/10.4103/ijmr.IJMR_1873_14
4. Klamert, L., Bedi, G., Craike, M., Kidd, S., Pascoe, M. C., & Parker, A. G. (2023). Physical activity interventions for young people with increased risk of problematic substance use: A systematic review including different intervention formats. *Mental Health and Physical Activity*, 25, Article 100551. <https://doi.org/10.1016/j.mhpa.2023.100551>
5. Kwan, M., Bobko, S., Faulkner, G., Donnelly, P., & Cairney, J. (2014). Sport participation and alcohol and illicit drug use in adolescents and young adults: A systematic review of longitudinal studies. *Addictive Behaviors*, 39(3), 497–506. <https://doi.org/10.1016/j.addbeh.2013.11.006>
6. Leung, R. K., Toumbourou, J. W., & Hemphill, S. A. (2014). The effect of peer influence and selection processes on adolescent alcohol use: A systematic review of longitudinal studies. *Health Psychology Review*, 8(4), 426–457. <https://doi.org/10.1080/17437199.2011.587961>
7. MacArthur, G. J., Harrison, S., Caldwell, D. M., Hickman, M., & Campbell, R. (2016). Peer-led interventions to prevent tobacco, alcohol and/or drug use among young people aged 11–21 years: A systematic review and meta-analysis. *Addiction*, 111(3), 391–407. <https://doi.org/10.1111/add.13224>
8. Torrejón-Guirado, M.-C., Baena-Jiménez, M. Á., Lima-Serrano, M., de Vries, H., & Mercken, L. (2023). The influence of peer's social networks on adolescent's cannabis use: A systematic review of longitudinal studies. *Frontiers in Psychiatry*, 14, Article 1306439. <https://doi.org/10.3389/fpsy.2023.1306439>
9. Zuckerman, S. L., Tang, A. R., Richard, K. E., Grisham, C. J., Kuhn, A. W., Bonfield, C. M., & Yengo-Kahn, A. M. (2021). The behavioral, psychological, and social impacts of team sports: A systematic review and meta-analysis. *The Physician and Sportsmedicine*, 49(3), 246–261. <https://doi.org/10.1080/00913847.2020.1850152>
10. Ambekar, A., Agrawal, A., Rao, R., Mishra, A. K., Khandelwal, S. K., & Chadda, R. K. (2019). *Magnitude of substance use in India*. Ministry of Social Justice and Empowerment, Government of India. [Press Information Bureau](https://www.pib.gov.in/Press-Information-Bureau)
11. Cole, V. T., Richmond-Rakerd, L. S., Bierce, L. F., Norotsky, R. L., Peiris, S. T., & Hussong, A. M. (2024). Peer connectedness and substance use in adolescence: A systematic review and meta-analysis. *Psychology of Addictive Behaviors*, 38(1), 19–35. <https://doi.org/10.1037/adb0000914> PubMed
12. Filges, T., Verner, M., Ladekjær, E., & Bengtsen, E. (2024). Participation in organised sport to improve and prevent adverse developmental trajectories of at-risk youth: A systematic review. *Campbell Systematic Reviews*, 20(1), e1381. <https://doi.org/10.1002/cl2.1381> PubMed
13. Jaisoorya, T. S., Ganjekar, S., Menon, P. G., Nair, B. S., Rani, A., & Thennarassu, K. (2021). Tobacco use among college students in Kerala, India. *Indian Journal of Medical Research*, 154(3), 527–532. https://doi.org/10.4103/ijmr.IJMR_1505_18 PubMed
14. Jaswal, N., Naskar, C., Ghosh, A., Prashar, S., & Kumar, M. (2023). Substance use and misuse among college students: Results of an online survey from three neighboring cities of North India. *Indian Journal of Psychiatry*, 65(9), 966–970. https://doi.org/10.4103/indianjpsychiatry.indianjpsychiatry_661_22 PubMed
15. Menon, P. G., George, S., Nair, B. S., Rani, A., Thennarasu, K., & Jaisoorya, T. S. (2020). Tobacco use among college students across various disciplines in Kerala, India. *Tobacco Use Insights*, 13, 1179173X20938773. <https://doi.org/10.1177/1179173X20938773> PubMed Central (PMC)

16. Murray, R. M., Sabiston, C. M., Doré, I., Bélanger, M., & O'Loughlin, J. L. (2021). Longitudinal associations between team sport participation and substance use in adolescents and young adults. *Addictive Behaviors, 116*, 106798. <https://doi.org/10.1016/j.addbeh.2020.106798> DOI
17. Walczak, B., Walczak, A., Tricas-Sauras, S., & Kołodziejczyk, J. (2023). Does sport participation protect adolescents from alcohol consumption? A scoping review. *International Journal of Environmental Research and Public Health, 20*(7), 5417. <https://doi.org/10.3390/ijerph20075417> PubMed Central (PMC)
18. West, A. B., Bittel, K. M., Russell, M. A., Evans, M. B., Mama, S. K., & Conroy, D. E. (2020). A systematic review of physical activity, sedentary behavior, and substance use in adolescents and emerging adults. *Translational Behavioral Medicine, 10*(5), 1155–1167. <https://doi.org/10.1093/tbm/ibaa008> OUP Academic
19. World Health Organization. (2024). *Global status report on alcohol and health and treatment of substance use disorders*. World Health Organization.