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Efficacy of a Nurse-Led Structured Teaching Programme in Enhancing Knowledge of Substance Abuse and its Complications among School-Going Adolescents: A Quasi-Experimental Study

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Abstract **- Background: Adolescence marks the developmental stage at which most lifetime substance use is initiated, and inadequate knowledge of substance-related harm is a recognised, modifiable risk factor. Nurse-led school-based education offers a scalable primary-prevention strategy, yet doctoral-level evidence from the Jaipur region of Rajasthan, India, remains scarce. Objectives: To evaluate the efficacy of a Structured Teaching Programme (STP) in enhancing knowledge of substance abuse and its complications among school-going adolescents, and to examine the association of baseline knowledge with selected socio-demographic variables. Methods: A quasi-experimental, one-group pre-test–post-test design was employed. Two hundred (200) adolescents aged 14–19 years were selected by purposive sampling from three schools. A validated bilingual (English–Hindi) 49-item Structured Knowledge Questionnaire (S-CVI/Ave = 0.94; KR-20 = 0.82) with randomised correct-option positions was administered before and seven days after a 45-minute STP. Data were analysed in SPSS v26 using paired t-test, Wilcoxon signed-rank test, McNemar test, chi-square test, one-way ANOVA and Pearson correlation ($\alpha = 0.05$). Results: Mean knowledge rose from 20.26 ± 5.04 (41.3%) to 35.12 ± 6.20 (71.7%). The mean gain of 14.86 points (95% CI 14.28–15.43) was significant [$t(199) = 50.85$, $p < 0.001$; Cohen's $d = 3.60$]. Respondents with adequate knowledge increased from 0% to 39.5% (McNemar $\chi^2 = 77.0$, $p < 0.001$). Baseline knowledge was significantly associated with area of residence, mother's education and previous source of information ($p < 0.05$). Conclusion: The nurse-led STP was highly efficacious in improving adolescents' knowledge of substance abuse and its complications. Integrating structured, culturally adapted, bilingual education into school health services is recommended as a cost-effective preventive measure.**

Keywords **- *Adolescent health; Substance abuse; Health education; Structured teaching programme; Nursing intervention; Knowledge; Primary prevention; Quasi-experimental study.***

I. INTRODUCTION

Adolescence is a critical developmental window during which experimentation with psychoactive substances most commonly begins, and the majority of adults living with a substance-use disorder report initiating use before eighteen years of age [1,2]. The adolescent brain—particularly the prefrontal cortex governing judgement and impulse control—is uniquely susceptible to the neurotoxic effects of tobacco, alcohol, cannabis and opioids, and early initiation strongly predicts later dependence, academic failure and psychosocial dysfunction [3,4]. Consequently, adolescence represents the optimal window for preventive intervention [5].

In India, national epidemiological data indicate widespread use of alcohol, cannabis and opioids alongside a concerning downward shift in the age of first use [6,7]. Rapid urbanisation, easy availability, peer influence, academic stress and the pervasive reach of social media have collectively intensified adolescent exposure [8,9]. Rajasthan, encompassing both rural and rapidly urbanising districts such as Jaipur, presents a demographic in which adolescents encounter both traditional products (tobacco, gutkha) and newer forms of use (energy drinks, prescription misuse) [10].

Knowledge is a well-established antecedent of health behaviour. Within the Health Belief Model and the Theory of Planned Behaviour, accurate knowledge of harmful consequences heightens perceived susceptibility and severity, strengthening protective intentions [11,12]. Adolescents with adequate substance-related knowledge consistently report lower experimentation, whereas misconceptions—such as the belief that occasional use cannot cause dependence—function as gateways to initiation [13,14].

Nurses, trained in health education and with structured access to schools, are ideally positioned to deliver preventive education. A Structured Teaching Programme (STP) is a planned, objective-based intervention employing defined content, teaching aids and evaluation [15]. Although numerous nursing studies confirm the efficacy of STPs across health topics [16–18], rigorous doctoral-level evidence specific to substance abuse among school adolescents in the Jaipur region is limited. Preliminary observation by the investigators revealed that adolescents frequently held inaccurate beliefs regarding tobacco safety, the reversibility of dependence and the legal status of substances. Since knowledge deficits are modifiable, the present study evaluated the efficacy of a nurse-led, bilingual STP and examined the socio-demographic correlates of baseline knowledge.

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1.1 Objectives and Hypotheses

The study aimed to: (i) assess pre-test knowledge of substance abuse and its complications; (ii) administer an STP; (iii) assess post-test knowledge; (iv) evaluate the efficacy of the STP; and (v) determine the association between pre-test knowledge and selected socio-demographic variables. Two hypotheses were tested at $p < 0.05$: H_1, the mean post-test score is significantly higher than the pre-test score; and H_2, pre-test knowledge is significantly associated with selected socio-demographic variables.

II. MATERIALS AND METHODS

2.1 Design and Setting

A quantitative, evaluative approach with a quasi-experimental one-group pre-test–post-test design was adopted, as randomisation of intact school classes was impractical. The study was conducted in three purposively selected co-educational secondary and senior-secondary schools of Jaipur district, Rajasthan, India.

2.2 Participants and Sampling

The target population comprised adolescents aged 14–19 years in Classes 10–12. Using G*Power for a paired-means comparison (effect size d = 0.5, power = 0.95, α = 0.05), a minimum of 54 participants was indicated; the sample was enlarged to 200 to improve precision and permit subgroup analysis. A non-probability purposive technique recruited eligible adolescents present on both data-collection days. Adolescents who had attended any formal substance-abuse programme within the preceding three months, or who were absent on either day, were excluded.

2.3 Instrument

A self-administered, bilingual (English–Hindi) tool comprised a 13-item socio-demographic proforma (Section A) and a 49-item Structured Knowledge Questionnaire (Section B: 42 four-option multiple-choice and 7 true/false items) spanning five domains—definitions and concepts; commonly abused substances and routes; specific substances; recognition of substance-use disorder; and prevention, management and rehabilitation. Each correct response scored one mark (maximum 49). To minimise response bias, the position of the correct option was randomised across items. Total scores were classified as inadequate (0–24; ≤50%), moderately adequate (25–37; 51–75%) or adequate (38–49; >75%).

2.4 Validity and Reliability

Content validity was established by nine experts from nursing, psychiatry and community medicine; the I-CVI ranged 0.89–1.00 and the S-CVI/Ave was 0.94. Internal consistency, assessed on 20 non-sample adolescents using the Kuder–Richardson formula, yielded KR-20 = 0.82. The Hindi version was back-translated to confirm semantic equivalence.

2.5 Intervention and Data Collection

After administrative permission and written assent/parental consent, the pre-test was administered on Day 1, immediately followed by a 45-minute STP delivered through lecture-cum-discussion with flip charts, posters and a short audio-visual clip. The identical questionnaire was re-administered on Day 7. Anonymity was preserved using code numbers.

2.6 Ethical Considerations

The protocol was approved by the Institutional Ethics Committee and adhered to the ICMR National Ethical Guidelines. Participation was voluntary; assent and parental consent were obtained; confidentiality was maintained; and participants could withdraw without penalty. Adolescents with concerning responses were offered referral to the school counsellor.

2.7 Statistical Analysis

Data were analysed in IBM SPSS v26. Descriptive statistics summarised characteristics and scores. The paired t-test (confirmed by the Wilcoxon signed-rank test) evaluated efficacy; the McNemar test assessed categorical shift; the chi-square test examined associations; and one-way ANOVA and Pearson correlation supported supplementary analyses. Significance was set at $p < 0.05$.

III. RESULTS

3.1 Socio-Demographic Profile

The largest age group was 16–17 years, reflecting concentration in Classes 11–12; males and females were fairly balanced; and most respondents resided in urban or semi-urban areas within nuclear families. Mass media and school/teachers were the principal prior information sources, while a notable minority reported no previous formal information—reinforcing the need for the intervention. Detailed frequency and percentage distributions are presented in Table 1, with graphical summaries in Figures 1–2.

Table 1. Frequency and percentage distribution of respondents by socio-demographic characteristics (N = 200).

Variable	Category	f	%	Variable	Category	f	%
Age (years)	14-15	64	32.0		Up to secondary	55	27.5
	16-17	87	43.5		Sr sec/Diploma	80	40.0
	18-19	49	24.5		Graduate & above	49	24.5
Gender	Male	95	47.5	Mother's education	No formal	37	18.5
	Female	100	50.0		Up to secondary	76	38.0
	Prefer not to say	5	2.5		Sr sec/Diploma	53	26.5
Class	10th	67	33.5		Graduate & above	34	17.0
	11th	68	34.0	Family income (₹)	≤10,000	46	23.0
	12th	65	32.5		10,001-30,000	81	40.5
Stream	Science	64	32.0		30,001-50,000	42	21.0
	Commerce	38	19.0		>50,000	31	15.5

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Variable	Category	f	%	Variable	Category	f	%
	Arts	31	15.5	Pocket money (₹)	None	0	0.0
	Not applicable	67	33.5		<500	58	29.0
Religion	Hindu	152	76.0		500-1,000	70	35.0
	Muslim	31	15.5		1,001-2,000	24	12.0
	Sikh	6	3.0		>2,000	10	5.0
	Christian	7	3.5	Info source	Mass media	73	36.5
	Others	4	2.0		School/Teachers	58	29.0
Residence	Rural	65	32.5		Family/Parents	34	17.0
	Urban	94	47.0		No previous info	25	12.5
	Semi-urban	41	20.5		Health-care	10	5.0
Family type	Nuclear	114	57.0	Family history	Yes	48	24.0
	Joint	68	34.0		No	133	66.5
	Single-parent/Other	18	9.0		Not sure	19	9.5
Father's education	No formal	16	8.0				

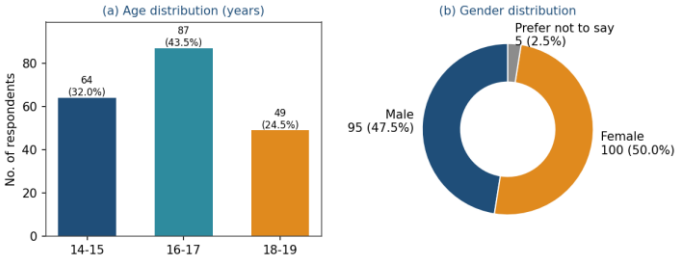

Figure 1. Distribution of respondents by (a) age and (b) gender.

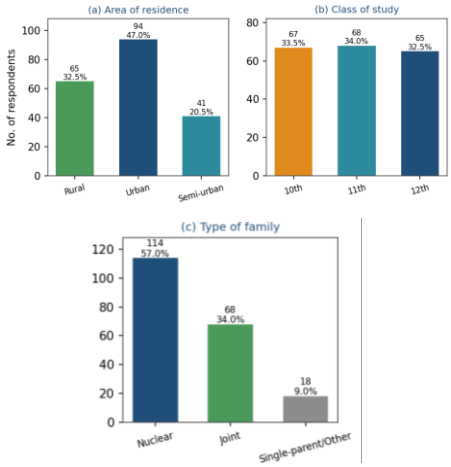

Figure 2. Distribution by area of residence, class of study and type of family.

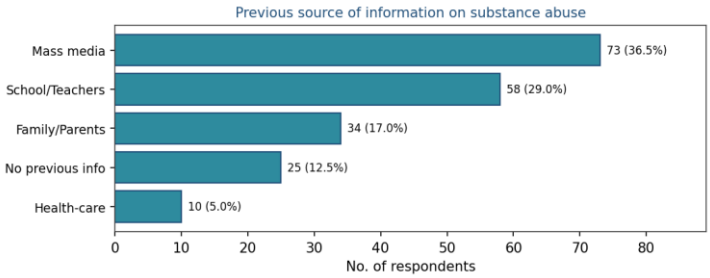

Figure 3. Previous source of information on substance abuse.

3.2 Pre-Test Knowledge

The mean pre-test score was 20.26 ± 5.04 (41.3%), ranging from 0 to 33 (median 20). An overwhelming 161 respondents (80.5%) had inadequate knowledge and none had adequate knowledge (Table 2), confirming a substantial baseline deficit.

Table 2. Pre-test level of knowledge (N = 200).

Knowledge level	Score	f	%
Inadequate	0–24	161	80.5
Moderately adequate	25–37	39	19.5
Adequate	38–49	0	0.0
Total		**200**	**100.0**

3.3 Efficacy of the STP

Post-intervention, mean knowledge rose to 35.12 ± 6.20 (71.7%), a mean gain of 14.86 ± 4.13 points. The paired t-test confirmed a highly significant improvement [$t(199) = 50.85$, $p < 0.001$; $d = 3.60$], corroborated by the Wilcoxon signed-rank test ($p < 0.001$). Hypothesis H_1 was accepted (Tables 3–4).

Table 3. Pre- vs post-test scores (max = 49).

Test	Mean ± SD	%
Pre-test	20.26 ± 5.04	41.3
Post-test	35.12 ± 6.20	71.7

Table 4. Paired t-test for efficacy of the STP.

Comparison	Mean diff. (95% CI)	t	p	d
Post – Pre	14.86 (14.3–15.4)	50.85	< 0.001	3.60

CI, confidence interval; d, Cohen's d. Significant at $p < 0.05$.

3.4 Shift in Knowledge Categories

The intervention produced a marked upward shift: adequate knowledge rose from 0% to 39.5% and inadequate knowledge fell from 80.5% to 3.5% (Table 5). The McNemar test confirmed significance ($\chi^2 = 77.0$, $p < 0.001$).

Table 5. Shift in knowledge level after the STP (N = 200).

Level	Pre f (%)	Post f (%)
Inadequate	161 (80.5)	7 (3.5)
Moderate	39 (19.5)	114 (57.0)
Adequate	0 (0.0)	79 (39.5)

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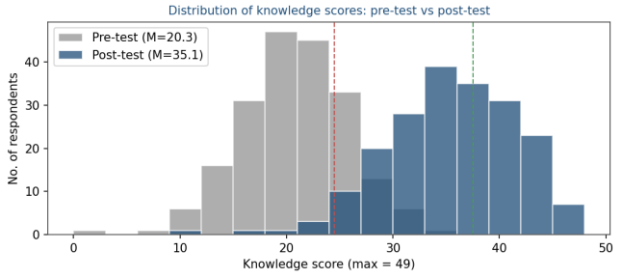

Figure 4. Distribution of knowledge scores at pre-test and post-test; dashed lines mark the ≤24 and ≥38 boundaries.

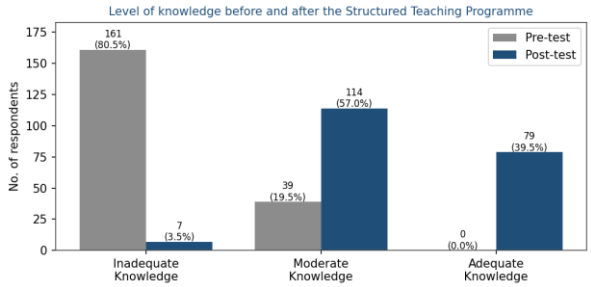

Figure 5. Level of knowledge before and after the Structured Teaching Programme.

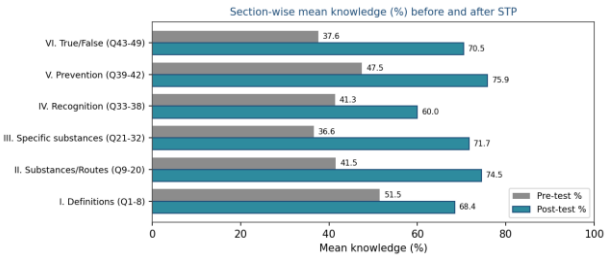

Figure 6. Section-wise mean knowledge (%) before and after the STP.

Table 6. Section-wise mean knowledge (%) before and after the STP.

Content domain	Pre %	Post %	Gain %
I. Definitions (Q1-8)	51.5	68.4	16.9
II. Substances/Routes (Q9-20)	41.5	74.5	33.0
III. Specific substances (Q21-32)	36.6	71.7	35.1
IV. Recognition (Q33-38)	41.3	60.0	18.7
V. Prevention (Q39-42)	47.5	75.9	28.4
VI. True/False (Q43-49)	37.6	70.5	32.9

3.5 Association with Socio-Demographic Variables

Chi-square analysis (Table 7) revealed significant associations between pre-test knowledge and area of residence (χ^2 = 8.58, p = 0.014), mother's education (χ^2 = 13.92, p = 0.003) and previous source of information (χ^2 = 12.80, p = 0.012). Gender, class, income and family history were not significant; H_2 was partially accepted. One-way ANOVA confirmed differences by information source (F = 7.33, p < 0.001), and mother's education correlated positively with pre-test score (r = 0.34, p < 0.001).

Table 7. Association of pre-test knowledge with socio-demographic variables.

Variable	χ^2	df	p	Inf.
Residence	8.58	2	0.014	Sig.*
Mother's education	13.92	3	0.003	Sig.*
Info source	12.80	4	0.012	Sig.*
Class	5.34	2	0.069	NS
Gender	2.42	2	0.298	NS
Income	1.11	3	0.775	NS
Family history	0.57	2	0.754	NS

**Significant at p < 0.05; NS, not significant.*

IV. DISCUSSION

This quasi-experimental study demonstrates that a brief, nurse-led, bilingual Structured Teaching Programme substantially and significantly improved adolescents' knowledge of substance abuse and its complications, raising mean knowledge from 41.3% to 71.7% with a very large effect size (d = 3.60). These findings align with prior nursing evaluations reporting marked knowledge gains following structured educational interventions [16–20].

The low baseline (with 80.5% inadequate and none adequate) mirrors school-based surveys documenting fragmentary knowledge of substance-related harm among adolescents [13,14,21]. Weakest baseline performance in the domains of specific substances and recognition of substance-use disorder suggests that adolescents recognise substances by name without understanding their mechanisms, complications or warning signs [22,23]. The pronounced post-test gains in precisely these domains indicate that targeted structured content can efficiently correct such misconceptions [24].

The magnitude of improvement, at the upper end of reported ranges, likely reflects the very low baseline, the bilingual and randomised-option instrument that curtailed guessing bias, and the interactive audio-visual delivery [15,25]. Convergence of the parametric, non-parametric and categorical-shift analyses strengthens internal validity [26].

The significant associations of baseline knowledge with urban residence, higher maternal education and formal information sources are theoretically coherent and consistent with the wider literature on health-information access and parental influence [8,11,27]. These correlates carry practical implications: preventive programmes should be intensified for rural adolescents and for those reliant on informal information, and should actively engage parents and teachers to sustain protective environments [28,29].

4.1 Implications for Nursing

The evidence supports embedding nurse-led structured substance-abuse education within routine school health services as a feasible, low-cost primary-prevention measure. Nursing curricula should build competencies in adolescent health education and validated assessment, while administrators can advocate for health–education-sector partnerships and resource allocation [30].

4.2 Limitations

The one-group design without a concurrent control cannot fully exclude maturation and testing effects; purposive sampling from three schools limits generalisability; the Day-7 post-test measured immediate gain rather than long-term retention; only knowledge (not attitude or behaviour) was assessed; and self-report is subject to bias. A controlled,

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longitudinal, multi-site design incorporating behavioural outcomes is recommended.

V. CONCLUSION

The nurse-led Structured Teaching Programme was highly efficacious in enhancing adolescents' knowledge of substance abuse and its complications, shifting the majority from inadequate to adequate knowledge. Baseline knowledge was significantly associated with residence, maternal education and information source. Integrating structured, culturally adapted, bilingual education into school health services—and evaluating it through controlled and longitudinal designs—offers a promising, scalable strategy for adolescent substance-abuse prevention.

DECLARATIONS

Ethics approval: Obtained from the Institutional Ethics Committee; conducted per the ICMR National Ethical Guidelines and the Declaration of Helsinki.

Informed consent: Written assent and parental/guardian consent were obtained from all participants.

Funding: This research received no specific grant from any funding agency.

Conflict of interest: The authors declare no conflict of interest.

Author contributions: B.L.P. conceived and designed the study, collected and analysed the data, and drafted the manuscript. N.J. supervised the study, provided methodological guidance and critically revised the manuscript. Both authors approved the final version.

Data availability: The dataset is available from the corresponding author on reasonable request.

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