

Current Tobacco-use Prevalence, Socio-economic Correlates, and Policy Perceptions in Nepal: An Analytical Cross-sectional Survey

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ABSTRACT

Introduction: Tobacco use remains an important public health concern in Nepal. This analytical cross-sectional study estimated current tobacco-use prevalence, examined socio-demographic and socio-economic factors associated with current use, and described tobacco-control policy perceptions.

Methods: We surveyed 1,587 respondents aged 15-69 years across seven provinces using multistage sampling. Primary analyses were unweighted because respondent-level design weights were unavailable; confidence intervals and regression inference accounted for ecological-region stratification and district-level clustering. Census-calibrated estimates were examined as sensitivity analyses.

Results: Overall, 541 respondents were current tobacco users (34.09%; design-adjusted 95% CI: 29.5%-38.7%). The prevalence was 455 (55.76%) among males and 86 (11.15%) among females. Among current users, 170 (31.42%) used smoked tobacco only, 300 (55.45%) smokeless tobacco only, and 71 (13.12%) both. In the adjusted model, current tobacco use was associated with male sex (aOR 12.75, 95% CI: 8.18–19.87), age 40–54 years (aOR 2.32, 95% CI: 1.20–4.48), age 55–69 years (aOR 3.29, 95% CI: 1.80–6.03), illiteracy (aOR 1.87, 95% CI: 1.20–2.92), non-paid work (aOR 2.28, 95% CI: 1.17–4.46), and the upper-lower socio-economic group (aOR 1.71, 95% CI: 1.26–2.34). A total of 1196 (75.36%) respondents perceived smoke-free policy enforcement to be poor.

Conclusions: Current tobacco use remains common in Nepal and varies markedly by sex, age, education, occupation, and socio-economic status. Comprehensive control of smoked and smokeless products, stronger policy implementation, and targeted prevention and cessation services are needed.



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INTRODUCTION

Tobacco use causes more than 7 million deaths annually; around 80% of the world's 1.2 billion users live in low- and middle-income countries, including Nepal.¹ Tax and price measures are central to tobacco control, as excise increases that raise prices reduce consumption and prevalence.²

National studies in Nepal show marked socio-demographic, socio-economic, and geographic differences in tobacco use, including higher use among older adults and people with lower education and socio-economic position.³ Nepal ratified the WHO (World Health Organization) Framework Convention on Tobacco Control in 2006 and has enacted national tobacco-control and noncommunicable disease policies.^{4,5} Continued surveillance of smoked and smokeless tobacco use, together with analysis of associated factors, can identify groups with higher

observed use and inform targeted prevention and cessation.

This analytical cross-sectional study aimed to estimate current tobacco-use prevalence, examine socio-demographic and socio-economic factors associated with current use, and describe tobacco-control policy perceptions in Nepal.

METHODS

An analytical cross-sectional survey was conducted among respondents aged 15-69 years across Nepal's seven provinces. The survey used a multistage sampling approach. Districts were selected across ecological regions, followed by selection of local levels and wards. Within each selected ward, a household list was prepared with support from local ward representatives and field

supervisors. The household sampling interval was calculated from the completed household list and allocated sample size. A random starting point was selected, and households were then selected systematically using the interval (k , $k+i$, $k+2i$, and so on). One eligible respondent aged 15-69 years was selected from each sampled household using a standardized respondent-selection approach.

The original survey sample size was calculated for prevalence estimation using a single-proportion formula. Assuming an expected tobacco-use prevalence of 32%, a 95% confidence level, and a 5% margin of error, the initial required sample was 335.⁶ After applying a design effect of 1.5 and allowing 5% for anticipated non-response, the adjusted sample size was 529 respondents. Multiplication by the three ecological domains gave a total target of 1,587 respondents. Because the study also examined associated factors, the adequacy of the achieved sample for multivariable logistic regression was assessed separately using the events-per-predictor-parameter (EPV) criterion. Following established EPV conventions, the denominator was the 17 non-intercept predictor parameters required to represent the six predictor domains, including the non-reference levels of categorical predictors.⁷ With 541 current tobacco-use events, this yielded 31.8 events per predictor parameter, exceeding the traditional benchmark of 10 events per parameter and supporting overall model estimability and stability.⁸

A structured questionnaire was adapted from standard national tobacco-surveillance and national health-survey instruments, including the STEPS Survey 2019, Nepal Demographic and Health Survey (NDHS), and Global Youth Tobacco Survey (GYTS), and covered socio-demographic characteristics, tobacco use, and tobacco-control policy perceptions.⁹⁻¹¹ Data collection was carried out by trained enumerators using Computer-Assisted Personal Interviewing (CAPI). Interviews were conducted in respondents' homes, and one eligible respondent was interviewed per sampled household. Data were collected using Kobo Toolbox, cleaned in MS Excel, and analyzed in Python using reproducible statistical scripts. Data-validation checks were used to identify inconsistencies, duplicate records, incomplete records, outliers, and logically inconsistent responses before analysis.

Current tobacco use was defined as current use of any smoked or smokeless tobacco product. Respondents who reported never using tobacco and therefore skipped the current-use question were classified as non-current users. Tobacco type among current users was categorized as smoked only, smokeless only, or both smoked and smokeless tobacco.

Socio-demographic variables included sex, age group, province, ecological region, marital status, education, occupation, ethnicity, and religion. Age was grouped as 15-24, 25-39, 40-54, and 55-69 years. Occupation was collapsed before regression to reduce sparse-category instability. The preferred adjusted model used six categories: self-employed, salaried employee, non-paid, unemployed/retired, student, and homemaker. Ethnicity was collapsed into five categories: Brahmin/Chhetri, Dalit, Janajati,

Muslim, and Other/Miscellaneous. Other/Miscellaneous comprised Other Terai Caste and Others. Religion was summarized descriptively but was not included in the main adjusted model because of strong overlap with ethnicity.

Socio-economic status was derived using the Modified Kuppuswamy components in the questionnaire: education of the household head, occupation of the household head, and monthly household income.¹² The available total-score field in the dataset was not used because it was missing for most respondents. Derived scores were categorized as upper, upper-middle, lower-middle, upper-lower, and lower; for regression, upper and upper-middle were combined as the reference group because of small numbers in the upper category.

Policy variables were grouped conceptually as policy support/opposition, perceived or observed enforcement, and policy awareness/knowledge. These variables were described separately and compared between current tobacco users and non-users using p-values. They were not included in the main adjusted model because they represent mixed constructs and may be influenced by tobacco-use status itself.

Descriptive statistics were used to summarize respondent characteristics, tobacco-use prevalence, tobacco type, and policy perceptions. Confidence intervals for key prevalence estimates were estimated accounting for ecological-region stratification and selected district/local-level clustering. Because respondent-level design weights were not available in the analytic dataset and the available sampling documentation did not contain all stage-wise selection probabilities, primary analyses used unweighted estimates with design-adjusted confidence intervals and cluster-robust standard errors. Province- and ecological-region-specific prevalence estimates were added as descriptive domain summaries with exact binomial 95% confidence intervals and were not used for primary inferential comparisons.

As a sensitivity analysis, normalized calibration weights were constructed from the analytic sample using Census 2021 age-sex margins for ages 15-69 years and ecological-region population margins.¹³ These calibrated estimates were compared with unweighted design-adjusted estimates. The calibrated weights should be interpreted as post-calibration analysis weights, not original sampling/design weights.

To address the analytical objective, bivariate and multiple logistic regression models were used to examine associations between current tobacco use and socio-demographic and socio-economic variables. The preferred adjusted model included six predictor domains, and no automated stepwise variable-selection procedure was used. The model was kept parsimonious because the number of selected district/local-level clusters was limited. Cluster-robust covariance estimates were calculated at the district level using a finite-sample correction. Adjusted odds ratios, 95% confidence intervals, and p-values were calculated using t-based inference with 17 degrees of freedom. A two-sided p-value of less than 0.05 was considered statistically significant. Multicollinearity and model stability were assessed

through category counts, cross-tabulations, variance-inflation diagnostics, and comparison of alternative occupation and geographic specifications.

Ethical approval was obtained from the Ethical Review Board of the Nepal Health Research Council (Ref: 488/2023). Written informed consent was obtained from all adult participants. For participants aged 15–17 years, consent was obtained from parents or guardians with participant assent. Participation was voluntary, and respondents could withdraw at any time.

RESULTS

A total of 1,587 respondents were included. Male participants comprised 816 (51.42%) of the study population. Participants aged 25–39 years accounted for 554 (34.91%), those aged 40–54 years for 404 (25.46%), those aged 15–24 years for 336 (21.17%), and those aged 55–69 years for 293 (18.46%) of the study population. Participants were recruited from multiple provinces, with Madhesh and Bagmati each accounting for 333 (20.98%), Lumbini 279 (17.58%) and Koshi 270 (17.01%). Ecological region distribution was Terai 902 (56.84%), Hills 427 (26.91%), and Mountain 258 (16.26%). Among the participants, 1218 (76.75%) were married, 1179 (74.29%) were literate, 624 (39.32%) belonged to the Janajati ethnic group, 566 (35.66%) to the Brahmin/Chhetri group, and 788 (49.65%) to the upper-lower socioeconomic category (Table 1).

Overall, 541 of 1,587 respondents were current tobacco users, yielding an unweighted prevalence of 34.09% (design-adjusted 95% CI: 29.5%–38.7%). The prevalence was 455 (55.76%) (95% CI: 49.6%–62.0%) among males and 86 (11.15%) (95% CI: 6.5%–15.8%) among females. Among all respondents, 170 (10.71%) used smoked tobacco only, 300 (18.90%) used smokeless tobacco only, and 71 (4.49%) used both. Among current tobacco users, 170 (31.42%) used smoked tobacco only, 300 (55.45%) used smokeless tobacco only, and 71 (13.1%) used both. Province- and ecological-region-specific estimates are presented in Table 2. Current tobacco-use prevalence was 80 (24.02%) in Bagmati and 44 (47.82%) in Karnali, and 80 (31.01%) in Mountain, 138 (32.32%) in Hills, and 323 (35.81%) in Terai. Census-calibrated sensitivity analysis estimated an overall prevalence of approximately 31.20% after raking to age-sex and ecological-region margins.

Regarding tobacco-control policies, 1472 (92.75%) respondents supported a law prohibiting smoking in indoor workplaces and public places, while 1450 (91.37%) supported a law prohibiting tobacco advertisements. Among current users, 477 (88.17%) supported the law prohibiting smoking in indoor workplaces and public places, and 476 (87.99%) supported the law prohibiting tobacco advertisements. Perceived implementation of smoke-free policy was reported as poor by 1196 (75.36%) respondents, and 99 (6.24%) reported having observed a smoker being fined for smoking in public. Awareness that pregnant women and minors cannot sell tobacco was reported by 1003 (63.20%) respondents, whereas 518 (32.64%) were aware that seller

Table 1. Socio-demographic characteristics of respondents (n=1,587).

Characteristic	n(%)
Sex	
Male	816(51.42)
Female	771(48.58)
Age group (years)	
15–24	336(21.17)
25–39	554(34.91)
40–54	404(25.46)
55–69	293(18.46)
Marital status	
Married	1218(76.75)
Never married	287(18.08)
Other	82(5.17)
Education status	
Literate	1179(74.29)
Illiterate	408(25.71)
Highest education completed	
Illiterate	408(25.71)
No formal schooling	73(4.59)
Less than primary school	150(9.45)
Primary school completed	274(17.27)
Secondary school completed	364(22.94)
High school completed	231(14.56)
College/University or higher	87(5.48)
Occupation (model categories)	
Self-employed	526(33.14)
Salaried employee	84(5.29)
Non-paid	85(5.36)
Unemployed/retired	144(9.07)
Student	183(11.53)
Homemaker	565(35.60)
Ethnicity	
Brahmin/Chhetri	566(35.66)
Other Terai Caste	73(4.60)
Dalit	151(9.51)
Janajati	624(39.32)
Muslim	144(9.07)
Others	29(1.83)
Religion	
Hindu	1318(83.05)
Buddhism	82(5.17)
Islam	144(9.07)
Others	43(2.71)
SES (Modified Kuppaswamy)	
Upper	10(0.63)
Upper-middle	241(15.19)
Lower-middle	474(29.87)
Upper-lower	788(49.65)
Lower	74(4.66)
SES (model categories)	
Upper/upper-middle	251(15.82)
Lower-middle	474(29.87)
Upper-lower	788(49.65)
Lower	74(4.66)

Table 2. Descriptive current tobacco-use prevalence by province and ecological region (N=1,587).

Characteristic	n(%)	95% CI
Province		
Koshi	103/270(38.15)	32.30–44.20
Madhesh	121/333(36.34)	31.20–41.80
Bagmati	80/333(24.02)	19.50–29
Gandaki	42/134(31.34)	23.60–39.90
Lumbini	97/279(34.77)	29.20–40.70
Karnali	44/92(47.83)	37.30–58.50
Sudurpaschim	54/146(36.99)	29.20–45.40
Ecological region		
Mountain	80/258(31.01)	25.40–37
Hills	138/427(32.32)	27.90–37
Terai	323/902(35.81)	32.70–39

Note: n=number of respondents with current tobacco use/total number of respondents in each category; Values are unweighted descriptive prevalence estimates. Confidence intervals are exact binomial 95% confidence intervals. Domain-level estimates should be interpreted cautiously because the survey was not primarily powered for precise province-level comparisons.

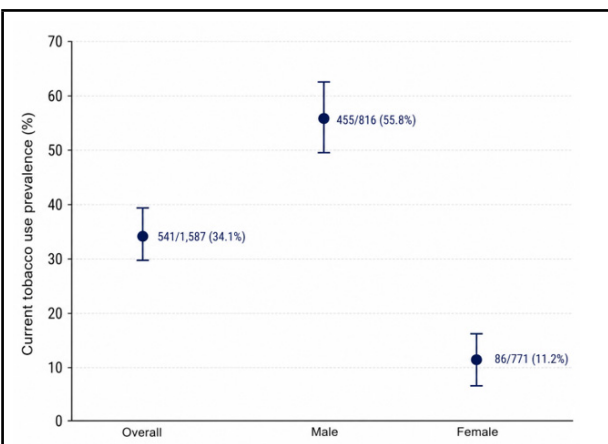


Figure 1. Current tobacco-use prevalence overall and by sex with design-adjusted 95% confidence intervals. Source: Authors' analysis of the National Survey on Socio-Economic and Policy Aspects of Tobacco Use in Nepal 2024 dataset.

notices should state that pregnant women and minors cannot purchase tobacco. These policy findings are descriptive and should not be interpreted as causal determinants of tobacco use.

The final multivariable model converged, all specified parameters were estimable, and the maximum variance inflation factor was 2.86.

In the preferred adjusted model, male sex was associated with current tobacco use (aOR 12.75, 95% CI: 8.18–19.87). Compared with respondents aged 15–24 years, adjusted odds ratios were 2.32 (95% CI: 1.20–4.48) for respondents aged 40–54 years and 3.29 (95% CI: 1.80–6.03) for those aged 55–69 years, whereas the association for respondents aged 25–39 years

was not statistically significant after adjustment. Illiteracy was associated with current tobacco use (aOR 1.87, 95% CI: 1.20–2.92).

Occupation was associated with current tobacco use. Non-paid workers had an adjusted odds ratio of 2.28 (95% CI: 1.17–4.46). Associations for salaried employees, unemployed/retired respondents, students, and homemakers were not statistically significant after adjustment. The adjusted odds ratio was 1.71 (95% CI: 1.26–2.34) for respondents in the upper-lower SES group and 2.90 (95% CI: 0.90–9.36) for respondents in the lower SES group. Associations for Dalit and Muslim respondents did not reach conventional statistical significance in the preferred adjusted model.

DISCUSSION

This survey found that current tobacco use remains common among respondents aged 15–69 years in Nepal, with approximately one-third reporting current use. The overall estimate was broadly comparable to the 31.7% reported in NDRI's earlier 2019/20 survey, although this comparison should not be interpreted as a formal time trend because differences in survey methods and analyses may affect comparability.¹⁴ The burden was highly gendered: more than half of male respondents currently used tobacco, compared with approximately one in nine female respondents. Smokeless tobacco was the most common form among current users, reinforcing the need for tobacco-control strategies that address both smoked and smokeless products rather than focusing only on cigarettes. These patterns are broadly consistent with earlier national evidence from Nepal showing a pronounced male–female difference in tobacco use and substantial smokeless tobacco use, although direct comparisons should be made cautiously because survey populations, age ranges, and tobacco-use definitions differ.^{3,15,16}

The adjusted analysis identified clear demographic and socio-economic patterns. Male sex, age 40–54 and 55–69 years, illiteracy, non-paid work, and upper-lower socio-economic status were associated with current tobacco use. These patterns are consistent with previous nationally representative evidence from Nepal showing higher tobacco use among males, older adults, people with lower education, and lower socio-economic groups.³ Earlier nationwide STEPS evidence similarly found lower smoking prevalence among women and people with higher education, while a women-specific analysis reported higher tobacco use with increasing age and lower education.^{16,17} Evidence from long-running surveillance also illustrates that tobacco-use patterns can vary by both age and birth cohort; the higher use observed among older respondents in this survey may therefore reflect a combination of age-related and cohort influences, which cannot be disentangled in a cross-sectional analysis.¹⁸ Evidence from neighboring India also demonstrates that smoking patterns vary by sex, age, education, and the type of smoked tobacco product.¹⁹ These findings support a combination of population-wide tobacco-control measures and targeted prevention and cessation services for population groups with higher observed tobacco use. However, the findings should

Table 3. Tobacco policy perceptions by current tobacco-use status (N=1,587).

Policy/perception variable	N(%)	n(%)	*n(%)	p-value
Support for law prohibiting smoking in indoor workplaces/public places				
Favor	1472(92.75)	477(88.17)	995(95.12)	<0.001
Oppose	39(2.46)	24(4.44)	15(1.43)	
Don't know	76(4.79)	40(7.39)	36(3.44)	
Support for law prohibiting tobacco advertisements				
Favor	1450(91.37)	476(87.99)	974(93.12)	0.003
Oppose	53(3.34)	25(4.62)	28(2.68)	
Don't know	84(5.29)	40(7.39)	44(4.21)	
Perceived implementation/enforcement of smoke-free policy				
Well enforced	80(5.04)	18(3.33)	62(5.93)	0.050
Somewhat enforced	152(9.58)	68(12.57)	84(8.03)	
Poorly enforced	1196(75.36)	393(72.64)	803(76.77)	
Don't know	159(10.02)	62(11.46)	97(9.27)	
Observed smoker fined for smoking in public				
No	1488(93.76)	495(91.50)	993(94.93)	0.015
Yes	99(6.24)	46(8.50)	53(5.07)	
Aware that pregnant women and minors (<18) cannot sell tobacco				
No	584(36.80)	203(37.52)	381(36.42)	0.676
Yes	1003(63.20)	338(62.48)	665(63.58)	
Aware that seller notice should state that pregnant women/minors cannot purchase tobacco				
No	1069(67.36)	366(67.65)	703(67.21)	0.873
Yes	518(32.64)	175(32.35)	343(32.79)	
Percentages were calculated using N=1,587 for the overall sample, n=541 for current users, and *n=1,046 for non-users.				
Note: P-values are global cluster-robust Wald tests comparing current tobacco users and non-users across all categories of each policy variable.				

be interpreted as associations, not causal effects, because the survey was cross-sectional. Policy support was high, but perceived enforcement was weak. Most respondents supported smoke-free and advertising restrictions, while three-quarters perceived smoke-free policy implementation as poor, and only 6.2% reported observing a smoker being fined for smoking in public. These findings indicate strong respondent support for tobacco-control laws alongside a perceived implementation gap. This interpretation is consistent with recent Nepal studies documenting low retailer awareness and compliance with tobacco-control provisions near schools and low average compliance with tobacco-control legal provisions in public places in the Kathmandu Valley.^{20,21} Policy variables were presented descriptively rather than included in the main adjusted model because support, perceived enforcement, observed enforcement, and awareness represent different constructs and may also be influenced by respondents' tobacco-use status.

The weighting approach should be interpreted carefully. Primary estimates were presented using design-adjusted analyses, while Census calibration was examined as a sensitivity analysis. The calibrated overall prevalence was approximately 31.2%, compared with 34.1% in the primary analysis, while the marked male–female difference remained.

This study has several limitations. The cross-sectional design prevents causal inference, and self-reported tobacco use may be affected by recall and social desirability bias. Primary estimates used design-adjusted analyses, with Census calibration examined as a sensitivity analysis. The original sample size was calculated for

prevalence estimation rather than for a single multivariable association. However, the achieved number of outcome events relative to the fitted parameters supported the overall model. The limited number of selected district/local-level clusters reduced precision for some subgroup estimates, and estimates for a few less frequent categories were interpreted cautiously. Finally, the policy findings reflect respondents' support, awareness, and perceptions of enforcement and should not be interpreted as objective measures of policy implementation.

CONCLUSION

Current tobacco use remains a substantial public health concern among respondents aged 15–69 years in Nepal, with pronounced differences by sex, age, education, occupation, and socio-economic status. Smokeless tobacco accounted for the largest share of current use, highlighting the need for comprehensive strategies that address both smoked and smokeless tobacco. High public support for tobacco-control laws, alongside weak perceived enforcement, supports stronger implementation of existing policies together with targeted prevention and cessation services for population groups with higher observed tobacco use.

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Table 4. Crude and adjusted associations with current tobacco use (n=1,587).

Variable	n(%)	cOR(95% CI)	Crude p-value	aOR(95% CI)	Adjusted p-value
Sex					
Female	86/771(11.15)	Ref.	—	Ref.	—
Male	455/816(55.76)	10.04(5.88–17.13)	<0.001	12.75(8.18–19.87)	<0.001
Age group (years)					
15–24	60/336(17.86)	Ref.	—	Ref.	—
25–39	147/554(26.53)	1.66(1.01–2.73)	0.045	1.37(0.74–2.54)	0.291
40–54	168/404(41.58)	3.27(2.00–5.35)	<0.001	2.32(1.20–4.48)	0.015
55–69	166/293(56.66)	6.01(3.52–10.27)	<0.001	3.29(1.80–6.03)	<0.001
Education status					
Literate	361/1179(30.62)	Ref.	—	Ref.	—
Illiterate	180/408(44.12)	1.79(1.27–2.52)	0.002	1.87(1.20–2.92)	0.009
Occupation					
Self-employed	208/526(39.54)	Ref.	—	Ref.	—
Salaried employee	30/84(35.71)	0.85(0.54–1.33)	0.451	1.04(0.66–1.65)	0.856
Non-paid	61/85(71.76)	3.89(2.32–6.51)	<0.001	2.28(1.17–4.46)	0.019
Unemployed/retired	79/144(54.86)	1.86(1.33–2.60)	0.001	1.13(0.66–1.95)	0.639
Student	26/183(14.21)	0.25(0.10–0.64)	0.006	0.55(0.19–1.62)	0.259
Homemaker	137/565(24.25)	0.49(0.24–0.98)	0.044	1.05(0.65–1.69)	0.842
Ethnicity					
Brahmin/Chhetri	170/566(30.04)	Ref.	—	Ref.	—
Dalit	66/151(43.71)	1.81(1.10–2.97)	0.022	1.67(0.89–3.14)	0.102
Janajati	219/624(35.10)	1.26(0.95–1.67)	0.103	1.14(0.82–1.60)	0.413
Muslim	55/144(38.19)	1.44(1.04–1.98)	0.028	1.38(0.94–2.03)	0.091
Other/Miscellaneous	31/102(30.39)	1.02(0.38–2.74)	0.972	0.90(0.45–1.80)	0.758
SES					
Upper/upper-middle	64/251(25.50)	Ref.	—	Ref.	—
Lower-middle	139/474(29.32)	1.21(0.78–1.87)	0.363	1.26(0.78–2.02)	0.327
Upper-lower	298/788(37.82)	1.78(1.06–2.97)	0.031	1.71(1.26–2.34)	0.002
Lower	40/74(54.05)	3.44(1.47–8.03)	0.007	2.90(0.90–9.36)	0.072

Note: n=number of respondents with current tobacco use/total number of respondents in each category; cOR = crude odds ratio; aOR = adjusted odds ratio; CI = confidence interval; SES = socio-economic status. Crude estimates were obtained from separate bivariate logistic regression models. Adjusted estimates were obtained from the preferred multivariable model including sex, age group, education status, occupation, ethnicity, and SES. Standard errors were clustered at district level, and confidence intervals and p-values used t-based inference. P-values are category-specific Wald tests. Ref. indicates the reference category.

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and writing—review and editing; **Gambhir Shrestha:** Data analysis and writing—review and editing; **Pragyan Ghale:** Data analysis and writing—review and editing.

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