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Aligning oral cancer screening capacity with tobacco burden across Indian states: a decade of National Family Health Survey data and a state-level prioritisation framework

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ABSTRACT

Background: Oral cancer accounts for a substantial share of India's cancer burden, driven predominantly by tobacco use, yet population-based screening uptake has historically remained very low. With India's tobacco-use landscape evolving over the past decade and screening infrastructure expanding under Ayushman Bharat, a combined assessment of risk burden and screening capacity is needed to guide resource prioritization.

Objectives: To examine temporal and spatial patterns of tobacco consumption across Indian states over the past decade, and to identify priority states for enhanced oral cancer screening using tobacco consumption trends and screening-infrastructure density.

Methods: State-wise tobacco consumption data for men and women were obtained from three rounds of the National Family Health Survey (NFHS-4, 2015–16; NFHS-5, 2019–21; NFHS-6, 2023–24). A sex-ratio-weighted combined prevalence and Ayushman Arogya Mandir (AAM) density was computed for NFHS-6 data. States were classified into tercile bands (Low/Moderate/High) for both

tobacco prevalence and AAM density, cross-tabulated into a 3×3 risk matrix, and collapsed into five ordinal priority categories (Very High to Low) for enhanced screening.

Results: National male tobacco prevalence declined from 44.5% to 36.3% across the three survey rounds, while female prevalence remained stable (6.8–8.85%). Mizoram recorded the highest prevalence among both sexes throughout the study period despite the national downward trend. Uttar Pradesh was identified as the sole Very High priority state, combining high tobacco prevalence with low AAM density; nine states were classified as Moderately High priority.

Conclusion: Combining tobacco-burden trends with screening-infrastructure density offers a reproducible, evidence-based framework for prioritising oral cancer screening resources, identifying Uttar Pradesh and a defined tier of states as immediate targets for intensified screening efforts.

Keywords:

Oral cancer screening; National Family Health Survey; Health system prioritisation; Spatial epidemiology; Primary healthcare infrastructure

INTRODUCTION

Oral Cancer constitutes one of India's most imperative yet under-prioritized public health concerns. It is among the most common cancers in India, and it is estimated that nearly 60,000 new cases of oral cancer are reported each year. Alarmingly, over 5 people in India die each hour every day due to oral cancer, indicating its high mortality (1). India accounts for roughly a third of the global burden of oral cancer (2) despite housing a sixth of the world's population. The central role of tobacco is highlighted through this disproportionate load, since it is the primary modifiable risk factor for oral cancer. India is the second-largest consumer of tobacco and its products, with 267 million users(3). This burden is largely driven by smokeless tobacco products like khaini, gutka, and betel nut, which carry carcinogenic potential to the oral mucosa (3,4).

Tobacco consumption in India is far from uniform. There are considerable state-level differences in the prevalence of smoking, smokeless tobacco use and dual tobacco use. Multilevel research has further shown substantial geographic clustering of tobacco use, indicating that the risk of tobacco consumption is influenced not only by individual characteristics but also by area-level factors (5), reflecting deep-rooted regional, cultural, and socioeconomic variation. A uniform, nationally applied screening strategy is therefore poorly suited to India's epidemiological reality; policy must instead be calibrated to state-level burden and its trajectory over time

Ayushman Bharat, announced in 2018, has four components: Ayushman Arogya Mandirs, the PM-JAY health assurance scheme (cover of ₹5 lakh per family per year for secondary and tertiary

hospitalisation), the PM-ABHIM infrastructure mission, and the Ayushman Bharat Digital Mission (6). Ayushman Arogya Mandirs (AAMs) are upgraded Sub Health Centres (SHCs) and Primary Health Centres (PHCs) that deliver Comprehensive Primary Health Care (CPHC), formerly called Ayushman Bharat Health and Wellness Centres and renamed in late 2023. The CPHC package adds non-communicable disease services, including screening for oral, breast and cervical cancers (6,7). Under the population-based screening initiative, all men and women aged 30 years and above are targeted for screening for hypertension, diabetes, and oral, breast and cervical cancers (8). Previous studies have shown that capacity building of healthcare workers is a sustainable and effective implementation strategy to enhance Oral Cancer screening in resource-limited settings (9). However, AAM density relative to population varies considerably by state, meaning the capacity to screen is as unevenly distributed as the need to screen. (10).

The National Family Health Survey (NFHS) is a large-scale, multi-round survey of a representative sample of households across India, conducted under the Ministry of Health and Family Welfare (MoHFW), with the International Institute for Population Sciences (IIPS), Mumbai, as nodal agency (11). IIPS has conducted it since 1992–93, giving state/UT-level data on population, health and nutrition, including tobacco use. The three successive rounds of the National Family Health Survey (NFHS-4, 2015-16; NFHS-5, 2019-21; NFHS-6, 2023-24) (12-14) offer a near-decadal, state-disaggregated window into tobacco-use trends among men and women- a resource that remains underutilized for infrastructure-linked prioritization. Recent analyses of the National Family Health Survey-5 reported that only a small proportion of eligible individuals had undergone oral cancer screening, with substantial disparities across states and socioeconomic groups (3). Existing studies have largely examined tobacco trends and screening infrastructure as separate questions, leaving a gap in composite, decision-oriented prioritization frameworks. Thus, the present study aims to examine the temporal and spatial pattern of tobacco consumption across Indian states over approximately the past decade to identify priority states for enhanced oral cancer screening using tobacco consumption trends and screening-infrastructure density.

Methodology

Source of Data

This study uses secondary data drawn exclusively from nationally representative government sources. State-wise tobacco consumption prevalence (percentage of men and women currently using any form of tobacco) was extracted from three consecutive rounds of the National Family Health Survey: NFHS-4 (2015-16), NFHS-5 (2019-21), and NFHS-6 (2023-24) (12-14), conducted by the International Institute for Population Sciences (IIPS) under the Ministry of Health and Family Welfare (MoHFW). Data on operational Ayushman Arogya Mandirs (AAMs) were obtained from the MoHFW/National Health Mission's district-wise AAM operational dataset (as on 31 July 2024)

(6). State-wise population estimates for 2024 were sourced from the Report of the Technical Group on Population Projections for India and States, 2011–2036 (National Commission on Population, MoHFW) (15).

Study Design

This is an ecological cross-sectional analysis of a nationally representative survey and administrative data, examining temporal trends across three survey time-points spanning approximately one decade (2015–16 to 2023–24). The state/union territory is the unit of analysis throughout. The study combines a descriptive trend analysis with a geospatial, indicator-based prioritization analysis.

Study Population

The study covers all 36 states and union territories of India, as constituted following the 2019–2020 administrative reorganization (28 states and 8 union territories. Within each NFHS round, the eligible survey population comprised women aged 15–49 years and men aged 15–54 years, consistent with the standard NFHS sampling frame. No primary data collection or individual-level recruitment was undertaken; all analyses use published, de-identified, state-aggregated indicators.

Study Variables

Exposure variable: State-wise tobacco consumption prevalence (%), disaggregated by sex, across NFHS-4, NFHS-5, and NFHS-6, (12-14) and its decadal trend (absolute and relative percentage-point change across rounds).
Outcome/comparator variables: AAM density, calculated as operational AAMs per unit population (per 1,000 population) as of July 2024

$$AAM\ density\ per\ 1000\ population\ =\ Functional\ AAM\ Centres/\ Population\ (000)$$

Derived variable: A combined (sex-pooled) tobacco prevalence estimate per state, computed as a population-weighted average of male and female prevalence.

$$P_{combined} = [(P_m \times N_m) + (P_f \times N_f)] / (N_m + N_f)$$

Where,

$P_{combined}$ is the sex-pooled overall prevalence of tobacco use in a state (expressed as a percentage or proportion).

P_m and P_f represent the tobacco prevalence rates among males and females in the state, respectively.

N_m and N_f represent the target population sizes for males and females in the state, respectively.

Data Analysis

Descriptive statistics (state-wise prevalence, means, ranges) were computed for each NFHS round and sex. Temporal trends were visualized using choropleth heat maps generated in QGIS v3.44. States were classified into Low, Medium, and High categories for both tobacco consumption and AAM density using percentile-based tercile cutoffs (33rd and 67th percentiles). To identify priority states, tobacco consumption prevalence and AAM density were each classified into three tiers (Low, Medium, High) using percentile-based tercile cutoffs, and cross-tabulated into a 3×3 risk matrix, an approach originally developed for qualitative risk ranking and now widely applied across public health, engineering, and safety-critical domains (16). Each of the resulting nine cells represents a distinct combination of tobacco burden and screening-infrastructure density; cells were further collapsed into five ordinal priority bands (Very Low, Low, Medium, High, Very High priority) based on their position along the matrix diagonal, consistent with standard risk-matrix banding conventions (17). States falling in the High-consumption/Low-AAM-density cell were classified as the highest priority for enhanced oral cancer screening, reflecting the combination of elevated tobacco-attributable risk and comparatively constrained screening infrastructure. While risk matrices offer a transparent and interpretable method for multi-criteria prioritization, they are subject to known methodological limitations, including non-linear risk ordering and sensitivity to category boundary placement (18).

Sensitivity Analysis

To assess the robustness of the categorical risk-matrix classification, a continuous Composite Priority Score (CPS) was independently computed for each state as an equally-weighted combination of min-max normalized tobacco prevalence and inverse AAM density. Spearman's rank correlation between the CPS and the matrix-derived ordinal priority category was strong and statistically significant ($\rho = 0.725$, $p < 0.001$), supporting the overall validity of the matrix-based classification. Notable divergence was observed for Mizoram, Tripura, and Nagaland, which ranked among the highest-priority states by continuous score but were classified as Moderate priority by the matrix due to comparatively high AAM density offsetting their tobacco burden in the diagonal-banding scheme-illustrating the known trade off in risk matrix methods between categorical simplicity and sensitivity to underlying continuous risk.

3. Results

3.1 AAM Density and Spatial Distribution

As of 31 July 2024, 1,73,881 Ayushman Arogya Mandirs were operational nationally, (5) corresponding to a national density of 0.121 AAMs per 1,000 population. **Figure 1 A & 1B** depict

the state-wise Tobacco consumption among women and men, respectively. **Figure 1C** depicts that the density varied substantially across states/UTs, ranging from 0 (Delhi) to 1.06 per 1,000 population (Ladakh). Tercile classification (33rd/67th percentile cutoffs) placed the Low tier at ≤0.131 per 1,000, the Medium tier at 0.131–0.190 per 1,000, and the High tier at >0.190 per 1,000 population.

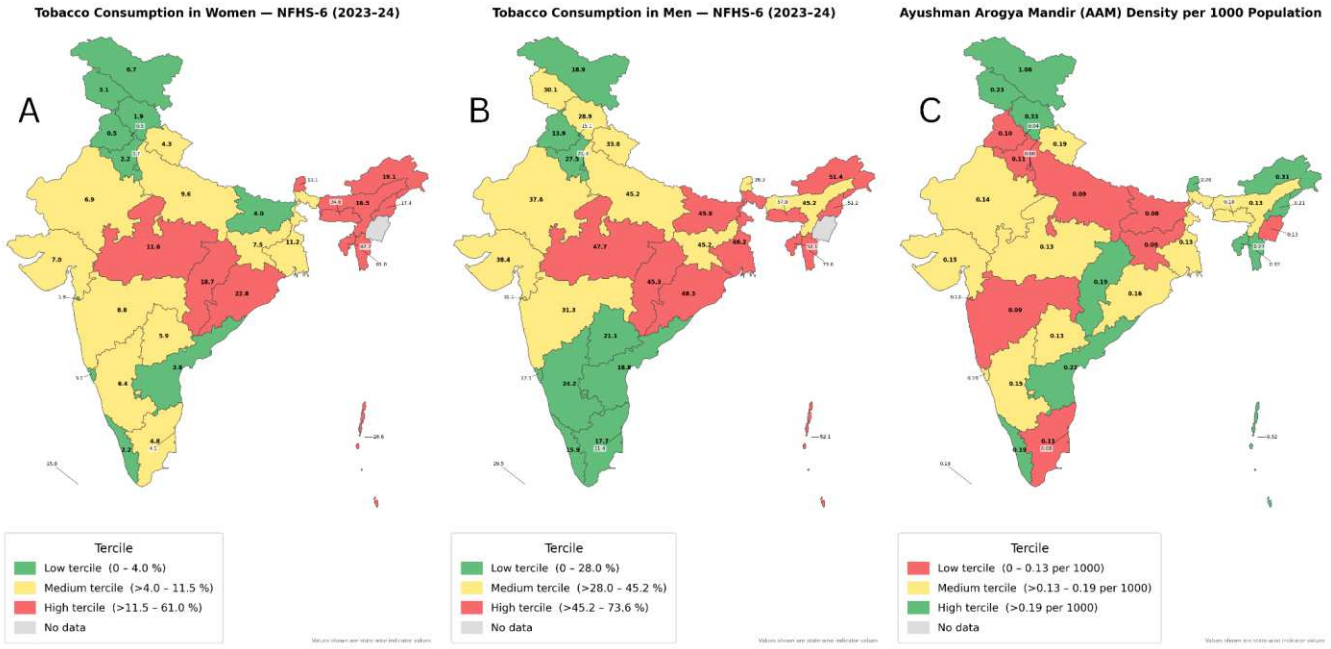


Figure 1A. State-wise Tobacco Consumption Among Women as per NFHS-6, Classified by Tercile. **Figure 1B.** State-wise Tobacco Consumption Among Men as per NFHS-6, Classified by Tercile. **Figure 1C.** State-wise AAM Density per 1000 population, Classified by Tercile.

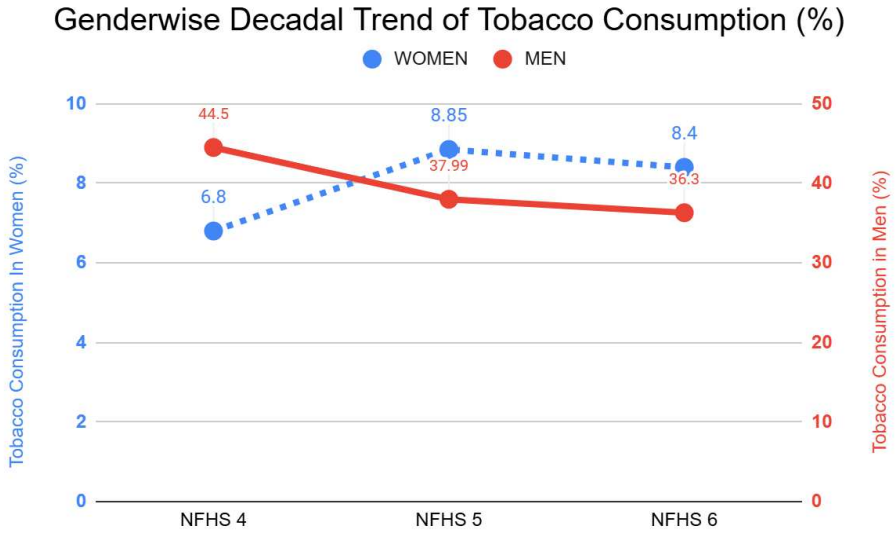


Figure 2. Gender-wise Decadal Trend in National Tobacco Consumption, NFHS-4 to NFHS-6

State	Tobacco Consumption						Weighted Average of Tobacco Consumption for NFHS 6[a]	AAM density per 1000 population in 2023-24[b]
	NFHS 4		NFHS 5		NFHS 6			
	WOMEN	MEN	WOMEN	MEN	WOMEN	MEN		
India	6.8	44.5	8.9	38.0	8.4	36.3	22.86	0.12
Andhra Pradesh	2.3	26.8	3.8	22.6	3.8	18.8	11.58	0.22
Assam	19.7	63.9	22.1	51.8	16.5	45.2	**31.21**	0.13
Bihar	2.8	50.1	5.0	48.8	4	45.8	26.07	**0.08**
Chhattisgarh	21.6	55.2	17.3	43.1	18.7	45.3	**32.26**	0.19
Gujarat	7.4	51.4	8.7	41.1	7	38.4	23.46	0.15
Haryana	1.6	35.8	2.5	29.1	2.2	27.5	15.73	**0.11**
Jharkhand	5.8	48.6	8.4	47.4	7.5	45.2	27.45	**0.09**
Karnataka	4.2	34.3	8.5	27.1	6.4	24.2	15.55	0.15
Kerala	0.8	25.7	2.2	16.9	2.2	15.9	9.15	0.19
Madhya Pradesh	10.4	59.5	10.2	46.5	11.6	47.7	**30.18**	0.13
Maharashtra	5.8	36.5	10.9	33.8	8.8	31.3	20.53	**0.09**
Odisha	17.3	55.9	26.0	51.6	22.8	48.3	**35.99**	0.16
Punjab	0.1	19.2	0.4	12.9	0.5	13.9	7.48	**0.10**
Rajasthan	6.3	46.9	6.9	42.0	6.9	37.6	22.62	0.14
Tamil Nadu	2.2	31.7	4.9	20.1	4.8	17.7	11.46	**0.11**
Telangana	2.8	28.3	5.6	22.3	5.9	21.1	13.86	0.13
Uttar Pradesh	7.6	53	8.4	44.1	9.6	45.2	**27.82**	**0.09**
West Bengal	8.7	58.9	10.8	48.1	11.2	46.2	**29.15**	0.13

Arunachal Pradesh	17.7	60	18.8	50.3	19.1	51.4	**34.86**	0.31
Delhi	1.8	30.4	2.2	26.3	1.7	21.3	11.88	**0.00**
Goa	1.9	20.8	2.6	18.2	3.1	17.1	10.38	0.19
Himachal Pradesh	0.5	40.5	1.7		1.9	28.9	15.86	0.33
Jammu & Kashmir	2.8	38.2	3.6	38.3	3.1	30.1	16.96	0.23
Manipur	48.8	70.7	43.1	58.1	-	-	NA	**0.13**
Meghalaya	32.3	72.2	28.2	57.7	34.6	57.8	**46.35**	0.18
Mizoram	59.3	80.4	61.6	72.9	61	73.6	**67.39**	0.32
Nagaland	27.5	69.4	13.7	48.4	17.4	51.2	**36.12**	0.21
Sikkim	7.3	40.3	11.7	41.3	13.1	39.3	26.20	0.26
Tripura	42.2	67.8	50.4	56.9	47.7	52.1	**49.96**	0.27
Uttarakhand	2.9	43.7	4.6	33.7	4.3	33.8	19.48	0.19
Andaman & Nicobar Islands	25.1	61.6	31.3	58.7	26.6	52.1	**39.45**	0.32
Chandigarh	0.4	22.5	0.6	12.1	0.5	15.1	8.05	**0.04**
Dadra & Nagar Haveli	2.1	39.9	2.9	38.6	1.9	31.1	16.92	**0.13**
Lakshadweep	15	24.3	17.5	28.5	15.8	29.5	23.15	0.19
Puducherry	1.1	14.4	2.6	14.8	4.1	11.4	7.86	**0.08**
Ladakh	-	-	3.2	35.7	0.7	18.9	10.06	1.06

a High: >27.70% Moderate: >15.77-27.70% Low: ≤15.77%	b High: >0.190386 Moderate: >0.130496 – 0.190386 Low: 0 – 0.130496

Table 1. State-wise Decadal Tobacco Consumption and AAM Density

3.2 Priority Classification for Enhanced Oral Cancer Screening

States/UTs were cross-classified using tercile bands of NFHS-6 combined tobacco prevalence (Low ≤15.77%, Medium 15.77–27.70%, High >27.70%) against AAM density terciles (**Table 1**), and the resulting nine matrix cells were collapsed into five ordinal priority bands along the matrix diagonal. Manipur was excluded from this classification owing to unavailable NFHS-6 data.

Across the three NFHS rounds (NFHS-4, 2015–16; NFHS-5, 2019–21; NFHS-6, 2023–24), (12-14) tobacco consumption in India has followed a modestly declining trend among men — falling from a national average of roughly 44.5% in NFHS-4 to 38.0% in NFHS-5 and further to about 36.3% in NFHS-6 — while remaining comparatively low and fairly stable among women (around 6.8%, 8.9%, and 8.4% respectively across the three rounds). The Northeastern states consistently dominate the high end of the spectrum for both sexes across all three rounds, with Mizoram topping the list throughout (men: ~80% → 73% → 74%; women: ~59% → 62% → 61%), and Meghalaya, Manipur, Tripura, Nagaland, and Andaman & Nicobar Islands recurring among the highest-burden states/UTs. At the other end, Punjab, Chandigarh, Puducherry, Goa, and Kerala have persistently reported the lowest tobacco use in both men and women across all three surveys, with Punjab and Chandigarh's women's prevalence staying under 1% throughout the decade. Overall, the decadal pattern shows a narrowing (**Figure 2**) but still stark east-west/northeast-rest-of-India divide, with high-burden Northeastern states showing some decline (especially Mizoram and Meghalaya in men) even as they remain far above the national average, while the already-low states have largely held steady near the bottom of the range.

As shown in **Table 2** and **Figure 3**, Uttar Pradesh was the sole state classified as Very High priority, combining high tobacco prevalence (27.8%) with low AAM density (0.094 per 1,000 population) -indicating a combination of substantial tobacco-attributable risk and comparatively constrained screening infrastructure.

Nine states/UTs were classified as Moderately High priority: Assam, Bihar, Jharkhand, Madhya Pradesh, Maharashtra, Odisha, West Bengal, Meghalaya, and Dadra & Nagar Haveli.

Sixteen states/UTs (the largest single category) were classified as Moderate priority: Chhattisgarh, Gujarat, Haryana, Punjab, Rajasthan, Tamil Nadu, Arunachal Pradesh, Delhi, Mizoram, Nagaland, Tripura, Uttarakhand, Andaman & Nicobar Islands, Chandigarh, Lakshadweep, and Puducherry. Notably, several northeastern states with a historically high tobacco burden (Mizoram, Nagaland, Tripura) fell into this middle category rather than a higher one, reflecting comparatively high AAM density that offsets their continued high consumption.

Six states were classified as Moderately Low priority: Karnataka, Telangana, Goa, Himachal Pradesh, Jammu & Kashmir, and Sikkim. Three states/UTs -Andhra Pradesh, Kerala, and Ladakh -were classified as Low priority, reflecting a combination of low tobacco consumption and high AAM density.

Priority Category	n	States/UTs
Very High	1	Uttar Pradesh
Moderately High	9	Assam, Bihar, Jharkhand, Madhya Pradesh, Maharashtra, Odisha, West Bengal, Meghalaya, Dadra & Nagar Haveli
Moderate	16	Chhattisgarh, Gujarat, Haryana, Punjab, Rajasthan, Tamil Nadu, Arunachal Pradesh, Delhi, Mizoram, Nagaland, Tripura, Uttarakhand, Andaman & Nicobar Islands, Chandigarh, Lakshadweep, Puducherry
Moderately Low	6	Karnataka, Telangana, Goa, Himachal Pradesh, Jammu & Kashmir, Sikkim
Low	3	Andhra Pradesh, Kerala, Ladakh
Excluded (data unavailable)	1	Manipur

Table 2. Distribution of States/UTs by Oral Cancer Screening Priority Category

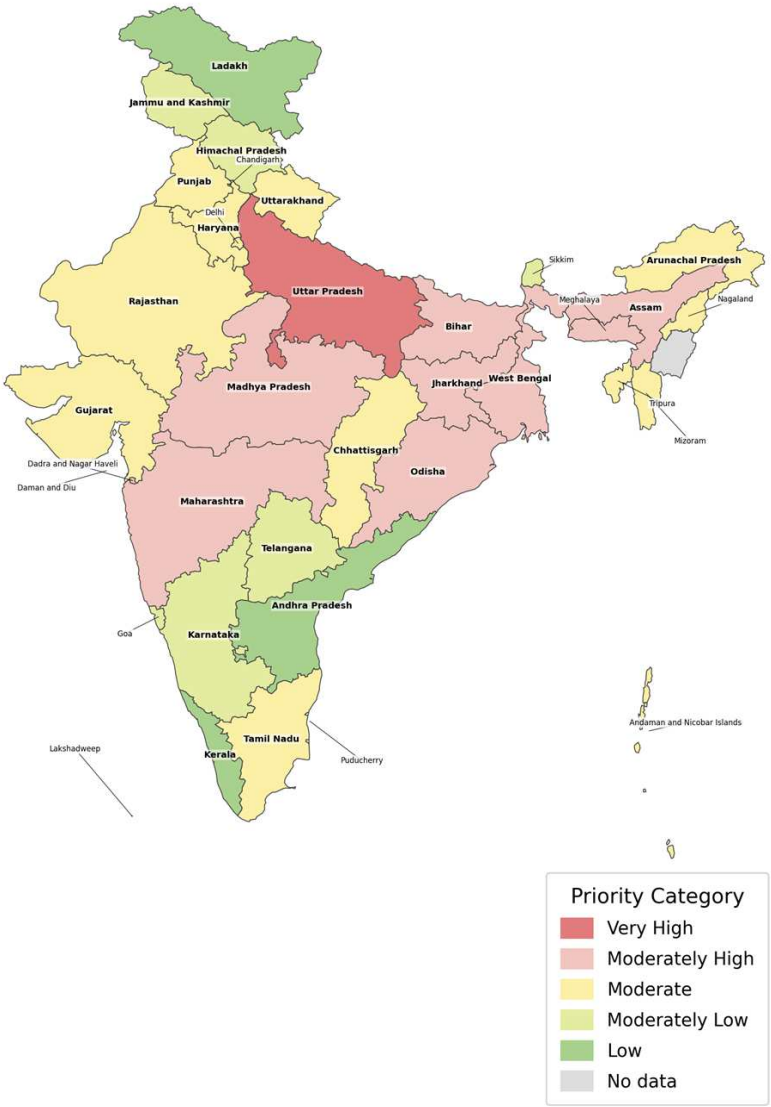


Figure 3: Distribution of States/UTs by Oral Cancer Screening Priority Category

4. Discussion

4.1 National and State-Level Tobacco Control Policy Context

The general reduction in the use of tobacco, reported by the Global Adult Tobacco Survey -2 India, is a positive indicator for the health and well-being of the population. It is the very first milestone in the long road to a future where people are less likely to suffer from the consequences of a preventable cause of morbidity and mortality (19).

The modest decline observed in male tobacco use over the study decade coincides with the maturation of India's tobacco control architecture. The Cigarettes and Other Tobacco Products Act (COTPA), 2003 (20) banned tobacco advertising, mandated pictorial health warnings, and

prohibited sale to minors and near educational institutions; India's ratification of the WHO Framework Convention on Tobacco Control in 2004 (21) further embedded these measures within the global MPOWER framework. The National Tobacco Control Programme (NTCP) (22), rolled out in a phased, state-wise manner from 2007–08 onward, is a plausible contributor to the differential rate of decline observed across states in this study -states reached earlier or more intensively by NTCP district-level cells may plausibly show earlier behavioral change, though the present ecological analysis cannot establish this causally. Similarly, state-level bans on gutkha and pan masala under the Food Safety and Standards (Prohibition and Restriction on Sales) Regulations, (23) enacted by most states between 2012 and 2013, targeted smokeless tobacco specifically- a category that dominates India's oral cancer risk profile -yet several states with early bans (including some in the northeast) still exhibit among the highest prevalence in this analysis, suggesting that enforcement gaps, informal cross-border supply, and deep cultural embeddedness of smokeless tobacco use (e.g., areca nut/tobacco quid chewing traditions) may be blunting policy impact in these settings. Excise and GST-related price increases on tobacco products since 2017 may partly explain the more consistent decline seen in states with larger formal retail markets compared to states where informal, unbranded tobacco products remain widely available and less price-responsive. Notably, Lakshadweep and Sikkim, both small, geographically distinct union territories/states- showed a net increase in combined prevalence over the study decade, a finding that runs counter to the national trend and warrants dedicated qualitative or policy-implementation research rather than explanation from survey data alone.

4.2 AAM Density as a Determinant of Screening Access - Rationale for Its Use in Priority Mapping

AAM density is therefore not merely a facility-count metric but a plausible structural determinant of screening reach: a higher density per population implies shorter travel distance, more frequent community outreach and screening camps, and greater Community Health Officer coverage per capita -all established enablers of screening uptake in low-resource settings. Conversely, low AAM density likely translates into higher patient load per facility, reduced outreach capacity, and lower effective population coverage, irrespective of whether screening protocols are nominally available at that facility. Given that NFHS-6 discontinued its oral cancer screening question, direct, current uptake data at the state level no longer exists; AAM density was therefore used in this study as a proximate, infrastructure-based indicator of screening capacity, paired with tobacco consumption as the indicator of screening need, to jointly identify states where the case for enhanced screening investment is strongest.

4.3 The Oral Cancer Screening Gap

A striking and policy-relevant finding, drawn from NFHS-5 (2019–21), (13) the only round in which cancer screening was surveyed, is the extremely low uptake of oral cancer screening

nationally, at approximately 0.92% among women and 1.18% among men. This finding is directly consistent with existing literature: NFHS-5 analyses have similarly found that only a small fraction of the eligible population has ever undergone oral cavity examination for oral cancer (3), despite India's disproportionately high burden of the disease. An updated uptake measurement, unfortunately unavailable in NFHS-6, would be needed to assess whether this infrastructure expansion has translated into higher actual screening rates.

4.4 Priority States and Health System Implications

Uttar Pradesh's classification as the sole Very High priority state, driven by a combination of substantial tobacco prevalence and comparatively low AAM density. This is consistent with well-documented, longstanding health system capacity constraints in the state relative to its population size, and reinforces the value of an infrastructure linked prioritization approach over one based on prevalence alone. Had this study relied solely on prevalence ranking, several northeastern states with historically higher raw tobacco use (e.g., Mizoram, Nagaland, Tripura) would have dominated the highest-priority tier; instead, their comparatively higher AAM density placed them in the Moderate band, illustrating that screening-capacity data meaningfully redistributes policy priority away from a naive burden-only ranking. This has a direct, practical implication: national oral cancer screening resource allocation guided only by prevalence data risks underprioritizing large, high population states like Uttar Pradesh, where both the absolute number of at-risk individuals and the infrastructure gap are substantial, even where prevalence itself is not the nationwide maximum.

5. Limitations

This study has an ecological, state-level design, and its findings should not be interpreted at the individual level. AAM density is a structural proxy for screening capacity, not a direct measure of actual screening uptake, quality, or Community Health Officer functional readiness, and may not equally reflect capacity across a state's plain and hilly/tribal terrain. Manipur was excluded from priority classification owing to missing NFHS-6 data. AAM density reflects public primary-care infrastructure specifically, and may understate true screening access in more urbanized states where private and tertiary care options are more widely available. Finally, tercile-based classification reflects each state's relative standing against other Indian states in a given year, not its adequacy against an absolute population-based infrastructure norm.

6. Conclusion

Over the past decade, India has seen a modest, uneven decline in tobacco consumption, with persistently high burden concentrated in specific states even as national averages have improved - while, in the one survey window for which screening data exists, fewer than 2% of Indians had ever been screened for oral cancer. By jointly mapping tobacco burden against Ayushman Arogya Mandir density, this study identifies Uttar Pradesh as the most urgent priority for enhanced oral

cancer screening, alongside a defined tier of states requiring close monitoring, offering policymakers a reproducible, evidence-based tool for allocating scarce screening resources where risk and infrastructure gaps intersect most sharply. As India's primary care platform continues to mature, closing this gap between where tobacco use lives and where screening reaches will determine whether Ayushman Bharat's promise of comprehensive care becomes a lived reality for those most at risk - not just an infrastructure milestone, but a mouth examined, a lesion caught early, and a life not lost to a preventable cancer.

Abbreviations

Here is the full list of abbreviations used in the manuscript, in alphabetical order:

AAM: Ayushman Arogya Mandir
COTPA: Cigarettes and Other Tobacco Products Act
CPS: Composite Priority Score
GST: Goods and Services Tax
MoHFW: Ministry of Health and Family Welfare
NCD: Non-Communicable Disease
NFHS: National Family Health Survey
NTCP: National Tobacco Control Programme
UT: Union Territory
WHO: World Health Organization

DECLARATIONS

Ethical Considerations: Not Applicable. The research article is based on the secondary data analysis of NFHS and AAM.

Consent for publication: Not applicable. This research article does not contain any person's data, images, or personally identifiable information.

Availability of data and materials: The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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Authors' Contribution

J.K.G. and S.K.B. contributed equally to this work as co-first authors. J.K.G. conceived and designed the study, supervised the overall research process, and served as the corresponding author. S.K.B. led the data analysis, including statistical computation and interpretation of results, and contributed to manuscript drafting. K.V. contributed to data curation, spatial/geospatial analysis, and methodology development. D.P. and S.B. contributed to literature review, data collection and verification, and critical revision of the manuscript. G.D. contributed to data interpretation and critical review of the manuscript for important intellectual content. All authors read, critically reviewed, and approved the final version of the manuscript.

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