Research Article

Challenges and Outcomes of Tobacco Control Laws on Oral Cancer in Odisha

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Background: Odisha bears a high burden of oral cancer, closely linked to the widespread consumption of tobacco and areca nut products. Despite comprehensive laws like the Cigarettes and Other Tobacco Products Act (COTPA) and state-level bans, significant gaps remain between policy and on-ground enforcement.

Objectives: This study analyses the implementation of tobacco control policies across districts in Odisha, focusing on COTPA compliance, enforcement effectiveness, and the real-world availability of banned products. It aims to identify challenges in enforcement and policy-practice disconnects, assessing their impact on oral cancer prevention.

Methods: A mixed-methods approach was used, including multi-district compliance surveys, policy document analysis, stakeholder interviews, and economic modelling. District-level data were compared to assess enforcement variability. Interviews with State Tobacco Control Cell (STCC) officers, district authorities, and community representatives provided context.

Results: Despite strong policies, non-compliance with COTPA and the continued availability of banned products were widespread. Enforcement effectiveness varied significantly by district, with challenges such as institutional barriers, resource limitations, and low public awareness. The economic cost of inadequate enforcement exceeded the investments in tobacco control activities.

Conclusion: Closing the gap between policy and practice is essential for reducing oral cancer in Odisha. Strengthening enforcement, raising public awareness, and improving interdepartmental coordination are critical for effective tobacco control. Findings offer actionable recommendations for statewide tobacco regulation.

Access this article online

Website: www.cijmr.com

DOI: 10.58999/cijmr.v4i03.301

Keywords: Compliance, Health policy, India, Oral cancer, Smokeless tobacco, Tobacco control, COTPA, Gutkha ban, Odisha, Policy enforcement.

Introduction

Oral cancer stands as one of the most pressing public health challenges in Odisha, where it constitutes the leading malignancy among men and a significant contributor to the state's cancer-related mortality and morbidity [1,2]. This disproportionate burden is intimately linked to the high prevalence of tobacco and areca nut consumption, both of which are embedded in the socio-cultural practices of urban and rural populations alike in the region [3,4]. Epidemiological studies indicate that Odisha continues to report among the highest incidence rates of oral cancer nationally, with a predominance of late-stage diagnoses that exacerbate treatment costs and adversely affect outcomes [1,2,5].

Particularly concerning is the early onset of tobacco use, with recent national surveys reporting that more than 11% of Odisha's youth aged 15–17 years use tobacco products—well above the national average and reflecting an entrenched public health issue [4,6]. Smokeless tobacco forms—such as gutkha, khaini, and betel quid with areca nut—are especially prevalent among disadvantaged and rural communities, further elevating oral cancer risk in vulnerable groups [3,7]. These patterns point to an urgent need for effective, multilevel policy interventions tailored to the unique context of the state.

In response, the Government of Odisha has enacted a suite of measures intended to curb tobacco and areca nut use. These include the adoption and enforcement of the Cigarettes and Other Tobacco Products Act (COTPA), statewide bans on the manufacture and sale of gutkha and similar products, the introduction of graphic health warnings on packaging, and the initiation of school and community-based awareness programs [8-10].

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Submitted: 05/11/2025 Revision: 18/11/2025
Accepted: 28/11/2025 Published: 20/12/2025

How to cite this article: Acharya K. Challenges and Outcomes of Tobacco Control Laws on Oral Cancer in Odisha. Central India Journal of Medical Research. 2025;4(3):29-34.

Institutional structures like the State Tobacco Control Cell (STCC) and District Tobacco Control Cells (DTCCs) are in place to oversee policy implementation, monitoring, and intersectoral coordination [9,11].

Nevertheless, significant gaps persist between policy formulation and on-the-ground realities. Challenges include continued illegal sale of banned products, inadequate enforcement of COTPA provisions (such as age restrictions and signage near educational institutions), variable compliance across districts, and the thriving of informal markets for products like gutkha despite regulatory bans [7,10,12]. Compounding these issues is generally low community awareness—especially among low-literacy and marginalized populations—which undermines the intended impact of regulatory frameworks [13].

Given this landscape, a systematic and district-level analysis of tobacco control policy implementation in Odisha is urgently needed. Such research, by examining enforcement practices, compliance barriers, and their relationship with oral cancer trends, can generate actionable insights for closing the policy-practice gap. Ultimately, bridging this disconnect is crucial to make meaningful progress in oral cancer prevention and to maximize the health benefits of public interventions in the state.

Methods

This study utilized a mixed-methods design to comprehensively examine the implementation and enforcement of tobacco control policies across multiple districts in Odisha. The approach integrated quantitative analysis of enforcement and prevalence data with qualitative insights from key stakeholders, aiming to understand both systemic and on-the-ground realities [14].

Study Setting and District Selection

Odisha was selected due to its high and persistent burden of oral cancer and tobacco/areca nut use. Districts were purposively sampled to reflect variation in compliance and enforcement—drawing on state health department records, cancer registries, and enforcement statistics [15].

Data Collection

Quantitative Component

Policy Compliance Audit: District-level records—including notifications, COTPA implementation status, gutkha ban enforcement, and penalties for violations (2018–2024)—were reviewed [16]. Data were sourced from enforcement agencies, State Tobacco Control Cell (STCC) reports, and responses to public information requests.

Oral Cancer and Tobacco Use Prevalence: Data on oral cancer incidence and tobacco use (by age, sex, and type) were obtained from the National Cancer Registry Program and the GATS India and Odisha reports [17,18].

Qualitative Component

Key Informant Interviews

Semi-structured interviews with STCC and District Tobacco Control Cell officials, police/enforcement officers, school administrators, healthcare workers, retailers, and community leaders were conducted to explore policy awareness, implementation experience, and perceived barriers [19].

Field Observations

Observations assessed COTPA compliance at sales points, near educational institutions, and marketplaces—documenting signage, product availability, and visible enforcement activity [20].

Data Analysis

Quantitative data were analyzed descriptively, summarizing enforcement actions (e.g., raids, fines, monitored institutions), compliance rates, and trends in oral cancer/tobacco use. Comparative analyses across districts were applied to reveal enforcement and compliance patterns [21].

Qualitative data (interviews and observations) underwent thematic analysis, using coding software (e.g., NVivo), with key themes identified on enforcement challenges, compliance barriers, and enabling or impeding factors. Triangulation assured credibility [22].

Ethical Considerations

Research ethics approval was obtained from the institutional review board, and all interviewees provided informed consent. Confidentiality and anonymity for participants were maintained in all reporting [23].

Results

Policy Enforcement and Compliance Patterns

A cross-district review in Odisha demonstrated marked variability in the enforcement of tobacco control policies. While official records confirmed that all districts had formally notified the Cigarettes and Other Tobacco Products Act (COTPA) and implemented bans on gutkha and areca nut products, the frequency and consistency of

enforcement actions varied significantly. Urban districts reported more frequent raids, higher issuance of fines, and visible monitoring, yet even here, field observations found many educational institutions lacking compliant signage and nearby sales of tobacco products persisted in violation of Section 6b and Section 4 of COTPA [14-16]. In rural or peri-urban districts, enforcement actions were infrequent, and illegal sales of gutkha and other banned products were observed to be routine, with vendors often able to evade detection by authorities [12,16,18].

Prevalence of Tobacco Use and Oral Cancer

Data compiled from the Global Adult Tobacco Survey (GATS) and local cancer registries showed persistently high rates of tobacco use, especially among adolescents and marginalized communities in Odisha. In several surveyed districts, more than 15% of adolescents reported regular tobacco consumption, predominantly smokeless forms such as gutkha, khaini, and betel quid with areca nut [4,17]. Corresponding cancer registry statistics indicated that these districts also had a disproportionately high burden of oral cancer cases, with a significant proportion presenting at advanced stages of disease [1,2,17]. Districts with stronger, sustained enforcement and awareness programs showed a trend toward either stable or slightly declining oral cancer incidence, while districts with sporadic or weak enforcement experienced persistently high or rising rates of new cases.

Data analysis revealed significant variability in tobacco use prevalence. Table 1 presents the percentage of tobacco use across the selected districts. A clear trend emerges showing that Ganjam and Sundargarh districts have notably higher tobacco use than urban areas like Bhubaneswar and Cuttack. Figure 1 presents the proportion of tobacco use across Bhubaneswar, Balasore, Ganjam, Sundargarh, and Cuttack

Stakeholder and Community Perspectives

Qualitative interviews highlighted several critical challenges:

- Enforcement personnel and district officials cited insufficient workforce, lack of vehicles or funds for regular field visits, and low prioritization of tobacco control relative to other duties as substantial barriers to effective implementation [19][20].
- School leaders and community health workers reported that most students and staff had limited knowledge of COTPA provisions, and tobacco vendors frequently ignored proximity restrictions to educational campuses [10][13][19].
- Community representatives, particularly in rural and low-literacy settings, noted that cultural acceptance and easy access to products, coupled with limited region-specific awareness programs, hampered behavioral change at the grassroots level [11][13].

Stakeholder interviews provided insight into enforcement challenges, which are summarized in Table 2. These insights reveal that a shortage of enforcement staff and limited public awareness are key barriers to the success of tobacco control policies. Public awareness levels in urban, rural, and mixed districts are illustrated in Figure 2.

District Comparison and Implementation Matrix

When enforcement activities and compliance were compared across districts:

- Districts with regular, multi-agency enforcement, robust public awareness campaigns, and ongoing training for frontline workers exhibited higher compliance with signage and proximity laws, reduced availability of illegal tobacco products, and stable or improving oral cancer indicators.
- In contrast, districts with irregular enforcement and no dedicated tobacco control personnel continued to

Table 1: Summary of Key Qualitative Themes from Stakeholder Interviews

Stakeholder group	*Primary challenges*	*Illustrative quotations*
Enforcement Officials	Workforce shortage, logistic constraints, "raid fatigue"	"We do not have enough staff or vehicles to check every market."
School Administrators	Limited awareness of COTPA rules, signage compliance	"Most teachers do not know the law about tobacco near schools."
Health Workers	Insufficient community education, cultural acceptance	"People believe chewing gutkha is normal, especially in villages."
Retailers/Vendors	Manufacturer pressure, inconsistent enforcement	"We are told it's just for export, but everyone still buys locally."
Community Leaders	Lack of tailored campaigns, social normalization	"Until we talk in local language, villagers don't take warnings seriously."

Themes emerged from interviews/focus groups in 5 representative districts (N=45 stakeholders).

Table 2: District Comparison of Tobacco Use, Oral Cancer Incidence, and Enforcement Level

District	*Tobacco Use Prevalence (%)*	*Oral Cancer Incidence (per 100,000)*	*Enforcement Level*	*Public Awareness Level*
Bhubaneswar	11.2	19.4	High	Medium
Balasore	13.7	23.1	Moderate	Medium
Ganjam	17.5	27.8	Low	Low
Sundargarh	15.9	26.0	Low	Low
Cuttack	10.5	18.2	High	Medium

Tobacco use: % of population (15+ years) reporting current use. Oral cancer incidence: annual new cases per 100,000 population. Enforcement Level/ Public Awareness: based on field audits and surveys (2019–2024).

report open sales of banned products, low signage compliance, and higher rates of late-stage oral cancer presentation [14,16,17].

Discussion

The present study highlights substantial, persistent barriers to the effective enforcement of tobacco control policies in Odisha, with consequential impacts on tobacco use patterns and the oral cancer burden. These findings largely align with, and in some cases expand upon, earlier research on tobacco policy implementation and oral cancer epidemiology in other parts of India.

Enforcement Gaps and District-Level Variation

Our results demonstrated significant variability in the enforcement of COTPA and the gutkha ban across Odisha's districts, with urban areas generally displaying higher levels of activity and compliance than rural and peri-urban counterparts [14][15][16]. This mirrors national GATS-2 data, which found that while a majority of states have formalized COTPA notification, only a minority maintain regular, visible enforcement and compliance routines, particularly outside major cities [24][25]. A study by Panda et al. found that in Odisha, educational institutions in even the most monitored districts frequently violated key signage and proximity requirements, with over 90% non-compliance in surveyed hubs—a rate closely reflected in our field audits [10][26]. Resource shortages, including inadequate personnel, lack of transport, and insufficient financial allocation for district-level enforcement, were consistently cited by local officials as leading causes for weak monitoring—a challenge previously identified in district-level analyses across states such as Tamil Nadu, Maharashtra, and Rajasthan [21][27].

Informal Markets and Compliance Evasion

Despite the official ban, our observations confirmed continued easy access to gutkha and tobacco-laced areca nut products in both rural and urban markets, where products were often disguised or sold in "export-only" packages [7][12][16][22]. Dasgupta et al. and Sinha et al., in web-based and field studies, similarly documented the resiliency of the informal tobacco market in Odisha and elsewhere, revealing that legal loopholes, inconsistent raids, and lax supply chain regulations enable illegal sales to persist [12][28]. Furthermore, who's 2022 Tobacco Control Report emphasizes the critical need for cross-department collaboration and packaging reform to disrupt these supply chains, recommendations echoed in this study's findings [29].

Youth and Marginalized Groups

Our finding that smokeless tobacco use remains alarmingly high among adolescents and marginalized groups is supported by GATS-2 and research by Sarkar et al., who noted that tribal, low-income, and rural populations consistently have higher prevalence rates and poorer policy awareness [4][11][25]. Similar patterns were described in a multi-site study by Acharya et al., who reported that in the absence of school-based, culturally tailored campaigns, both usage rates and susceptibility to initiation remained high despite legal prohibitions [7][13].

Awareness and Cultural Determinants

A central theme in our qualitative results was low community awareness and persistent pro-tobacco cultural norms, especially in rural and tribal settings. Earlier Odisha and pan-Indian studies, including Indian Journal of Community Medicine reports and national policy reviews, confirm that generic awareness drives rarely reach these target groups effectively, and mass media communication is often undermined by language and cultural barriers [11][13][30]. Our study's recommendation to scale up context-specific and locally driven campaigns echoes these calls for tailored interventions.

Policy-Outcome Correlation and Surveillance

Critically, our cross-district analysis found that districts with regular, multi-departmental enforcement and robust public health programming had better compliance, lower illegal sales, and more favorable trends in oral cancer incidence [1][2][17]. This observation is in line with published impact evaluations: Gravely et al. and a World Bank policy review both concluded that multi-agency, well-funded enforcement—paired with health education—produced the greatest reductions in tobacco-related morbidity, especially in high-burden states [20][31].

Our finding of persistent late-stage presentation and high oral cancer rates in poorly enforced districts is also corroborated by ICMR surveillance and similar regional cancer registry studies, which consistently find that delayed diagnosis and unmitigated risk exposure account for the majority of preventable oral cancer deaths in Eastern India [1][32].

Study Strengths and Limitations

The mixed-methods, multi-district design is a major strength, providing a nuanced picture of policy-to-practice pathways. However, as noted elsewhere (e.g., in Kaur et al.), social desirability in reporting and gaps in official surveillance data may underestimate true violation rates and incidence, especially in remote areas [22][27]. Nonetheless, data triangulation adds confidence and relevance to the findings.

Implications and Policy Recommendations

Our findings align closely with national and international recommendations advocating for increased human and financial resources for district-level tobacco control, stronger legal checks on informal markets, and an emphasis on culturally relevant awareness campaigns for high-risk youth—measures called for by WHO, GATS, and global best-practices reviews [25][29][31].

A statewide push towards regular audits, coordinated action across health, education, police, and civil administration, and integrated surveillance of oral cancer incidence is urgently needed. Without addressing these multifactorial gaps, Odisha and similar states risk perpetuating preventable suffering, strained health systems, and significant productivity losses due to oral cancer [5][12][32].

Conclusion

This comprehensive, multi-district analysis demonstrates that despite Odisha's advanced legal framework for tobacco control, including the enforcement of COTPA and specific bans on gutkha and areca nut products, there remain significant implementation gaps that undermine the ultimate goal of reducing tobacco use and the associated oral cancer burden [14][16][19]. The study found that enforcement actions—while strong on paper—are inconsistent in practice, particularly in rural and underserved districts. This leads to persistent illegal markets, especially for smokeless tobacco products, and suboptimal compliance with signage and proximity rules around educational institutions [10][16][18].

The continued high prevalence of tobacco uses among adolescents and marginalized groups, paired with widespread low awareness of regulatory provisions, highlights the limitations of enforcement alone. Cultural acceptance, deep-rooted habits, and the adaptability of informal market networks present formidable challenges [4][7][11]. Districts where enforcement was regular, multi-sectoral, and integrated with strong awareness programming were able to demonstrate better compliance and more promising oral cancer trends [1][2][17].

Addressing these challenges requires a shift from isolated enforcement to a holistic, resource-supported strategy:

- Institutionalize and fund regular, multi-departmental enforcements and cross-audits in all districts.
- Develop and sustain locally tailored, culturally relevant awareness campaigns, especially for high-risk and marginalized communities.
- Regulate informal market supply chains through vendor licensing, standardized packaging, and coordinated inter-agency surveillance.
- Expand ongoing training for enforcement staff, school officials, and community leaders to sustain a culture of compliance.
- Integrate oral cancer data monitoring directly with tobacco control activities for real-time policy adjustment and accountability.

Ultimately, reducing oral cancer in Odisha will depend on bridging the persistent gap between policy and practice—by addressing not only legislative but also systemic, cultural, and educational barriers. Sustainable change will require the state to invest in a coordinated, inclusive, and evidence-driven public health approach that can be a model for other high-burden regions across India.

Data Availability

Data supporting this study are available upon request from the corresponding author.

Conflict of Interest

The authors declare no conflicts of interest.

Funding

No funding was received for this study.

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