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Betel Quid Without Tobacco: A Threat to Oral Health and Well-Being in India

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Abstract

Betel quid without tobacco, a popular cultural product across India and other South and Southeast Asian nations, is often consumed for its refreshing stimulant effects during social and religious gatherings. Despite its deep cultural significance, the health hazards of betel quid – especially its strong association with oral cancers – are often overlooked. The International Agency for Research on Cancer (IARC) has identified betel quid as a human carcinogen, and research from countries, such as India, Pakistan, and Taiwan, highlights a troubling link between its use and the increasing rates of oral cancer. India, with one of the highest oral cancer rates globally, faces significant public health challenges due to the widespread use of betel quid, especially in its tobacco-free form. The primary ingredient, areca nut, contains alkaloids and polyphenols that contribute to oxidative stress, inflammation, and DNA damage – critical factors in cancer development. Additionally, including lime further exacerbates these harmful effects by increasing the alkalinity of the mouth, promoting carcinogenesis. While tobacco is often mixed with betel quid in India and Pakistan, complicating the ability to assess the independent risks of areca nut and lime, Taiwan's high prevalence of tobacco-free betel quid consumption provides clearer evidence of its potential dangers. This literature review critically examines both global and Indian perspectives on the health risks of betel quid use, shedding light on the emerging evidence linking it to cancer. Despite growing scientific awareness, the carcinogenic effects of non-tobacco betel quid remain largely neglected in public health campaigns. To reduce the burden of oral cancer, this review calls for increased awareness, more stringent regulations, and culturally sensitive interventions, particularly targeting vulnerable youth. Addressing the risks of betel quid consumption is essential for lowering oral cancer rates and improving public health outcomes across South and Southeast Asia.

Keywords: Betel quid, areca nut, oral cancer, tobacco-free betel quid, carcinogenesis

INTRODUCTION

Betel quid without tobacco is a popular cultural product in India, but its potential health risks are often underestimated. Despite its widespread use, recent studies have highlighted its significant threat to oral health, particularly its connection to oral cancer. The International Agency for Research on Cancer has classified betel quid without tobacco as a human carcinogen (Thomas et al., 1993; Jacob et al., 2004; Gupta et al., 2014) [1–3]. Case-control studies in India, Pakistan, and Taiwan indicate that betel quid, especially when consumed without tobacco, is a major risk factor for oral cancer (Amarasinghe et al., 2010; Thennakoon et al., 2012; Ko et al., 2024) [4–6]. In Taixwan, where betel quid is often used without tobacco (Lin et al., 2006) [7], its independent effects are more easily studied. However, in India and Pakistan, where tobacco is commonly added, more large-scale research is

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needed to focus on users who consume it without tobacco. Additionally, smoking and alcohol consumption, both recognized risk factors for oral cancer, should be accounted for as potential confounders, as they are often associated with betel quid use.

India, with one of the highest rates of oral cancer globally, faces a significant health challenge due to the widespread use of betel quid, also known as "pan." While much of the public health focus has been on the role of nicotine in oral cancer risk, the carcinogenic effects of betel quid without tobacco remain poorly understood (Gunjal et al., 2020) [8]. Betel quid is culturally significant in India, where it is used for purposes such as aiding digestion and symbolizing hospitality (Ahuja and Uma, 2011) [9]. Despite its cultural importance, the practice of using betel quid, even without tobacco, poses considerable risks to oral health (Khan, 2016) [10]. Emerging research suggests that betel quid is an independent risk factor for oral cancer due to its composition and carcinogenic mechanisms (Garg, 2014) [11]. Areca nuts, a key ingredient in betel quid, contain alkaloids and polyphenols that cause oxidative stress, inflammation, and DNA damage, all contributing to cancer development (Sari and Liza, 2021) [12]. The addition of lime further exacerbates these effects by making the mouth more alkaline. To address the risks of betel quid without tobacco, efforts should focus on raising awareness, restricting its availability, and promoting culturally relevant interventions (Nair et al., 2004) [13]. Reducing oral cancer rates in India requires greater attention to this often-overlooked risk factor (Javed et al., 2010; Sharan et al., 2012; Sharma et al., 2022) [14–16].

The term "substance" refers to non-essential food ingredients that are typically addictive. Among the three major substances abused by humans, tobacco is the most harmful (Mehrotra et al., 2017; Zhang et al., 2023; Singhal et al., 2021) [17–19]. While smoking is prevalent worldwide, chewing tobacco with pan or pan masala is particularly common in the Indian subcontinent**.** Extensive evidence links tobacco use to oral cancer and precancerous conditions, but it remains unclear whether non-tobacco pan masala poses the same risks**.** Non-tobacco pan masala consumption is most common in the 15–19 age group for both males and females, whereas tobacco use is more common among males aged 20–35 years and females aged 35–39 years. In a population of 12,711, cases of oral precancer (including leukoplakia, erythroplakia, oral submucous fibrosis (SMF), verrucous hyperplasia, lichen planus, and smoker's palate) were clinically diagnosed. Oral precancer prevalence was 3.17% among non-tobacco pan masala users, 12.22% among tobacco users, and only 0.16% among non-users. The incidence of oral precancer was 19 times higher among non-tobacco pan masala users and 73 times higher among tobacco users compared to non-users. In the surveyed population, 73% were non-users, 3% consumed non-tobacco pan masala, and 24% used tobacco products. Among males, 60% were non-users, 3% consumed non-tobacco pan masala, and 37% used tobacco. Among females, 84% were non-users, 3% consumed non-tobacco pan masala, and 13% used tobacco.

A community-based survey conducted in two villages of Sriperambudur Taluk in 2006, involving 500 randomly selected residents, revealed that 19.8% chewed Areca nut products, with 11.2% using them exclusively and 8.6% engaging in multiple habits (Sandhya et al., 2013) [20]. A large survey in Uttar Pradesh found that 10.6% of urban males and 7.9% of rural males (aged >10 years) used gutkha or tobacco pan masala, with 80% of users under the age of 40. Fewer than 4% used pan masala without tobacco (Aruna et al., 2011) [21]. A retrospective case study of oral cancer patients from Karnataka (1991–2000) revealed that 75% had risk habits, with 59% being chewers and 17% chewing betel quid without tobacco (Gupta and Ray, 2003) [22]. In Taiwan, the habit of chewing unripe areca nuts is more common among men (9.8%) than women (1.6%). A 1995 study of 1,110 residents in two states found that 72% of males and 80% of females chewed areca nut, with 80% incorporating tobacco into their quid. A survey of 22,000 villagers aged 15 and above in Bhavnagar district, Gujarat, found that 20.4% of males used mawa or betel quid. The popularity of areca nut mixtures, like mawa, pan masala, and gutkha, have contributed to an epidemic of SMF, with more than 70% of cases occurring in individuals under 35. Pan masala and gutkha chewers developed SMF at a faster rate than those who chewed betel quid or areca nuts alone, with 7.5% of pan masala chewers developing the disease within 4.5 years

compared to 9.5 years for areca nut chewers (Goldenberg, 2004; Kumar, 2008; Priebe et al., 2010; Huang et al., 2017) [23–26].

The research findings show that 3% of the population consumes non-tobacco pan masala, while tobacco use is eight times more common, affecting 24% of the population. Among the 15–24 age group, 4% consume non-tobacco pan masala, while 10% use tobacco. Non-tobacco pan masala consumption decreases with age, with 3% of both males and females using it. A study in Cambodia found that 32.6% of women and 0.8% of men aged over 15 years chewed betel quid (Ikeda, 1995) [27]. According to the review of literature, in India, the use of betel quid, particularly when combined with tobacco, is a major contributor to the country's high rates of oral cancer and precancerous conditions. India has one of the highest incidences of oral cancer in the world, and tobacco use, especially in the form of chewing pan masala, plays a significant role. Betel quid is a cultural tradition in both rural and urban areas, making it a deeply ingrained habit. The prevalence of oral submucous fibrosis (SMF) and other oral precancerous conditions is particularly high in younger individuals, especially those under 35 years old. Despite the focus on tobacco use in public health campaigns, the carcinogenic risks of non-tobacco pan masala and areca nut products have not been sufficiently addressed. To reduce the incidence of oral cancer, it is essential to raise awareness, regulate the availability of these substances, and promote healthier alternatives while addressing the dual use of both tobacco and betel quid.

GLOBAL OVERVIEW OF BETEL QUID WITHOUT TOBACCO

Betel quid without tobacco is widely consumed in several regions, particularly in South and Southeast Asia. Countries, such as India, Sri Lanka, Taiwan, Thailand, Malaysia, Indonesia, and Papua New Guinea, incorporate it into their cultural and social practices, using it during social gatherings, religious ceremonies, and traditional rituals. The primary ingredients include areca nut, slaked lime, and betel leaves, which are typically chewed together for their mild stimulant and refreshing effects.

Despite its popularity, concerns about its health implications have grown. Numerous studies have shown a link between betel quid consumption and a heightened risk of oral cancers, with the International Agency for Research on Cancer (IARC) classifying it as a human carcinogen. While Taiwan predominantly consumes betel quid without tobacco, other regions, such as India and Pakistan, often combine it with tobacco, making it challenging to isolate the effects of betel quid alone. Additionally, smoking and alcohol use, both established risk factors for oral cancer, are frequently associated with betel quid consumption, further elevating health risks (Table 1).

OVERVIEW OF BETEL NUT CULTIVATION IN INDIA

Karnataka has the largest area under betel nut cultivation, followed by Kerala and Assam. Despite having approximately 80.81 thousand hectares of land dedicated to betel nut farming – accounting for 16.27% of India's total betel nut plantation area – Assam has one of the lowest yields per hectare among the major betel nut-producing states. The state's yield was only 0.96 metric tons per hectare (Ganaraja, 2017; Ashoka et al., 2021) [28, 29]. In contrast, Nagaland recorded the highest yield, followed by Andhra Pradesh and Tripura. In terms of production, Assam contributed 77.90 thousand metric tons, which makes up 9.51% of the national total in 2017. The Nagaon district in Assam led the state's betel nut production, contributing 15.1% of the total in 2013 (Suryanarayana, 2014) [30].

Betel nut cultivation in Assam is highly labor-intensive, offering both direct and indirect employment opportunities for growers and traders. Consequently, efficient use of production inputs is critical for minimizing costs and maximizing profits for farmers. Improving productivity and production is also an important policy consideration. A lower efficiency in input utilization indicates higher inefficiency among producers, and vice versa. Therefore, evaluating the technical efficiency of betel nut growers is essential. This study aims to assess the technical efficiency of growers in Nagaon using stochastic frontier analysis (SFA) to determine the efficiency levels and identify factors contributing to inefficiency in betel nut production (Table 2).

Table 1. Global prevalence, cultural significance, and health risks of betel quid without tobacco.

Country	Prevalence of Use	Primary Ingredients	Cultural Significance	Health Risks	References
India	Widely consumed, especially in rural areas	Areca nut, slaked lime, betel leaves	An integral part of social and religious practices	Associated with oral cancer, classified as a carcinogen	Thomas et al., 1993; Gupta et al., 2014 [1]
Sri Lanka	Common among adults and older populations	Areca nut, slaked lime, betel leaves	Cultural practice for centuries	Increased risk of oral cancer	Amarasinghe et al., 2010 [4]
Taiwan	Predominantly consumed without tobacco	Areca nut, slaked lime, betel leaves	Strong cultural and social elements	Significant risk for oral cancers	Lin et al., 2006; Ko et al., 2024 [7]
Thailand	Common in rural and urban areas	Areca nut, slaked lime, betel leaves	Frequently used in social gatherings	Oral cancer risk linked to long-term use	Thennakoon et al., 2012 [5]
Malaysia	Consumed in some rural areas	Areca nut, slaked lime, betel leaves	Part of social customs and traditional practices	Correlated with oral cancers	Jacob et al., 2004 [2]
Indonesia	Widely consumed in certain regions	Areca nut, slaked lime, betel leaves	Central to traditional customs and rituals	Carcinogenic potential, oral cancer risk	Gupta et al., 2014 [1]
Papua New Guinea	Common in both rural and urban areas	Areca nut, slaked lime, betel leaves	Cultural importance in social settings	Link to oral cancers	Various regional studies

Table 2. Overview of betel nut cultivation in India: area, production, yield, and state contributions.

S.N.	Location	Cultivated Land Area (in '000 Hectares)	Total Production (in '000 M.T.)	Average Yield (in M.T. per Hectare)	Percentage of Total Production
1	Karnataka	254.6	517.3	2.0	63.1
2	Kerala	98.5	130.1	1.3	15.8
3	Assam	80.8	77.9	0.9	9.5
4	Meghalaya	16.9	24.9	1.4	3.0
5	West Bengal	11.5	22.8	1.9	2.7
6	Tripura	5.9	20.4	3.4	2.4
7	Tamil Nadu	6.5	10.1	1.5	1.2
8	Mizoram	11.8	7.2	0.6	0.8
9	Maharashtra	2.3	3.4	1.4	0.4
10	Andhra Pradesh	0.5	2.3	4.2	0.2
11	Nagaland	0.4	2.3	6.0	0.2
	India	496.6	832.9	1.6	100

Composition and Popularity of Betel Quid without Tobacco

Betel leaf, areca nut (supari), slaked lime (chuna), and flavorings or sweeteners are the usual ingredients of betel quid without tobacco. Regardless of age or gender, Indians like this combination in both urban and rural areas. Many people believe that the non-tobacco form of pan is a safer option because it doesn't include the risk of nicotine addiction. Its main ingredient, areca nut, can cause cancer, notwithstanding this notion. The International Agency for Research on Cancer (IARC) has designated areca nut, the main ingredient in betel quid, as a Group 1 carcinogen. Its use is nevertheless widely unregulated and socially acceptable despite this. Millions of people are ignorant of the silent harm betel quid poses to their dental health because of the cultural normality of chewing it without tobacco, which has distracted attention from its negative health effects (Table 3).

Carcinogenic Effects of Areca Nut

Approximately 223.79 million people in India consume areca nut, with 14.2 percent of them using it in combination with tobacco (Thakur and Ravi, 2022) [31]. Areca nut, a primary ingredient in betel quid, is widely acknowledged as a potent carcinogen, especially for the oral cavity (Jeng et al., 2001) [32]. It contains several biologically active compounds, notably arecoline, which are believed to play a significant role in its cancer-promoting effects. Upon chewing, the alkaloids in Areca nuts induce oxidative stress, inflammation, and DNA damage, all of which contribute to the process of carcinogenesis. Furthermore, the nut's metabolites, particularly those metabolized in the liver, amplify these detrimental effects. One of the primary metabolites, arecaidine, has been shown to facilitate the formation of DNA adducts, which serve as precursors to cancer (Myers and Alan, 2022) [33]. Extensive research has demonstrated the carcinogenic potential of Areca nuts, with long-term use being linked to oral squamous cell carcinoma (OSCC) and other oral cancers. In addition, regular consumption of areca nut increases the risk of developing oral submucous fibrosis (OSMF), a serious precancerous condition that can ultimately lead to malignant transformation (Nethan et al., 2022) [34]. Even without tobacco use, the consistent use of Areca nuts significantly heightens the risk of oral cancer (Trivedy, 2002) [35]. The inclusion of betel quid additives, such as slaked lime, intensifies the carcinogenic effects by increasing the release of harmful alkaloids. Furthermore, studies (Chen et al., 2017) [36] suggest that areca nut metabolites can disrupt normal cell cycle processes, leading to abnormal cell growth and creating an environment conducive to tumor development. The simultaneous use of tobacco and areca nut greatly enhances mutagenic effects, which helps explain the elevated rates of oral cancer in regions where these substances are commonly consumed (Warnakulasuriya et al., 2022) [37]. Consequently, public health campaigns are increasingly focusing on the carcinogenic risks of Areca nuts, calling for stronger regulations to limit its use. Figure 1 shows (A) potentially malignant lichenoid lesions, which may progress to oral lichen planus (B). In the long term, BN chewing, even without tobacco, can lead to oral squamous cell carcinoma (C).

Table 3. Summarizing the composition and popularity of betel quid without tobacco.

Components	Scientific Name	Description	Popular Usage
Areca Nut (Betel Nut)	Areca catechu	Alkaloids, like arecoline, found in areca palm seeds, have stimulating properties.	Because of its mild stimulant properties, it is frequently chewed to refresh breath or as part of social events and cultural practices.
Lime	Calcium Hydroxide	By producing an alkaline environment in the mouth, a paste produced from slaked lime amplifies the effects of the areca nut.	Most places use it as a binder for the other ingredients, which helps the areca nut's alkaloids be released more easily. Additionally, it preserves the quid.
Betel Leaves	Piper betel	Used a Wrapper for the ingredients, leaves of piper betel	It is frequently employed in social or religious activities and is well-liked for its cooling qualities and ability to carry active chemicals.
Sweeteners (Optional)	Elettaria cardamomum	Ingredients used to enhance the taste of areca nuts like sugar, honey, & jaggery	It is frequently employed in social or religious activities and is well-liked for its cooling qualities as well as its ability to carry active chemicals.
Spices and Flavorings	Crocus sativus	Cardamom, cloves, saffron	Frequently used, particularly in ceremonial contexts or social settings, to cover the harshness of areca nuts.

Cultural and Social Impact of Betel Quid Consumption

Betel quid, a mixture of areca nut, slaked lime, and sometimes tobacco, is deeply embedded in the cultural and social fabric of many regions in Asia, Africa, and the Pacific Islands. It plays a crucial role in numerous traditions and customs, often symbolizing hospitality, respect, and social bonding. Offering betel quid to guests is considered a gesture of welcome, and it is commonly included in religious rituals and significant life events, such as weddings, especially in countries like India. It is believed to bring good luck, aid digestion, and act as a stimulant. Beyond these ceremonial uses, betel quid also serves

as a daily social activity, particularly in rural communities where it fosters social cohesion and provides a sense of identity. Many people, especially in Southeast Asia and South Asia, chew betel quid as a form of relaxation or stress relief, reinforcing its cultural significance in daily life.

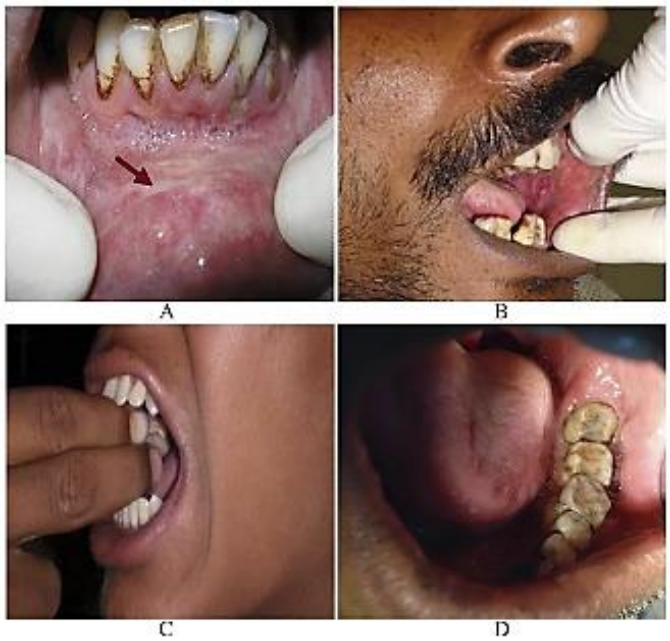

Figure 1. Potentially malignant and malignant conditions linked to betel nut chewing. Prolonged BN use can cause lichenoid lesions (A), which may progress to oral lichen planus (B). In the long term, BN chewing, even without tobacco, can lead to oral squamous cell carcinoma (C) in the primary mastication site.

However, the widespread consumption of betel quid complicates public health efforts aimed at addressing its health risks. Despite growing evidence of its carcinogenic properties, betel quid consumption remains deeply ingrained in social practices, making it challenging to change established behaviors. In some regions, using betel quid is viewed as a normal and even essential part of daily life, contributing to resistance against health warnings. This cultural attachment to betel quid is particularly strong in India, where the non-tobacco variety is highly valued and often shared during meals, ceremonies, or as a treat. This form of betel quid is widely accepted, with many people unaware of its potential health risks. It is particularly popular among women and teenagers who may avoid tobacco-based products due to societal stigma. In rural areas, where access to healthcare and education is limited, the risks associated with non-tobacco betel quid remain underappreciated. This lack of awareness, combined with the unregulated use of areca nuts, continues to contribute to India's increasing burden of oral diseases. The persistence of these practices underscores the need for culturally sensitive public health campaigns that balance respect for traditions with the urgent need to address the health consequences of betel quid consumption [38].

Carcinogenic Mechanisms of Areca Nut: Epidemiological Evidence

According to (Gupta et al., 2015) [39], epidemiological studies have provided strong evidence for the carcinogenic effects of areca nut through several key mechanisms. Arecoline, a primary alkaloid in areca nut, induces chromosomal abnormalities and DNA strand breaks, leading to mutations that accelerate carcinogenesis and contribute to the development of oral cancers like oral squamous cell carcinoma (OSCC). The consumption of areca nuts also generates reactive oxygen species (ROS), causing oxidative stress and damage to cellular structures, including DNA, proteins, and lipids, which further promotes cancer progression. Additionally, areca nut alkaloids activate fibroblasts, resulting in excessive collagen production and the development of oral submucous fibrosis (OSMF), a precancerous

condition linked to oral cancer. Prolonged areca nut use also triggers chronic inflammation in the oral cavity, leading to the release of growth factors and cytokines that foster a tumor-promoting environment. These factors collectively highlight the significant role of Areca nuts in the development of oral cancer and related diseases.

CULTURAL AND SOCIAL INFLUENCES ON BETEL QUID CONSUMPTION

Public Health Implications

India's healthcare sector faces several challenges because of the growing usage of betel quid without tobacco. A significant amount of the nation's cancer-related morbidity and mortality is caused by oral cancer, and betel quid users bear a disproportionately high burden of this disease. The financial impact is also problematic because advanced-stage oral malignancies can be expensive to cure, frequently beyond the means of those who are impacted.

Confronting the Hidden Danger: Strategies for Addressing Betel Quid Consumption

Effectively managing the health risks associated with betel quid without tobacco requires a comprehensive, multifaceted approach. The dangers of betel quid consumption, even without the inclusion of tobacco, have been well-documented, yet its prevalence remains high in many regions. Addressing this silent threat involves raising awareness, implementing regulatory measures, encouraging community involvement, advancing research, and providing better clinical care. Through a combination of public health campaigns, policy changes, community engagement, and robust surveillance systems, a balanced and sustainable solution can be achieved.

Raising Public Awareness and Education

The first step in addressing the health risks of betel quid without tobacco is to raise awareness among the public about its dangers. Public health campaigns must aim to inform individuals about the risks of chronic consumption, such as oral submucous fibrosis (OSMF) and oral cancers, even in the absence of tobacco. These campaigns should target communities where betel quid consumption is a cultural norm, emphasizing the carcinogenic effects of Areca nuts and promoting healthier alternatives. Utilizing media outlets, such as social media platforms, television, and radio, can significantly increase the reach of these messages. Involving respected figures and local leaders in these campaigns can help break cultural taboos and shift perceptions. The goal is not only to provide education but also to inspire behavior change, reducing the normalization of betel quid consumption.

Policy and Regulatory Measures

Public health efforts need to be reinforced by strong policy and regulatory frameworks. Governments can play a key role in curbing betel quid consumption by enforcing restrictions on its sales and marketing. The inclusion of areca nut and betel quid in the list of controlled substances or products, along with appropriate labeling of health risks, could help limit its use. Taxation or pricing strategies, like those applied to tobacco and alcohol, may serve as deterrents to consumption. Additionally, clear health warnings, especially on packaging, can ensure that consumers are aware of the risks they are taking. Local governments should also work towards regulating the quality and content of betel quid products, particularly with respect to the addition of slaked lime or other additives that enhance their carcinogenic effects. Collaboration with international health bodies and organizations can also amplify these policy efforts, contributing to global efforts to tackle the issue.

Research and Surveillance

To fully understand the breadth of the health consequences of betel quid consumption, comprehensive research must be undertaken. Longitudinal studies are crucial to establishing a direct link between areca nut use and the development of conditions such as OSMF, oral cancer, and other oral diseases. Further research should focus on understanding the molecular mechanisms underlying the carcinogenic effects of areca nut and their metabolites, as well as identifying individuals who are at high risk due to genetic or environmental factors. Surveillance systems should be established to track betel quid usage patterns, monitor the prevalence of associated health issues, and evaluate the

effectiveness of public health interventions. By investing in research, policymakers can develop targeted, evidence-based solutions that are tailored to the needs of specific populations. Such data will not only enhance the understanding of Betel Quid's health impact but also guide the development of new, more effective health policies.

Local Engagement Strategies

Community-based interventions are vital to changing long-standing cultural practices associated with betel quid consumption. These interventions must be culturally sensitive, recognizing the social and cultural significance of betel quid in many communities. Involving local leaders, healthcare professionals, and influencers in these initiatives is critical to making meaningful changes. By educating these key figures about the health risks of betel quid and empowering them to advocate for change, communities can begin to shift their norms. Local healthcare workers should be trained to identify early signs of OSMF and other oral disorders, enabling them to intervene before these conditions progress to cancer. The use of peer support groups, cultural workshops, and interactive sessions can further promote healthier behaviors and encourage individuals to stop or reduce their consumption of betel quid. Grassroots efforts can be a powerful tool in challenging the status quo and promoting safer, healthier practices within the community.

Clinical and Preventive Care

Strengthening clinical and preventive care is essential in addressing the long-term health effects of betel quid consumption. Regular oral screenings in high-risk populations can help detect early signs of OSMF, oral cancers, and other related diseases. Community healthcare centers and primary healthcare settings should offer accessible and affordable screening services, particularly in areas with high rates of betel quid consumption. Preventive care must also be integrated into general healthcare practices, with healthcare workers educating individuals on the risks of betel quid and providing support for cessation programs. By improving access to preventive care, especially in rural and underserved areas, the early detection of precancerous conditions becomes more feasible, ultimately reducing the incidence of oral cancers. Additionally, public health policies should focus on integrating oral health services into national health systems, ensuring that everyone, regardless of their socioeconomic status, has access to necessary oral healthcare [40].

CONCLUSIONS

Betel quid without tobacco, often perceived as a safer alternative to tobacco-based products, poses significant health risks, particularly due to the carcinogenic properties of areca nut. As a leading cause of oral cancers and precancerous conditions, the consumption of betel quid continues to be a pressing public health issue, particularly in regions, like India, where it is culturally ingrained. Despite its widespread use, the carcinogenic effects of Areca nuts have been increasingly recognized, underscoring the need for a comprehensive approach to mitigate its harm. This includes raising public awareness about its dangers, implementing stronger regulatory measures, fostering community engagement, and enhancing clinical care, particularly in high-risk populations. Collaborative efforts among policymakers, healthcare professionals, researchers, and communities are crucial to combating the health threats posed by betel quid without tobacco. By addressing this silent threat through early intervention, education, and regulation, it is possible to reduce the burden of oral cancer and safeguard the health of future generations. The time to act is now, as the lasting impact of betel quid consumption could otherwise continue to devastate public health.

Recommendations

- *Research and Surveillance:* Increase funding for research on the health impacts of betel quid and establish surveillance systems to track consumption patterns.
- *Early Detection and Preventive Care:* Strengthen oral health services and routine screenings for early signs of oral cancers and other related conditions in high-risk areas.
- *Community-Based Interventions:* Encourage community-driven health initiatives, including peer support groups and local health workshops.

- *International Collaboration:* Collaborate with international organizations to raise global awareness and implement effective policies.
- *Healthier Alternatives:* Promote the development of safer, culturally acceptable substitutes to betel quid.

Ethical Approval

No ethical approval is required in this study.

Consent to Participate

Yes.

Consent to Publish

Yes.

Authors' Contributions

NKJ conceptualization, drafting the manuscript, MUR data collection, analysis, writing the manuscript, TA editing, finalizing the manuscript.

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No conflict of interest.

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