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Self-Examination of The Oral Cavity as A Strategy for Awareness and Help-Seeking Behavior in Oral Cancer: Implications for The Betel Quid Chewing Community in Papua

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ABSTRACT

Oral cancer remains a major public health concern, particularly among populations exposed to tobacco, alcohol, smokeless tobacco products, and areca nut. Mouth self-examination (MSE) is a simple approach that enables individuals to recognize oral abnormalities; however, its effectiveness as a stand-alone screening method remains uncertain. This review aimed to synthesize evidence on MSE for the early detection of oral cancer and oral potentially malignant disorders (OPMDs), distinguish its diagnostic performance from its potential to improve awareness and help-seeking behavior, and assess its relevance to betel quid-chewing communities in Papua, Indonesia. A structured narrative literature review was conducted using PubMed/MEDLINE and authoritative scientific sources. Systematic reviews, meta-analyses, randomized controlled trials, diagnostic accuracy studies, Indonesian epidemiological studies, and recommendations from the International Agency for Research on Cancer (IARC) were prioritized. Evidence was synthesized across diagnostic performance, awareness and behavioral outcomes, professional oral examination, and areca nut exposure. Diagnostic studies reported low and variable MSE sensitivity, ranging from 8.6% to 43%, with one study reporting 0% sensitivity for OPMDs in a high-risk Indigenous population. In contrast, educational interventions incorporating MSE improved knowledge, awareness, self-efficacy, intentions, and self-examination practices. Professional oral examination demonstrated better diagnostic performance, with pooled sensitivity and specificity estimates of approximately 71% and 85%, respectively. Indonesian evidence indicated a substantial burden of OPMDs and strong associations with betel quid exposure, including findings from West Papua. Therefore, MSE should not be recommended as a stand-alone screening method but may serve as a complementary strategy for improving oral health literacy and encouraging timely help-seeking behavior. In Papua, oral self-examination initiatives, including SAMURI, could be culturally adapted and integrated with risk-factor education, professional oral examinations, and accessible referral pathways.

INTRODUCTION

Oral cancer is a major public health concern that significantly affects patients' ability to eat and speak, physical appearance, quality of life, and survival. The burden of oral cancer is particularly substantial in populations with a high prevalence of tobacco use, alcohol consumption, smokeless tobacco use, betel quid chewing, and areca nut consumption (International Agency for Research on Cancer, 2023; Jasim et al., 2024; Kadooka et al., 2026; Sari et al., 2024; Scott et al., 2010).

Most malignant tumors of the oral cavity are histologically classified as oral squamous cell carcinoma (OSCC). In some patients, oral cancer is preceded by mucosal abnormalities classified as oral potentially malignant disorders (OPMDs). These disorders encompass a range of oral mucosal conditions associated with an increased risk of malignant transformation, including oral leukoplakia, oral erythroplakia, proliferative verrucous leukoplakia, and oral submucous fibrosis (Elango et al., 2011; Furquim et al., 2014; Ghasemian et al., 2024; Lee et al., 2019; López-Jornet et al., 2015).

The oral cavity offers an anatomical advantage for visual examination because much of its mucosal surface is directly accessible for inspection. Nevertheless, oral cancer is frequently diagnosed at an advanced stage. One contributing factor is that early-stage lesions may be asymptomatic or painless and can be mistaken for common mouth ulcers or other benign oral abnormalities (Essat et al., 2022; International Agency for Research on Cancer, n.d.; Sankaranarayanan et al., 2005; Walsh et al., 2021; Warnakulasuriya et al., 2021).

Delays in seeking professional healthcare are also influenced by health literacy, perceived risk, geographic accessibility, socioeconomic conditions, and the availability of healthcare professionals trained to recognize suspicious oral lesions. These challenges are particularly relevant in Papua, Indonesia, where extensive geographic distances and geographically dispersed communities contribute to disparities in access to dental care, medical services, biopsy facilities, and specialist consultations. Furthermore, areca nut chewing remains an established social and cultural practice in various Papuan communities, underscoring the importance of culturally appropriate approaches to oral cancer prevention and early recognition (Kerr & Lodi, 2021; World Health Organization, 2022; Yang et al., 2021).

The International Agency for Research on Cancer (IARC) has classified areca nut and betel quid, both with and without tobacco, as carcinogenic to humans, with established associations with oral cancer. Regional epidemiological evidence has also indicated strong associations between betel quid chewing, OPMDs, and oral malignancies. In this context, accessible strategies that improve individuals' ability to recognize potentially suspicious changes in the oral cavity may offer important public health benefits.

Mouth self-examination (MSE) involves systematically inspecting the oral cavity, typically using a mirror and adequate lighting, to identify visible abnormalities. This approach is relatively inexpensive, requires minimal equipment, and can be performed at home. However, two distinct potential roles of MSE must be considered. The first is its use as a screening method intended to identify individuals with suspected oral disease. The second is its use as a health education strategy to improve awareness of oral abnormalities and encourage individuals to seek professional evaluation when suspicious changes are identified.

This distinction is particularly important because an effective screening method must demonstrate adequate diagnostic sensitivity to minimize false-negative results. When sensitivity is low, individuals with oral cancer or OPMDs may fail to recognize existing abnormalities and incorrectly assume that their oral cavity is healthy, potentially delaying professional consultation. Consequently, the value of MSE should be evaluated not only in terms of its diagnostic performance but also its potential to improve oral health awareness, risk recognition, and timely help-seeking behavior.

Accordingly, this review aimed to synthesize evidence regarding the diagnostic performance of MSE in detecting oral cancer and OPMDs, clarify its appropriate role within oral cancer prevention and early detection strategies, and examine its implications for betel quid- and areca nut-chewing communities in Papua. The review also sought to provide a conceptual foundation for distinguishing self-examination as a diagnostic screening approach from its role as a health literacy intervention. Its findings were intended to inform healthcare professionals, public health program managers, and future community-based research initiatives in developing culturally appropriate strategies that integrate oral health education, professional examination, and timely referral within Indonesia's oral cancer prevention framework.

METHOD

Design

This study employed a structured narrative literature review with an integrative synthesis approach to examine evidence from diagnostic accuracy studies, educational intervention trials, randomized controlled trials, epidemiological studies, systematic reviews, meta-analyses, and international guidelines and recommendations.

Literature Search Strategy

The literature search was conducted using PubMed/MEDLINE and relevant authoritative scientific sources.

The combination of keywords used include: mouth self-examination, oral self-examination, oral cancer, oral squamous cell carcinoma, oral potentially malignant disorders, early detection, oral cancer screening, health awareness, help-seeking, areca nut, betel quid, Indonesia, Papua, clinical oral examination, and community health worker.

Additional literature was obtained through bibliography search from systematic reviews, meta-analyses, and main articles.

Literature Criteria

Literature is included when:

1. involving humans;
2. discuss self-examination, OPMD, oral cancer, or early detection;
3. assess diagnostic, educational, behavioral, or epidemiological outcomes;
4. discuss at-risk populations or risk factors for oral cavity cancer;
5. It is a primary study, systematic review, meta-analysis, randomized controlled trial, or recommendation of an international scientific institution.

Articles that only discuss cancer therapy with no connection to prevention or early detection are not the main focus.

Data Synthesis

The evidence is synthesized into four themes:

1. diagnostic performance of self-examination oral examination;
2. the effect of MSE education on knowledge and behavior;
3. the role of oral cavity examination by health workers;
4. areca nut risk factors and their relevance to Papua.

Because there is heterogeneity in the population, examination techniques, definition of positive outcomes, educational methods, and outcomes, no new meta-analyses were conducted.

RESULTS AND DISCUSSION

Oral Self-Examination Diagnostic Performance

A number of studies have shown that MSE's ability to detect OPMD is not sufficient to be used as a single screening method. Scott et al. assessed self-examination of 53 smokers over 45 years of age. Participants were given a leaflet containing examination guidelines. The sensitivity of MSE in recognizing potentially malignant lesions was only 33%, with a specificity of 54%, a positive predictive value of 17%, and a negative predictive value of 73%. The findings suggest that most potentially malignant lesions can be unrecognizable by individuals who self-examined. Similar results were found in the study of Furquim et al. of patients with Fanconi anemia. Although the population had a high risk of oral cavity cancer, the sensitivity and specificity of MSE were only about 43% and 44%, respectively.

Another study of Indigenous populations with high exposure to tobacco and quid betel showed MSE sensitivity to only 8.6% for all mucosal lesions. For OPMD, sensitivity was even reported at 0%, although the specificity was relatively high. Overall, the pattern suggests that negative MSE results cannot be used to rule out the presence of disease. Thus, MSE has not been able to replace oral cavity examinations performed by health workers.

MSE and Awareness Raising

Different results were found when MSE was assessed as an educational intervention. Elango et al. conducted their own oral screening program on more than 34,000 participants at risk of oral cancer. Although the sensitivity of MSE was only about 18%, public awareness of oral cancer and its risk factors increased to more than 80%.

These findings suggest that the benefits of MSE can not only be measured through the number of lesions found. MSE can provide opportunities for communities to:

1. get to know the anatomy of the oral cavity;
2. knowing the abnormal signs;
3. understand risk factors;
4. increase attention to the condition of the body;
5. and be more prepared to seek help.

However, the study also shows that not all individuals who are advised to seek health services actually come to be examined. This suggests that increased awareness must be accompanied by an easily accessible health service pathway.

Behavior Change through Educational Interventions

Some studies have shown that an active educational approach yields better results than just leaflets. López-Jornet et al. show that hands-on education about oral cancer and self-

examination methods can improve MSE practices. A person's perception of susceptibility, the severity of the disease, and the benefits of screening play an important role in behavior change.

Lee et al. conducted a randomized controlled trial in Aboriginal communities in remote areas. Individualized education provided by lay health advisors increased the likelihood of participants having their own oral exams monthly about twice compared to the group that only received leaflets.

The intervention also increased self-efficacy and reduced the barriers felt by participants to oral cancer screening. Ghasemian et al. used the Theory of Planned Behavior approach in 400 participants. The educational intervention improved oral self-examination, intention, attitude, subjective norm, and perceived behavioral control. The effect was still visible at the three-month evaluation.

The findings suggest that the effectiveness of MSE as a public health intervention is likely influenced by the quality of education. Programs that only provide passive information tend to be less effective than programs that involve: education, demonstration, practice, reinforcement, and referral information.

Standardization of Self-Examination

Recent systematic reviews that specifically assess MSE methods found large variations between studies. Differences include:

1. the anatomical part examined;
2. the order of examination;
3. the use of mirrors;
4. type of lighting;
5. the presence of palpation;
6. educational media;
7. frequency of inspection;
8. and success evaluation methods.

This heterogeneity is one of the reasons why there is no universal MSE protocol that can be recommended. Standardization is important if MSE is to be developed as a public health program.

Oral Cavity Examination by Health Workers

Professional examinations showed better performance. A meta-analysis of Essat et al. showed that conventional oral examination in patients with clinically visible lesions had a sensitivity of about 71% and a specificity of 85% to identify dysplastic or malignant lesions.

When the analysis included only malignant lesions, sensitivity increased to about 88%. Other findings suggest that trained frontline health workers may have a good enough ability to perform oral cavity examinations. This is important for areas with a shortage of specialist dentists. Trained primary care physicians, dentists, nurses, and community health workers can be part of the early detection system.

High-Risk Group Screening

One of the important studies on oral cancer screening was conducted in Kerala, India. In a cluster randomized controlled trial with a very large population, visual examination of the oral cavity was performed by trained health workers. In the overall population, the

decrease in oral cancer mortality did not show a significant difference. However, in the tobacco or alcohol user group, periodic screening provided a benefit to mortality. The findings support the risk-based screening approach, which prioritizes groups with high risk factors. This approach is also in line with the IARC recommendation that clinical examination of the oral cavity in high-risk populations may play a role in reducing oral cancer mortality.

Areca Fever and the Risk of Oral Cavity Cancer

Areca Nut as a Risk Factor

Areca nut or areca nut is one of the important risk factors for oral cavity cancer. Chronic exposure can cause a variety of biological changes in oral cavity tissue, including oxidative stress, DNA damage, chronic inflammation, changes in cell proliferation, and fibrosis. IARC has placed areca nut as a carcinogen in humans. The risk can increase when areca nut is used with other ingredients such as tobacco.

Evidence of Southeast Asia and the Pacific

A meta-analysis of Jasim et al. involving more than 19,000 participants from the Southeast Asia and Pacific region showed a strong association between betel quid use and OPMD or oral cavity malignancy. The pooled odds ratio was reported to be around 8.18. These findings show that areca nut users are a group that has a strong reason to be targeted for primary prevention and early detection programs.

Evidence of Indonesia and its relevance to Papua

Sari et al. conducted a cross-provincial study in Indonesia involving 973 participants from West Java, Jakarta, West Papua, West Kalimantan, and Banda Aceh. OPMD was found in about 14.1% of participants. Leukoplakia is one of the most commonly found disorders.

Consumption of betel quid has a strong relationship with OPMD. The study also showed that the pattern of betel nut use differed between regions. Participants from West Papua found that the use of a combination of areca nut, lime, and certain parts of betel plants was found to be different from consumption patterns in other regions. The use of betel stem inflorescence was associated with an increased risk of OPMD compared to the use of betel leaves. The addition of tobacco in betel quid mixture was also associated with a higher risk.

The findings show that the risk of oral cavity cancer is not only determined by the presence or absence of betel nut chewing habits, but is also influenced by:

1. mixed composition;
2. duration of consumption;
3. frequency;
4. tobacco use;
5. and possible other social and biological factors.

The local context needs to be considered in the preparation of oral health programs in Papua.

Paradox Mouth Self-Examination

The main findings of this review show a clear difference between the diagnostic capabilities and educational value of MSE. As a screening tool, MSE has a major disadvantage in the form of low sensitivity. The general public is not always able to distinguish between normal variations of the oral cavity and suspicious lesions.

Some early lesions can be very thin, painless, or in locations that are difficult to see. In addition, a self-examination cannot accurately assess:

1. induration;
2. depth of lesions;
3. network characters;
4. dysplasia;
5. and histopathological changes.

Therefore, MSE should not be positioned as a substitute for doctors or dentists. Instead, as a health literacy intervention, MSE has greater potential. MSE can help people recognize their own normal oral cavity and be more aware of changes sooner. Thus, the right question is not:

"Are people capable of diagnosing cancer on their own?"

rather:

"Can self-examination make people more quickly aware of changes and seek help?"

Based on the available evidence, the answer to the second question is more promising.

Mse Repositioning in Early Detection

MSE is more accurately placed as:

health awareness and help-seeking intervention

from:

stand-alone cancer screening test.

Such repositioning is important to prevent false security. A person who performs an examination and does not find abnormalities cannot conclude that he or she is free of OPMD or cancer.

On the other hand, MSE can help the community recognize changes such as:

1. settling wounds;
2. white spots;
3. red spots;
4. red-white combination;
5. lumps;
6. thickening of the tissue;
7. unexplained bleeding;
8. difficulty moving the tongue;
9. or other abnormalities that are different from the usual condition.

Samuri as a Local Adaptation

In the Indonesian context, the concept of MSE can be translated as SAMURI—Check Your Own Mouth. SAMURI can be defined as:

An educational strategy for self-examination that aims to increase awareness of risk factors for oral cavity cancer, the ability to recognize persistent changes, self-efficacy, and seek professional help early, not to enforce self-diagnosis.

This concept allows the international evidence on MSE to be translated into a simpler and more understandable approach.

Samuri Steps

SAMURI can be taught systematically through the examination:

1. outer and inner lips;
2. mucosa of the right and left cheeks;
3. gums;
4. palate;
5. the upper surface of the tongue;
6. right and left sides of the tongue;
7. the lower part of the tongue;
8. base of mouth;
9. Persistent or unusual changes.

The examination is done with clean hands, adequate lighting, and a mirror. The message that should accompany every SAMURI education is:

Oral examination alone cannot ensure that a person is free from cancer. If there are persistent or suspicious abnormalities, an examination by a health professional is required.

Early Detection Model of Oral Cavity Cancer in Papua

Models that are more in line with the evidence can be described as follows:

Exposure to risk factors

Areca nut • tobacco • alcohol

↓

Risk awareness

↓

SAMURI / self-examination

↓

Recognize persistent or unusual changes

↓

Seeking help early

↓

Examination of the oral cavity by health workers

↓

Referral of suspicious lesions

↓

Biopsy and histopathological examination when necessary

↓

Early diagnosis and management

The approach requires three supporting components: culturally sensitive communication, trained primary health workers, and an accessible referral system.

Culturally Sensitive Risk Communication

Areca nut has a broader meaning than just a consumable ingredient for some Papuans. Areca nut can have social, relational, and cultural functions. Therefore, judgmental health communication risks causing resistance.

Health promotion approaches should respect the cultural context while clearly conveying health evidence.

Healthcare workers can use a dialogue-based approach:

"Areca nut is part of people's social lives, but long-term use can also increase the risk of changes in the oral tissue. By knowing the risks, people can make more conscious decisions and check themselves early if they find changes."

This approach is more in line with the principles of patient-centered care and culturally responsive health promotion.

The Role of Primary Health Services

Primary health services are the main link between the community and diagnosis.

Doctors, dentists, nurses, and public health workers can play a role in:

1. identify the history of areca nut consumption;
2. inquire about tobacco and alcohol use;
3. perform an examination of the oral cavity;
4. providing risk factor counseling;
5. teach SAMURI;
6. recognize OPMD;
7. refer to suspicious lesions;
8. monitor referral compliance.

The integration of oral cavity examination into primary services is important because people with risk factors do not always come specifically with oral cavity complaints.

Examination opportunities may arise when:

a. visits to health centers;
b. Posbindu;
c. examination of chronic diseases;
d. elderly services;
e. community activities;
f. church activities;
g. as well as community service programs.

Implications for Public Health

The oral cancer prevention strategy in Papua should include four components.

1. Primary Prevention
   Efforts to reduce exposure to risk factors remain a priority. Education needs to cover the risks of areca nut use, tobacco, and alcohol.
2. Health Literacy
   The public needs to know the signs to watch out for and understand the importance of professional examinations.
3. Self-Examination
   SAMURI can be used as a strategy to build the habit of paying attention to the oral cavity.
4. Professional Examination and Referral
   Any community intervention should be linked to a health facility that can provide follow-up evaluation. Without a clear referral system, raising awareness does not always result in an earlier diagnosis.

Research Agenda

SAMURI has the potential to be further developed through community-based research.

The first stage is the development of evidence-based modules.

The second stage is in the form of content and culture validation by dentists, family doctors, health promotion experts, communication experts, and the public.

The third stage is a feasibility test to assess:

1. understanding;
2. acceptance;
3. the ability to follow steps;
4. inspection time;
5. and obstacles to implementation.

The next stage can be an intervention test to measure:

6. knowledge;
7. risk perception;
8. self-efficacy;
9. the ability to conduct examinations;
10. self-examination behavior;
11. and the intention to seek help.

Further implementation research can evaluate:

12. compliance with referrals;
13. time from the discovery of the abnormality to the consultation;
14. the number of OPMDs found;
15. integration with Puskesmas services;
16. and cost-effectiveness.

Strengths and limitations

This review integrates evidence from diagnostic accuracy studies, randomized controlled trials, educational interventions, systematic reviews, meta-analyses, international recommendations, and Indonesian research. Another strength is the clear separation between the function of MSE as a screening tool and its function as an awareness strategy.

However, there are several limitations. First, research on MSE uses very heterogeneous methods. Second, educational techniques and the sequence of examinations differ between studies. Third, some behavioral outcomes are self-reported. Fourth, evidence on the influence of MSE on cancer stages at diagnosis and mortality is still limited. Fifth, there are still very few studies that specifically evaluate the effectiveness of MSE in Papuan people.

Therefore, SAMURI needs to be seen as a model of translational intervention that still requires prospective validation.

CONCLUSION

Current scientific evidence does not support the use of mouth self-examination (MSE) as a stand-alone screening method to diagnose or rule out oral cancer and oral potentially malignant disorders (OPMDs). The diagnostic sensitivity of MSE is relatively low and variable; therefore, the absence of visible abnormalities during self-examination cannot

reliably exclude these conditions. Nevertheless, MSE may serve as a complementary health literacy strategy. Educational interventions incorporating MSE have demonstrated potential to improve awareness, knowledge, risk perception, self-efficacy, intentions to seek professional care, and self-examination practices. Professional oral examination remains an essential component of early detection strategies for oral cancer and OPMDs. In Papua, the continued cultural practice of areca nut chewing, together with Indonesian epidemiological evidence linking betel quid consumption to OPMDs, highlights the importance of developing culturally appropriate, risk-based oral health promotion and early detection programs.

SAMURI (Check Your Own Mouth) could be developed as a culturally adapted community-based initiative that integrates risk awareness, mouth self-examination, recognition of suspicious oral changes, timely help-seeking, professional oral examination, referral, and diagnostic evaluation. This approach would position MSE as a means of encouraging awareness and appropriate healthcare-seeking behavior rather than as a substitute for professional screening or diagnosis.

When implemented through culturally sensitive approaches and integrated into primary healthcare services, SAMURI could contribute to oral cancer prevention and early detection efforts among communities in Papua. However, its effectiveness in improving timely professional consultation, referral completion, and early diagnosis would require evaluation through appropriately designed community-based studies.

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CONFLICT OF INTEREST

The author states that there is no conflict of interest in the preparation of this article.

AUTHOR CONTRIBUTIONS

All authors contributed to conceptualization, search and synthesis of literature, interpretation of results, manuscript preparation, and critical review of manuscripts. All authors have read and approved the final version of the manuscript.

GENERATIVE AI STATEMENT

The authors declare that Generative Artificial Intelligence (Generative AI) was used solely to assist with language refinement, grammatical correction, and improvement of manuscript readability. All scientific concepts, interpretations, literature synthesis, analyses, and conclusions were developed by the authors. All AI-assisted content was carefully reviewed, verified, and revised by the authors, who take full responsibility for the accuracy, integrity, and final content of the manuscript.

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