
# FACTORS RELATED TO BETEL NUT CHEWING BEHAVIOR AMONG RESIDENTS OF LONGKUNXIA VILLAGE, LONGHUA DISTRICT, HAIKOU CITY, HAINAN PROVINCE, CHINA

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# 摘要

题目：海南科技职业大学云龙校区学生吸烟行为的影响因素

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本研究旨在调查海南省海口市龙华区居民的槟榔咀嚼行为及其影响因素。 研究采用横断面调查设计，以简单随机抽样的方式选取了 380 名 15 岁及以上的参与者。 采用结构式问卷收集数据，内容包括人口统计学、槟榔知识、行为特征和社会文化影响因素。 结果显示，23.7%的受访者目前咀嚼槟榔，41.3%的受访者将槟榔与烟草混合咀嚼。 受教育程度和对槟榔的了解程度与咀嚼行为有显著相关性（$p < 0.01$），而性别、年龄和收入则无统计学意义。 知识水平较高的参与者咀嚼槟榔的可能性较小。 研究结果表明，咀嚼槟榔的行为在该地区仍然很普遍，并且受到文化、家庭和认知因素的影响。 建议加强对低学历群体和青少年的健康教育，提高他们对槟榔健康风险的认识，减少槟榔的食用量。

**关键词：**槟榔/健康行为/青少年/风险认知/海南

# ABSTRACT

**Title** : Factors Related to Betel Nut Chewing Behavior Among Residents of Longkunxia Village, Longhua District, Haikou City, Hainan Province, China

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This study aimed to examine betel nut chewing behavior and its influencing factors among the population in Longhua District, Haikou City, Hainan Province. A cross-sectional analytical study design was employed, and 380 participants aged over 15 years and older were selected using simple random sampling. Data were collected using a structured questionnaire that covered demographic information, knowledge about betel nut, behavioral characteristics, and socio-cultural influences.

The findings revealed that 23.7% of respondents reported currently chewing betel nuts. Additionally, education level and knowledge about betel nut were significantly associated with chewing behavior ($p < 0.01$), while gender, age, and income showed no statistically significant relationship. Participants with higher knowledge levels were less likely to engage in betel nut chewing than those with lower

knowledge. These results indicate that betel nut chewing remains prevalent in the region and is influenced by cultural, familial, and cognitive factors.

Based on these findings, it is recommended that health education should be strengthened, particularly among low-education populations and adolescents, to enhance awareness of the health risks associated with betel nut chewing and reduce its prevalence in the long term.

**Keywords**: Betel nut, Health behavior, Adolescents, Risk perception, Hainan

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# CHAPTER I

# INTRODUCTION

## Background and rationale

Betel nut is one of the most widely consumed substances in the world (Arora & Squier, 2019) and is now the fourth most popular addictive substance after nicotine, ethanol and caffeine. Research and survey data show that about 700 million people worl dwide chew betel nut in different forms, accounting for 10% of the total global population (Li F. Q., Wei Y. X., Lu J,2020). The world's former or existing betel nut chewing habits of the region: Bangladesh, Burma, Khmer, India, Thailand, Pakistan, Vietnam and so on. Betel nut is the fruit of a tropical evergreen tree, Betel nut, mainly produced in Southeast Asia, Indonesia, Malaysia, and China, Taiwan, Guangdong, Hainan, Guang Xi, Yunnan, etc. (Liu Shuwei, et al,2024) , for a long time, for some of the countrymen and residents of South and Southeast Asia prefer a kind of chewing, In China alone, 100 million people consume betel nut. The domestic chewing population is mainly distributed in Hunan, Taiwan, Fujian, Hainan, Yunnan. There are regional and individual differences in the way betel nut is chewed. In Hainan, betel nut chewing is mainly a combination of raw and dried betel nut.

With the increase of migration and travel to Europe and the United States in the Asia-Pacific region, betel nut has been widely spread around the world. However, betel nut itself is classified as a Class I carcinogen by the International Agency for Research on Cancer (IARC) under the World Health Organization (WHO). Long-term betel nut chewing is closely associated with serious health problems such as oral cancer and oral

mucosal fibrosis. Betel nut blocks in the active ingredients are: betel nut alkaloids. Betel nut secondary alkaloids. Currently, it turns into ammonium nitrite through nitrosyl Tion, which has a toxic effect on cells.According to the statistics of the Department of Health of Taiwan, 80% of oral cancer patients are caused by betel nut chewing. Medical experts in Taiwan believe that long-term betel quid chewing is prone to oral cancer, and it is also easy to cause periodontal disease, oral mucosal disease, loss of appetite, salivation and other diseases. 2017, Xiangya Hospital of Central South University published a research paper on the number of oral cancer patients in Hunan Province in the Chinese Journal of Dental Research, using 10 years of data from five hospitals in Changsha, and concluded that long-term betel quid chewing led to oral cancer accounted for 85.53% of the oral cancer patients. 85.53% of oral cancer patients.Betel nut chewing is strongly associated with the development of oral cancer and oral precancerous lesions. Betel nut chewing may also lead to oral submucous fibrosis and oral leukoplakia, which is a precancerous lesion of the oral cavity. In addition to oral and oropharyngeal cancer, betel nut can also cause esophageal cancer. In addition, betel nut chewing is also associated with the development of liver cancer. Apart from causing cancer and precancerous lesions, betel nut chewing also has other adverse health effects such as hypertension, obesity, high blood sugar, high blood lipids and metabolic syndrome (Zhao X., 2017).

Since ancient times, Hainan people have the habit of chewing betel nut, and formed a rich betel nut culture, betel nut has become a Hainanese marriage, socialization, rituals and New Year's Eve customs in the necessary supplies. The formation of betel nut culture in Hainan is closely related to the local natural geographic environment, economic and production activities, as well as historical and cultural heritage, Li aesthetic concepts and the influence of Han culture. A study found that the rate of betel nut chewing among

community residents in Haikou City is 17.4%, with a higher rate of betel nut chewing among male residents (27.6% for men vs. 3.8% for women). It was also found that Haikou residents had a low awareness of betel nut as a disease-causing agent, with only 15.0% of the respondents believing that betel nut itself contains carcinogens. Betel nut chewers often combined with the use of tobacco and alcohol psychoactive substances, there are 1/2, 1/3 and more than 1/3 of the betel nut chewers were accompanied by smoking, drinking, smoking and drinking habits, respectively, this betel nut chewing habits, which greatly increased their risk of oral cancer.

Betel nut is widely spread all over the world. However, betel nut itself has been classified as a Class I carcinogen by the International Agency for Research on Cancer (IARC) under the World Health Organization. Long-term betel nut chewing is closely associated with serious health problems such as oral cancer and fibrosis of the oral mucosa. In China, the habit of betel nut chewing is particularly prevalent in southern provinces such as Hainan, Hunan, and Taiwan. In Hainan Province, chewing betel nut has a long cultural history, often associated with hospitality, social bonding, and traditional customs. Among the Hainanese, especially in Haikou City, this practice is deeply rooted, forming a distinct "betel nut culture." According to a study by Zhang et al. (2017), the prevalence of betel nut chewing among community residents in Haikou was found to be approximately 17.4%, with higher rates observed among men and older adults.This has laid a great hidden danger to the health of local residents. in order to Study the Betel Nut Chewing Behavior of the Population in Longhua District, Haikou City, Hainan Province, China, and investigation to Study the Factors Influencing Betel Nut Chewing Behavior Among the Population in Longhua District, Haikou City, Hainan Province, China. China. Conducting the present study (Zhang, Q.el, 2017).

## Objective

1. To Study the Betel Nut Chewing Behavior of the Population in Longhua District, Haikou City, Hainan Province, China
2. To examine the factors related to the betel nut chewing behavior of the population in Longhua District, Haikou City, Hainan Province, China.

## Research question

1. What is the betel nut chewing behavior of the population in Longhua District, Haikou City, Hainan Province, China?
2. What are the factors related to the betel nut chewing behavior of the population in Longhua District, Haikou City, Hainan Province, China?

## Hypothesis

1. The population in Longhua District, Haikou City, Hainan Province, China, demonstrates a moderate level of betel nut chewing behavior.
2. Personal factors and knowledge are significantly related with the betel nut chewing behavior of the population in Longhua District, Haikou City, Hainan Province, China.

**Operational definition**

Betel nut chewing refers to the practice of chewing the immature fruit of the betel nut, which should not be swallowed. The betel nut is usually harvested when the internal seeds have not yet hardened and the endosperm is still fluid or paste-like. Betel nut chewing is often done in combination with betel leaves, which may be coated with red or white ash, and sometimes it is chewed along with betel flowers or fresh fruit.

Longkunxia Village Longkunxia Village is located in Longhua District, Haikou City, Hainan Province, east of Longkun on the village, the south to the west of Yilong Road, west of Longkun North Road, north of Longhua Road, the area of about 0.11 square kilometres. The resident population is 5453 people in 1996 household.

How to get betel nut Purchase at markets or supermarkets: betel nut is available at local supermarkets or shops. Online purchase: Betel nut products from Hainan can be purchased through e-commerce platforms (e.g. Taobao, Jingdong, etc.). Search for "Haikou betel nut" or "Hainan betel nut" to find related products. Buy betel nut directly from betel nut plantations: There are many betel nut plantations in and around Haikou, some of which may sell betel nut directly, and tourists can buy fresh betel nut during their visit. There are more mobile vendors selling betel nut on the streets of Haikou City.

Betel nut chewing behavior In this study, betel nut chewing behavior refers to the action of individuals who chew areca nut (Areca catechu) either alone or in combination with other substances such as betel leaf, slaked lime, tobacco, or various spices. This behavior is characterized by regular and repeated chewing over an extended period of time. It is commonly found in South Asia, Southeast Asia, Pacific Island countries, and some regions of China. Areca nut contains a key psychoactive substance known as arecoline,

which has stimulating effects on the nervous system and may lead to a certain degree of addiction. (Warnakulasuriya & Chen, 2022)

Knowledge of betel nut In this study, knowledge of betel nut refers to the population's understanding of Areca catechu and its primary active compound, arecoline. This includes botanical characteristics, chemical composition, pharmacological effects, mechanisms of addiction, pathogenesis, and the impact on various body systems related to health. This knowledge is assessed through a self-report questionnaire, based on predefined evaluation criteria. (Garg A, 2022)

**Expected Benefits and applications**

Individual level:Betel nut chewing is associated with a variety of health problems (e.g., oral cancer, digestive disorders, etc.). Through the study, individuals can be made aware of the potential health risks of betel nut chewing and thus promote health behavior change to reduce betel nut chewing habit. The data and analysis provided by the study can inform behavioral intervention strategies for betel nut chewers. For example, designing more effective betel nut cessation programs and providing more targeted health education could reduce betel nut chewing rates.

Social dimension The results of this study could provide a scientific basis for local governments and public health departments to develop more effective public health policies to address the health hazards associated with betel nut chewing. This may include publicity and education, legislative restrictions or the provision of support services for quitting betel nut.At the same time Betel nut has certain cultural and social significance in Hainan and other places, but its health risks should not be ignored. The study will help

society to reflect on betel nut culture, promote socio-cultural change, and prompt the public to re-examine the social value and health impacts of betel nut.

# CHAPTER II

# LITERATURE REVIEW

This chapter presents the relevant concepts, theories, and conceptual framework that serve as the foundation for conducting this research. It provides an overview of the theoretical framework that structures the study and includes a review of related literature to support and clarify the research, as detailed below.

**What is betel nut?**

Betel nut, genus Betel nut of the palm family, scientific name Areca catechu L. It is an evergreen tree, commonly used for medicinal purposes. Seeds contain a variety of alkaloids, the active ingredient is betel nut alkaloids (Arecoline, D8H13O2N), the content of about 0.1-0.5%, with anthelmintic, elimination of stagnation, Qi, diuretic and other efficacy, the main treatment of stagnation, abdominal distension, ascites, dysentery, cestode worms, ascaris lumbricoides, schistosoma, and so on. Southeast Asia, Africa and the Pacific region residents to chew betel nut instead of tobacco as a hobby. A few people in China's Yunnan and Hainan provinces also have the habit of chewing betel nut. Native to Malaysia, China has a long history of cultivation, the main producing areas for the southeastern and central Hainan Province. Betel nut is a class 1 carcinogen in the World Health Organisation's International Agency for Research on Cancer (IARC) list of carcinogens, and has been classified as a drug by Turkey, Singapore, the United Arab Emirates, Canada, Australia and other countries, and has been banned from sale in many European and American countries.

Retrieved from：Chinese Crop Germplasm Resources Information System

## Betel nut eating behaviour

### Why try betel nut

The reasons why most people initiate betel nut use can generally be categorized into four main areas. First, cultural and traditional influences play a significant role in many parts of South and Southeast Asia, where betel nut chewing is often embedded in local customs, religious rituals, weddings, and festivals. Second, the social function of betel nut chewing is evident in some communities, where it serves as a medium for interpersonal interaction and bonding. Third, due to the presence of psychoactive alkaloids such as arecoline, some individuals are drawn to betel nut for its stimulating and refreshing effects. Finally, curiosity also motivates some to try betel nut, as they seek to experience a novel oral habit (Wu, Kong, & Wan, 2020; Jasim et al., 2024).

## Betel nut chewing behaviour

People do not chew the fresh betel nut fruit directly, but usually wrap the betel nut seeds with betel leaf and slaked lime and add spices or sweeteners. The addition of quicklime raises the pH of the betel nut product, increasing the delivery and absorption of psychoactive ingredients such as betel nut alkaloids. A variety of flavourings are often added during consumption, including traditional spices (e.g. cardamom, saffron, cloves, fennel, turmeric, and mustard), sweeteners (e.g. coconut and dried dates), and seasonings (e.g. menthol and mint), which vary according to regional tastes. In the Solomon Islands

and Papua New Guinea, betel nut seeds are commonly wrapped in piper betel leaves, while betel nut without piper betel leaves is more common on other Pacific islands; Pacific Islanders and people in Taiwan, China, often consume the whole, unripe betel nut fruit; and people in mainland China consume mainly the unripe rind. The main reason for the popularity of betel nut is its tobacco-like addictive properties and the greater dependence on tobacco-added betel nut than on betel nut alone. Most people reportedly consume betel nut with tobacco. In addition, the consumption of slaked lime as an added ingredient also increases dependence (Guo Shao dan&Deng Yunlong.(2020))

**Topic of related research**

In a study by Hui-Ching Chuang (2022). The major predisposing factors of developing oral cancer include smoking, alcohol drinking, and betel quid chewing. Betel quid chewing could cause the abrasion and damage of oral mucosa by crude fibers, chemical insults by additive slaked lime, and arecoline from areca nut. These would lead to the local consequence of oral submucosal fibrosis, which is regarded clinically as a precancer lesion and a major cause of trismus. In addition, the components and additives in betel quid contain chemical toxins and carcinogens, which would further affect the oral mucosa and gradually develop a malignancy. Following literature review, aside from having a greater total tumor burden and more local diseases in the oral cavity and digestive tract, patients with betel quid-related oral cancer also have more systemic diseases from metabolic syndrome, hypertension, cardiovascular disease, type II diabetes mellitus, and obesity than those without this habit. In conclusion, those patients who have the history of smoking, alcohol drinking, and betel quid chewing would present much more unique

clinical characteristics than those who only have a history of smoking and alcohol drinking. More attention should therefore be paid to pretreatment evaluation, treatment strategy, and posttreatment follow-up among betel quid chewers.

In a study by Rui Liu Betel (2023) nut (Areca catechu) is a widely chewed plant that is grown and eaten in Asia and the Pacific. Prolonged consumption of betel nut may lead to oral health problems such as oral mucosal damage and oral fibrosis. The aim of this review paper is to examine the current state of research on the effects of betel nut on oral mucosal health, particularly in relation to oral injury and oral fibrosis.

This meta- analysis and scoping review clearly identify a strong association between BQ chewing, with or without tobacco, and the presence of OPMDs and MDs. This association still poses a great risk to the oral health and quality of life of chewers in the SEA and Pacific regions. While the habit may be decreasing in some regions, it has gained popularity among the local populace in other regions such as Cairns, Australia. This study delves deep into the rigid perceptions of BQ's continuous use among SEA and Pacific cultures, acknowledging the importance of understanding that constituents, methods of chewing, and gender may translate to the staging and types of OPMDs/MDs, suggesting a great benefit in harm-minimisation strategies to combat the BQ chewing endemic. There is a clear, overarching burden of OPMDs and MDs in the SEA and Pacific countries that will continue to result in high morbidity and mortality rates of oral cancer if no intervention to reduce disease risk is promptly and rigorously adopted.( Jasim A, Li X, Octavia A, Gunardi I, Crocombe L and Sari EF (2024))

Mohammad Redwanul Islam In this cohort study( Islam MR, Aktar S, Pervin J, Rahman SM, Rahman M, Rahman A, Ekström EC. (2024)), no association was observed between betel nut use by mothers during pregnancy and growth of children around five

years of age. Although catch- up growth among those born to heavy users may have attenuated any negative impact of prenatal exposure to betel quid on postnatal growth, such catch- up growth often involves greater acquisition and a more centralized distribution of body fat and insulin resistance later in life; leading to a potential heightening of cardiometabolic risk.Given that betel quid consumption during pregnancy remains socially acceptable across south and south-east Asia, this study highlights the need for following up those born to betel quid users beyond childhood for capturing long-term health implications of prenatal betel quid exposure.

Facilitator experiences and lessons learnt from the Betel nut intervention trial (BENIT): This study evaluated the effects of a betel nut withdrawal intervention trial called BENIT. The study showed that the oral health of the participants improved after quitting betel nut, especially the reduction of mouth ulcers and periodontal disease. The study also highlighted the importance of education and support in the betel nut withdrawal process.(Rojas, G.A., Erari, S., Paulino, Y.C. et al.(2024))

In a study by LIU Shuwei（2024）. Betel nut is not only the most important Nan and Li medicine, but also a popular oral hobby in South China with excellent biological activities, but the controversy over the side effects of betel nut has been plaguing the development of the betel nut industry. Currently, the market for betel nut as an oral hobby is spreading nationwide from Hunan, Hainan and Taiwan provinces. Pharmacological effects are antiparasitic, antidepressant, anti-fatigue, and digestive stimulant. The toxic side effects have oral injury, reproductive toxicity, liver toxicity and so on.

In a study by Zhang Jing（2023） It is well established that betel nut chewing can lead to oral mucosal diseases and oral cancer, but it is difficult to assess the effects of different chewing habits and different additives of betel nut chewing block on the

development of oral mucosal diseases. In this study, through the clinical investigation and analysis of two groups of people with different hobbies of chewing fresh and dry betel nut, it was confirmed that dry betel nut has a greater impact on human health in terms of pathogenicity and carcinogenicity, especially carcinogenicity, and long-term chewing is more hazardous, which is of great significance for future clinical work and disease prevention, and also indicates that the different additives in the chewing block of betel nut can have an important impact on the occurrence of oral mucosal diseases. It also suggests that different additives in betel nut chewing block can have an important effect on the occurrence of oral mucosal diseases.

In Zhao Xinran's (2023) study to understand the betel quid chewing and oral health knowledge and behavioural habits of Changsha and Xiangtan, Hunan Province, to provide information and basis for decision-making on oral health care in Hunan Province. Methods A total of 507 residents of Changsha and Xiangtan, Hunan Province, were selected by random cluster sampling from May to July 2022, and a self-designed questionnaire was used to collect the answers to the questionnaire and analyse the data using SPSS 26.0 software. The results of the survey showed that 76.7% of the male group had the habit of chewing betel nut, refreshing and wanting to eat were the main reasons, and there was a significant difference in the reasons for chewing betel nut (P=0.000). There was significant difference (P=0.0000) in the level of knowledge of the residents about betel nut chewing causing oral damage. In terms of oral health information, 81.7% of the residents were willing to spend time to learn about oral health, and the online video was the most acceptable. It is concluded that the awareness of betel nut and oral health knowledge is low among the residents of Changsha and Xiangtan, Hunan Province, so the betel nut chewing rate is still high, and it is necessary to actively promote the hazards of betel nut

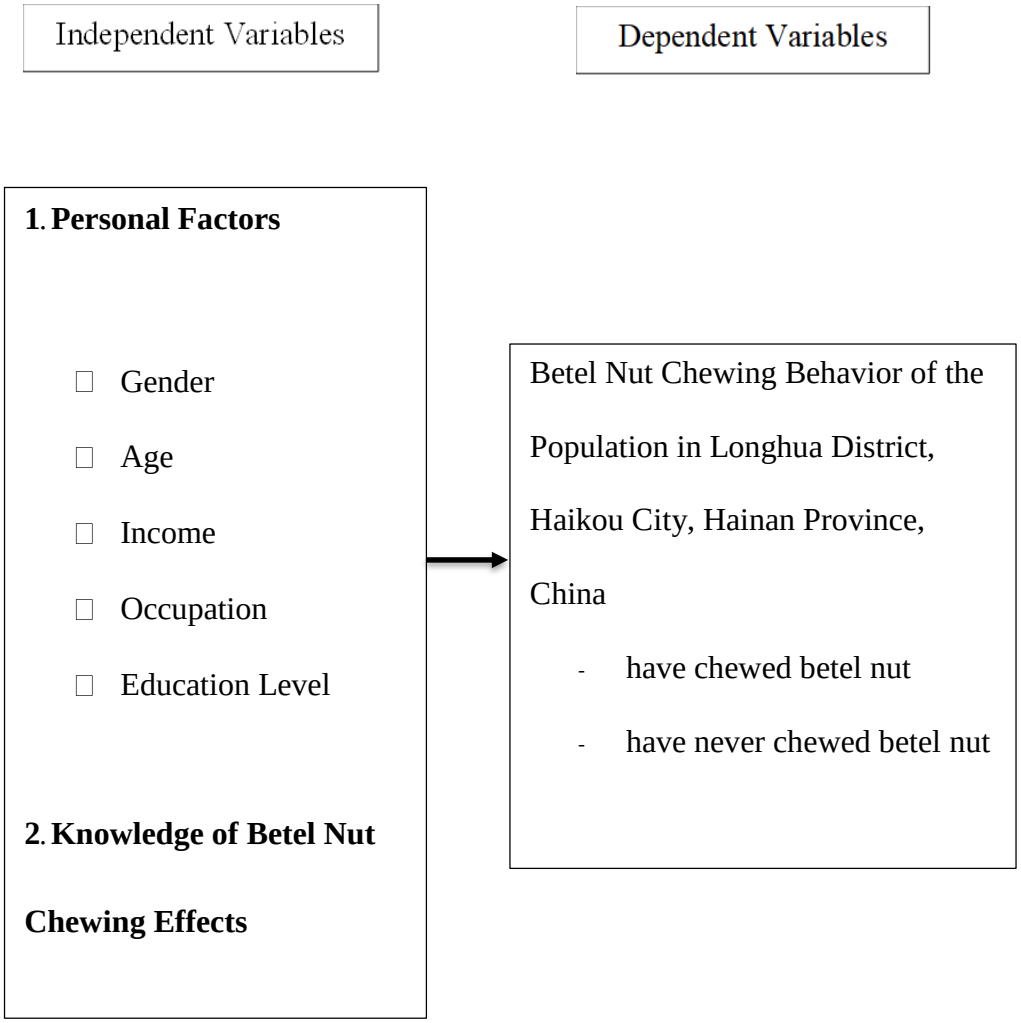
chewing and oral health knowledge in order to reduce the betel nut chewing behaviour and to improve the level of oral health.

To observe the relationship between betel nut chewing and oral submucosal fibrosis carcinoma in the study of Mingyu Zhao. Methods 160 patients with oral submucous fibrosis (OSF) who underwent surgical treatment in our hospital from January to December 2019 were selected as the case group, and 160 patients with OSF without oral squamous cell carcinoma who underwent outpatient treatment in the same period of time were selected as the control group, and the survey was conducted in the form of a questionnaire. The survey was conducted in the form of a questionnaire, which included: (i) OSF-related information: when the patients started to use betel quid, duration of betel quid chewing (years), and the amount of betel quid chewed per day (pills/d); (ii) OSF specialist examination: pathology diagnosis and staging; and (iii) oral cancer-related information: onset of disease, and pathology grading after surgery. The relationship between betel nut chewing and oral cancer was analysed by one-way analysis, Mantel-Haenszel hierarchical analysis, and multifactorial analysis with unconditional logistic regression. The results of the study showed that the duration of betel quid chewing was positively correlated with OSF cancer ($P<0.001$), and the amount of betel quid chewed per day was positively correlated with OSF cancer ($P<0.001$), and the results of the Mantel-Haenszel stratified analysis showed that there was no statistical significance of the difference between the amount of betel quid chewed per day and the amount of betel quid chewed per day and the amount of betel quid chewed per day in the sub-mucous membrane of the mouth; the ORMH value of the amount of betel quid chewed per day was significantly higher than the value of ORMH value of the amount of betel quid chewed per day. The ORMH value of daily betel nut chewing was significantly higher than the unadjusted ORC, suggesting that

age has a decreasing effect on daily betel nut chewing. Unconditional logistic regression analysis showed that age (OR 95% CI: 1.087-4.498), betel nut chewing time (OR 95% CI: 1.267-4.212), and the number of betel nut chewed per day (OR 95% CI: 1.526-3.202) were the independent risk factors for OSF carcinogenesis. Conclusion: Older age, longer betel nut chewing time, and more betel nut chewing per day were independent risk factors for OSF carcinogenesis, and there was a significant positive correlation between betel nut chewing time and amount and OSF carcinogenesis.（Zhao Mingyu, Tao Zirong, Chen Xiuwen, etc. (2021)

In a study by Yang Bo ( 2019) Chewing betel nut may cause oral and oropharyngeal cancer, but also cause many diseases in the body, which is more harmful to the body. Moreover, epidemiological surveys in many countries and regions have shown that the prevalence of betel quid chewing is very different from region to region, and the difference in the rate of betel quid chewing between men and women is also very different, which may be related to the local living habits. This may be related to the local lifestyle. Through comparison, we can also find that the incidence of oral cancer and oropharyngeal cancer is higher in countries where betel nut chewing is more prevalent. If the harmful substances in betel quid chewing can be effectively reduced or If the harmful substances in betel nut chewing are effectively reduced or the production and sale of betel nut are controlled, the incidence of oral and oropharyngeal cancers can be reduced and other diseases can be prevented to a certain extent.

**Conceptual Framework**




**Figures 1** Concept Framework

# CHAPTER III

# RESEARCH METHODOLOGY

## Research design

This research is a cross-sectional analytical study design conducted among the residents of Longkunxia Village, Longhua District, Haikou City, Hainan Province, China.

## Population and sample size

### Population

Residents of Longkunxia Village, Longhua District, Haikou City, Hainan Province, 5,453 persons in total

### Inclusion and Exclusion Criteria

To ensure the smooth conduct of this research and to safeguard the physical and mental well-being of the participants, the final research subjects were determined based on inclusion and exclusion criteria as follows:

**Inclusion Criteria**:

1. Participants are able to complete the questionnaire independently without relying on others.

2. Participants voluntarily agree to participate, are fully informed about the research protocol, and have signed the informed consent form.

**Exclusion Criteria:**

1. Participants with hearing impairments that affect their ability to communicate or accurately complete the questionnaire.

**2.** Participants who do not voluntarily cooperate in completing the questionnaire or who withdraw from participation during the data collection process.

**Sample size**

The population used in the study was 5453, and the slope did not exceed 5%or 95% confidence level, so in this study we used the following methodology forcalculations. Yamane (1967)

$$n = \frac{N}{1 + Ne^2}$$

N＝5453÷（1＋5453×0.05×0.05）

＝5453÷14.6325

＝372.66

where

n=sample size

N=population size (5453 students)

e= margin of error (often set at 0.05 for a 5% margin of error)

n＝372.66

All sample sizes are 373

Calculating the sample size with an additional 10% to account for potential non-responses or other issues results in a sample size of 410.The questionnaires were screened and finally 380 valid questionnaires were obtained.

**Sampling**

Simple random sampling was used in this study. Questionnaire survey of randomly selected villagers in Long Kun xia. Randomly invite villagers in villages to conduct questionnaire surveys.

**Study area**

Longkunxia Village, Longhua District, Haikou City, Hainan Province, China

**Study period**

During the study period from November 2024 to February 2025, questionnaires were distributed to the residents of Longkunxia Village, Longhua District, Haikou City, Hainan Province, China, to conduct a survey during this period. The data were collected, analyzed, and summarized.

**Research method**

A questionnaire was used to collect basic information related to the residents of Longkunxia Village area in Longhua District, Hainan Province. By screening and analysing the data, the influencing factors of betel nut chewing among the people in the

area were obtained. Again through these analyses the results are suggested and known for the people in the area. The data obtained can also provide relevant guiding suggestions for the local functional departments.

**Measurement instruments**

The questionnaire used in this study consists of four main sections as follows:

1. Part 1: Personal Information

This section will collect demographic data including: gender, age, income, occupations,education level.

2. Part 2: Knowledge of Betel Nut Chewing Effects

Knowledge of Betel Nut Chewing Effects

The self-assessment questionnaire consists of 15 items. Each item was scored from 0 (incorrect) to 1 (correct). The results were categorised into three levels. The classification of knowledge levels follows the Taxonomy of Learning framework using the percentage and grouping method, which can be used to assess students' learning outcomes. This method classifies knowledge into the following three levels:

Low level of knowledge (0–60%)

Moderate level of knowledge (61–70%)

High level of knowledge (80% and above)(Bloom et al., 1956; Anderson & Krathwohl, 2001).

**Table 1** Cognitive Rating Scale

| Level of Knowledge | Score Range | Number |
|---|---|---|
| Low Knowledge | Below 60.0% (0–8 points) | low knowledge level |
| Moderate Knowledge | 60.0% – 74.9% (9–11 points) | Moderate knowledge |
| High Knowledge | 75.0% and above (12–15 points) | High Knowledge |

3. Part 3:Attitudes toward smoking

This section will cover various aspects of betel nut chewing behavior, including whether you currently chew betel nut, the age at which you first started chewing, and the primary reasons for chewing (such as curiosity, tradition, or digestive aid). It will also explore the specific ingredients you use with betel nut (like betel leaf, tobacco, or sugar), your chewing frequency (daily, weekly, or occasionally), and the typical times and situations when you chew (such as during work, leisure, or social gatherings). Additionally, the section will assess how chewing makes you feel, any withdrawal symptoms when not chewing, where you usually purchase betel nut (local markets, convenience stores, or online), your average daily spending on it, and your willingness or attempts to quit. This comprehensive approach helps understand the full context of betel nut chewing habits, cultural influences, and potential health implications.

**Data collection**

In this research, the researcher will follow these steps to collect data:

1. Request a letter of certification from I-SEM, Chiang Rai Rajabhat University, to authorize the data collection process.

2. Coordinate with the relevant areas to conduct the data collection using the questionnaire.

3. Collect data using the questionnaire by coordinating with the heads of departments to schedule dates for data collection from the sample groups of each college.

4. The questionnaire used for data collection has been validated by three experts, with a validity score of 0.776, and its reliability has been calculated from a sample group similar to the target population of the research, consisting of 30 individuals, with a reliability score of 0.823

5. Collect data from the target sample group of the research, which consists of 410 individuals.After screening, 380 valid questionnaires were obtained

6. Verify the accuracy and completeness of the data obtained from the questionnaires.

7. Compile the data and conduct statistical analysis.

**Data Analysis**

The data analysis in this study is divided into two main types: descriptive statistics and correlation analysis, with details as follows:

1. Descriptive Statistics

Descriptive statistics were used to summarize the general characteristics of the data obtained from the study. The following statistical methods were applied:

1.1 Mean, Median, Mode

These were used to summarize the central tendencies of data, particularly for knowledge and food consumption behavior variables.

1.2 Standard Deviation and Variance

These were used to measure the dispersion or variability of scores for each variable.

1.3 Frequency Distribution and Percentages

These were used to describe categorical data such as gender, age, income, educational level, and occupation.

2. Correlation Analysis

Correlation analysis was used to examine the relationships between variables through appropriate statistical tests, as follows:

2.1 Chi-square Test

The Chi-square test was employed to examine relationships between categorical variables. This includes:

- Comparing the proportion or component ratio between two groups
- Comparing the proportion or component ratio across multiple groups
- Analyzing statistical relationships among categorical data

# CHAPTER IV

## Results and Discussion

This research is a study of the Betel Nut Chewing Behavior and the Factors Influencing Betel Nut Chewing Behavior Among the Population in Longhua District, Haikou City, Hainan Province, China Data was collected from a sample of 380 individuals, selected using simple random sampling (SRS) without replacement, employing a lottery method to ensure equal representation among the desired sample groups. The data collection instrument was a questionnaire. The data collected were analyzed, and the results of the analysis can be categorized as follows:

Part I: Personal factors.

Part II: Analysis of Knowledge about Betel nut chewing Among the Population in Longhua District, Haikou City, Hainan Province, China.

Part III: Analysis of Betel nut chewing behavior Among the Population in Longhua District, Haikou City, Hainan Province, China

Part IV: Analysis of Factors Influencing Betel Nut Chewing Behavior Among the Population in Longhua District, Haikou City, Hainan Province, China.

**Part I: Personal factors.**

In this study, the researcher selected using simple random sampling (SRS) without replacement, employing a lottery method to ensure equal representation among the desired sample groups. Among the Population in Longhua District, Haikou City, Hainan Province,

China. The results of the data collection provide the general information of the sample group as follows:

**Table 2** Number and Percentage of the Sample Group Classified by Gender.

| Gender | Number | Percentage |
|---|---|---|
| Male | 182 | 47.89 |
| Female | 198 | 52.11 |
| **Total** | **380** | **100.00** |

Table 2 It can be observed that the majority of the sample in this study are Female, with a total of 198 individuals (52.11%), while the Male participants account for 182 individuals (47.89%).

**Table 3** Number and Percentage of the Sample Group Classified by Age.

| Age | Number | Percentage |
|---|---|---|
| Under 18 | 112 | 29.47 |
| 19-34 | 123 | 32.36 |
| 35-60 | 85 | 22.36 |
| Over 60 years old | 60 | 15.81 |
| **Total** | **380** | **100.00** |

Table 3 It can be observed that the majority of the sample in this study are 19-34years, with a total of 123 individuals (32.36%) 325 people（61.83%）of the population are aged 34 and under, indicating that the sample is predominantly youn. of the sample, and only 85 people（15.81%） over 60 years of age, indicating that the sample has a low level of ageing.

**Table 4** Number and Percentage of the Sample Group Classified by Income

| **Income** | **Number** | **Percentage** |
|---|---|---|
| Below 3000 RMB | 176 | 46.31 |
| 3000-5000 RMB | 98 | 25.78 |
| 5000-8000 RMB | 59 | 15.52 |
| Above 8000 RMB | 47 | 12.39 |
| **Total** | **380** | **100.00** |

Table 4 Rreveals that the majority of the sample in this study have an income below 3000 RMB, comprising 176 individuals (46.31%). The second largest group is those with an income between 3000 and 5000 RMB, accounting for 98 individuals (25.78%). Individuals with an income between 5000 and 8000 RMB make up 59 individuals (15.52%), while those with an income above 8000 RMB represent the smallest group, with 47 individuals (12.39%).

**Table 5** Number and Percentage of the Sample Group Classified by Occupations.

| Occupations | Number | Percentage |
|---|---|---|
| Private enterprise | 134 | 25.36 |
| Functionary | 57 | 15.00 |
| Students | 112 | 29.47 |
| Freelancer | 77 | 20.27 |
| **Total** | **380** | **100.00** |

Table 5 Shows that the most prevalent occupation in the sample is student, with a total of 112 individuals (29.47%). This is followed by drivers, comprising 18 individuals (4.74%). The third largest group is accountants, with 13 individuals (3.42%). Other notable occupations include programmers and builders, each with 12 individuals (3.16%), and cameramen, doctors, and salesmen, with 12, 12, and 1 individual (3.16%, 3.16%, and 0.26%, respectively). The remaining occupations are relatively less represented, with each accounting for less than 3.4% of the total sample.

**Table 6** Number and Percentage of the Sample Group Classified by Education Level.

| Education Level | Number | Percentage |
|---|---|---|
| primary schools | 24 | 6.32 |
| middle school | 229 | 60.26 |
| universities | 127 | 33.42 |
| **Total** | **380** | **100.0** |

Table 6 indicates that the majority of the sample have completed middle school, with a total of 229 individuals (60.26%). This is followed by those who have attended universities, comprising 127 individuals (33.42%). The least represented group is those who have only completed primary school, with 24 individuals (6.32%).

**Part II: Analysis of Knowledge about Betel nut chewing Among the Population in Longhua District, Haikou City, Hainan Province, China**

**Table 7** Number and Percentage of Knowledge about Betel nut chewing by correct and incorrect responses.

| **Knowledge questions about betel nut chewing.** | **Correct respondents.** | | **Incorrect respondents.** | |
|---|---|---|---|---|
| | **Number** | **Percentage** | **Number** | **Percentage** |
| 1. Chewing betel nut frequently helps strengthen teeth and gums? | 100 | 26.30% | 280 | 73.70& |
| 2. Chewing betel nut for a long period may increase the risk of oral cancer? | 267 | 70.30% | 113 | 29.70% |
| 3. Alkaloids in betel nut can cause addiction? | 309 | 81.30% | 71 | 18.70% |
| 4. Chewing betel nut has no effect on the digestive system? | 82 | 21.60% | 298 | 78.40% |

**Table 7** (Continued)

| Knowledge questions about betel nut chewing. | Correct respondents. | | Incorrect respondents. | |
|---|---|---|---|---|
| | **Number** | **Percentage** | **Number** | **Percentage** |
| 5. Regularly chewing betel nut can cause teeth discoloration and plaque buildup? | 339 | 89.20% | 41 | 10.80% |
| 6. Chewing betel nut has no effect on social image? | 57 | 15.00% | 323 | 85.00% |
| 7. Chewing betel nut affects oral health, such as causing gum inflammation? | 342 | 90.00% | 38 | 10.00% |
| 8. Chewing betel nut during pregnancy may affect the baby, such as increasing the risk of preterm birth? | 338 | 88.90% | 42 | 11.10% |
| 9. Chewing betel nut can help reduce the risk of heart and vascular diseases? | 175 | 46.10% | 205 | 53.90% |
| 10. Chewing betel nut is often associated with cultural traditions in some areas? | 338 | 88.90% | 42 | 11.10% |

**Table 7** (Continued)

| Knowledge questions about betel nut chewing. | Correct respondents. | | Incorrect respondents. | |
|---|---|---|---|---|
| | **Number** | **Percentage** | **Number** | **Percentage** |
| 11. Long-term betel nut chewing may negatively impact mental health, such as causing addiction? | 294 | 77.40% | 86 | 22.60% |
| 12. Chemicals in betel nut have a stimulating effect on the nervous system, providing temporary refreshment? | 336 | 88.40% | 44 | 11.60% |
| 13. Chewing betel nut benefits gum health and reduces the risk of tooth decay? | 89 | 23.40% | 291 | 76.60% |
| 14. Betel nut chewing is a common cause of addiction, making it difficult for many people to quit? | 318 | 83.70% | 62 | 16.30% |
| 15. Chewing betel nut has no long-term negative effects on oral health? | 364 | 95.80% | 16 | 4.20% |

From table 7, Public awareness of betel nut's effects showed stark disparities: while most recognized its oral cancer risk (Q2: 70.30%), addiction potential (Q3: 81.30%; Q14: 83.70%), and pregnancy hazards (Q8: 88.90%), critical gaps persisted—73.70% falsely

believed it strengthens teeth (Q1), 78.40% overlooked digestive harm (Q4), and 76.60% erroneously linked it to gum health (Q13). Social perception was severely underestimated (Q6: 15.00% correctly noted its negative image), and 53.9% incorrectly assumed cardiovascular benefits (Q9). High awareness of teeth discoloration (Q5: 89.20%), oral inflammation (Q7: 90.00%), and cultural ties (Q10: 88.90%) contrasted with poor understanding of mental health impacts (Q11: 77.40% correct) and nervous system stimulation (Q12: 88.40%). Alarmingly, 4.2% still denied long-term oral harm (Q15), revealing entrenched myths. Targeted education should prioritize debunking "health benefits" (Q1/Q9/Q13), amplifying systemic risks (Q4/Q11), and addressing social stigma (Q6).Key issues: Misinformation about dental/physiological "benefits" (Q1/Q13) and underestimated social consequences (Q6) may perpetuate use, despite strong awareness of addiction (Q3/Q14) and acute oral damage (Q5/Q7/Q15).

**Table 8** The number and percentage of respondents categorized by the level of Knowledge about Betel nut chewing.

| Knowledge level. | Score range. | Number | Percentage |
|---|---|---|---|
| Low knowledge. | 0-8 | 70 | 18.42 |
| Moderate knowledge | 9-11 | 251 | 66.05 |
| High knowledge. | 12-15 | 59 | 15.53 |
| **Total** | | **380** | **100.0** |

Mean = 9.82 , S.D. =1.94 , Min =4 , Max = 14.

From the table, the majority of respondents (66.05%) exhibited moderate knowledge (scores 9–11), indicating a general awareness of the topic, though key details may still be lacking. A smaller portion (15.53%) demonstrated high knowledge (scores 12–15), suggesting a solid grasp of the subject and stronger comprehension of its implications. Meanwhile, 18.42% fell into the low knowledge category (scores 0–8), pointing to notable misunderstandings or limited exposure. Importantly, the combined proportion of respondents with low and moderate knowledge (84.47%) significantly exceeded those with high knowledge, underscoring ongoing challenges in achieving comprehensive understanding across the population.

**Part III: Analysis of Betel nut chewing behavior Among the Population in Longhua District, Haikou City, Hainan Province, China**

**Table 9** Number and percentage of sample groups by Betel nut chewing behavior.

(n=380)

| **Betel nut chewing behavior** | | **Number** | **Percentage** |
|---|---|---|---|
| Never chewed betel nut | | 140 | 36.84 |
| Chew betel nut | Tried chewing betel nut but no longer chew | 150 | 39.47 |
| | Currently chewing betel nut | 90 | 23.69 |
| **Total** | | **380** | **100.00** |

From table 9, assessment of betel nut chewing behavior revealed three distinct groups: those who never chewed betel nut (36.84%), those who tried but no longer chew (39.47%), and current chewers (23.69%). This distribution indicates that while a majority have experience with betel nut, a significant portion have ceased the behavior, suggesting potential awareness of associated health risks or changing attitudes over time.

**Table 10** Number and percentage of sample groups by age did you first start chewing betel nut. (n=240)

| Age at first betel nut chewing | Number | Percentage |
|---|---|---|
| Under 15 years | 67 | 27.92 |
| 15-24 years | 91 | 37.92 |
| 25-34 years | 44 | 18.33 |
| Over 35 years | 38 | 15.83 |
| **Total** | **240** | **100.0** |

From table 10,The age of first betel nut use reveals critical risk periods, with nearly two-thirds of users initiating before age 25 (65.84% combined for <15 and 15-24 groups). Early initiation (<15 years) represents over one-quarter of cases (27.92%, n=67), peaking in adolescence/young adulthood (15-24 years: 37.92%, n=91). Only 15.83% (n=38) began after 35 years, suggesting betel nut use predominantly starts in youth.

**Table 11** Number and Percentage of Sample Groups by Frequency of betel nut chewing. (n=240)

| Frequency of betel nut chewing | Number | Percentage |
|---|---|---|
| Every day | 95 | 39.58 |
| 2-3 times a week | 52 | 21.67 |
| Once a month or less | 36 | 15.00 |
| Never chew | 57 | 23.75 |
| **Total** | 240 | 100.00 |

From table 11, The frequency distribution reveals significant public health concerns, with 61.25% of users (combining daily and weekly consumers) demonstrating regular betel nut use patterns. Daily consumption represents the most prevalent pattern (39.58%, n=95), indicating established addictive behaviors in this subgroup.

**Table 12** Number and percentage of sample groups by the main reason for starting betel nut chewing. (n=240)

| The main reason for starting betel nut chewing | Number | Percentage |
|---|---|---|
| Curiosity | 88 | 36.67 |
| Following local traditions | 77 | 32.08 |
| To aid digestion | 75 | 31.25 |
| **Total** | **240** | **100.0** |

From table 12, The primary drivers for betel nut initiation present three distinct intervention opportunities, with curiosity emerging as the leading factor (36.67%, n=88), closely followed by cultural traditions (32.08%, n=77) and perceived digestive benefits (31.25 %, n=75).

**Table 13** Number and percentage of sample groups by betel nut chewing with other ingredients. (n=240)

| Betel nut chewing with other ingredients | Number | Percentage |
|---|---|---|
| Betel leaf | 69 | 28.75 |
| Tobacco | 99 | 41.25 |
| Sugar | 72 | 30.00 |
| **Total** | **240** | **100.00** |

From Table 13, The analysis reveals concerning polysubstance use patterns, with tobacco being the most common additive (41.3%, n=99), significantly elevating cardiovascular and cancer risks. The remaining users combine betel nut with either betel leaf (28.7%, n=69) or sugar (30.0%, n=72).

**Table 14** Number and percentage of sample groups by location of betel nut chewing. (n=240)

| Location of betel nut chewing | Number | Percentage |
|---|---|---|
| While working | 97 | 40.42 |
| During leisure time | 106 | 44.17 |
| When socializing with friends | 37 | 15.41 |
| **Total** | **240** | **100.0** |

From Table 13, The data reveal distinct environmental triggers for betel nut consumption, with leisure-time use being most prevalent (44.17%, n=106), closely followed by work-associated use (40.42%, n=97). Social use accounts for a smaller but notable proportion (15.41%, n=37).

**Table 15** Number and percentage of sample groups by attempts to quit betel nut chewing. (n=240)

| Attempts to quit betel nut chewing | Number | Percentage |
|---|---|---|
| Yes, and successfully quit | 81 | 33.75 |
| Yes, but unsuccessfully | 126 | 52.50 |
| Never tried to quit | 33 | 13.75 |
| **Total** | **240** | **100.00** |

From Table 15, It can be seen that the number of Yes, but unsuccessfully (126) is the largest (52.50%), Yes, and successfully quit is 81 (33.75%t), and Never tried to quit is the smallest (33) (13.75%).

**Table 16** Number and percentage of sample groups by the impact of betel nut chewing on social relationships. (n=240)

| **Impact of betel nut chewing on social relationships** | **Number** | **Percentage** |
|---|---|---|
| Positively | 87 | 36.25 |
| Negatively | 88 | 36.67 |
| No impact | 65 | 27.08 |
| **Total** | **240** | **100.00** |

From Table 16, it can be observed that the number of participants who reported a negative impact of betel nut chewing on social relationships (88) is the largest (36.67%), followed closely by those who reported a positive impact (87) (36.25%), while the number of those who reported no impact is the smallest (65) (27.08%).

**Table 17** Number and percentage of sample groups by place of betel nut purchase. (n=240)

| Place of betel nut purchase | Number | Percentage |
|---|---|---|
| Local market | 99 | 41.25 |
| Convenience store | 89 | 37.08 |
| Online | 52 | 21.67 |
| **Total** | **240** | **100.00** |

From Table 16, it can be observed that the number of participants who purchase betel nut from local markets (99) is the largest (41.25%), followed by those who buy from convenience stores (89) (37.08%), while the number of those who purchase online is the smallest (52) (21.67%).

**Table 18** Number and percentage of sample groups by average daily expense on betel nut. (n=240)

| Average daily expense on betel nut | Number | Percentage |
|---|---|---|
| Less than 10 yuan | 26 | 10.83 |
| 10-20 yuan | 147 | 61.25 |
| More than 20 yuan | 67 | 27.92 |
| **Total** | | **100.00** |

From Table 18, it can be observed that the number of participants who spend 10-20 yuan daily on betel nut (147) is the largest (61.25%), followed by those who spend more than 20 yuan (67) (27.92%), while the number of those who spend less than 10 yuan is the smallest (26) (10.83%).

**Table 19** Number and percentage of sample groups by the time of day they chew betel nut the most. (n=240)

| **The time of day they chew betel nut the most** | **Number** | **Percentage** |
|---|---|---|
| After meals | 96 | 40.00 |
| Morning | 82 | 34.17 |
| Evening | 62 | 25.83 |
| **Total** | **240** | **100.0** |

From Table 19, it can be observed that the number of participants who chew betel nut the most after meals (96) is the largest (40.0%), followed by those who chew in the morning (82) (34.17%), while the number of those who chew in the evening is the smallest (62) (25.83%).

**Table 20** Number and percentage of sample groups by family members who chew betel nut. (n=380)

| Family members who chew betel nut. | Number | Percentage |
|---|---|---|
| Yes | 259 | 68.20 |
| No | 121 | 31.80 |
| **Total** | **380** | **100.00** |

From Table 20, it can be observed that the number of participants who have family members who chew betel nut (259) is the largest (68.20%), while the number of those who do not have family members who chew betel nut is the smallest (121) (31.80%).

**Table 21** Number and percentage of sample groups by opinions on whether betel nut chewing is an important part of the local culture. (n=380)

| Opinions on whether betel nut chewing is an important part of the local culture. | Number | Percentage |
|---|---|---|
| Yes | 227 | 59.70 |
| No | 153 | 40.30 |
| **Total** | **380** | **100.00** |

From Table 21, it can be observed that the number of participants who believe betel nut chewing is an important part of the local culture (227) is the largest (59.70%), while the number of those who do not share this belief is smaller (153) (40.30%).

**Table 22** Number and percentage of sample groups by smoking behavior. (n=380)

| Smoking behavior | Number | Percentage |
|---|---|---|
| Frequently | 61 | 16.05 |
| Occasionally | 124 | 32.63 |
| Never | 195 | 51.32 |
| **Total** | **380** | **100.0** |

From Table 22, it can be observed that the number of participants who never smoke (195) is the largest (51.32%), followed by those who smoke occasionally (124) (32.63%), while the number of those who smoke frequently is the smallest (61) (16.05%).

**Table 23** Number and percentage of sample groups by alcohol consumption behavior. (n=380)

| Alcohol consumption behavior | Number | Percentage |
|---|---|---|
| Frequently | 130 | 34.21 |
| Occasionally | 131 | 34.47 |
| Never | 119 | 31.32 |
| **Total** | **380** | **100.0** |

From Table 23, it can be observed that the number of participants who consume alcohol occasionally (131) is the largest (34.47%), followed closely by those who consume alcohol frequently (130) (34.24%), while the number of those who never consume alcohol is the mallest (119) (31.32%).

**Part IV: Analysis of Factors Influencing Betel Nut Chewing Behavior Among the Population in Longhua District, Haikou City, Hainan Province, China.**

**Table 24** Relationship between personal information factors and betel nut chewing behavior.

| **Factors** | **betel nut chewing behavior.** | | $\chi^2$ | **P-value** |
|---|---|---|---|---|
| | **Do not chew betel nut** | **Chew betel nut** | | |
| | **Number (Percentage)** | **Number (Percentage)** | | |
| Gender | | | | |
| Male | 69 (37.91%) | 113(62.09%) | 0.172 | 0.678 |
| Female | 71 (35.86%) | 127 (64.14%) | | |
| Age | | | | |
| Under 18 | 40 (35.71%) | 72 (64.29%) | 1.942 | 0.585 |
| 34-19 | 41 (33.33%) | 82 (66.67%) | | |
| 60-35 | 33 (38.82%) | 52 (61.18%) | | |
| Over 60 years old | 26 (43.33%) | 34 (56.67%) | | |

**Table 24** (Continued)

| Factors | betel nut chewing behavior. | | $\chi^2$ | P-value |
|---|---|---|---|---|
| | Do not chew betel nut | Chew betel nut | | |
| | Number (Percentage) | Number (Percentage) | | |
| Income | | | | |
| Below 3000 RMB | 64 (36.37%) | 112 (63.63%) | 1.772 | 0.621 |
| 5000-3000RMB | 41 (41.84%) | 57 (58.16%) | | |
| 8000-5000RMB | 19 (32.20%) | 40 (67.80%) | | |
| Above 8000 RMB | 16 (34.04%) | 31 (65.96%) | | |
| Occupations | | | | |
| Private enterprise | 54 (40.30%) | 80 (59.70%) | 3.850 | 0.278 |
| Functionary | 15 (26.31%) | 42 (73.69%) | | |
| Students | 40 (35.71%) | 72 (64.29%) | | |
| Freelancer | 31 (40.26%) | 46 (59.74%) | | |
| Education Level | | | | |
| primary schools | 4 (16.67%) | 20 (13.33%) | 26.553 | $<0.01$ |
| middle school | 67 (29.26%) | 162 (70.74%) | | |
| universities | 69 (54.33%) | 58 (45.67%) | | |

From Table 24, According to the data presented in Table 23, there is no statistically significant association between betel nut chewing behavior and factors such as gender, age, income, or occupation among the population in Longhua District, Haikou City. Specifically, gender is not significantly related to betel nut chewing ($\chi^2 = 0.172$, $p = 0.678$), indicating that both males and females engage in the behavior at similar rates. Age also shows no significant correlation ($\chi^2 = 1.942$, $p = 0.585$), suggesting a relatively consistent distribution of chewing behavior across different age groups. Monthly income does not appear to influence betel nut chewing ($\chi^2 = 1.772$, $p = 0.621$), and chewing is found across various income levels. Similarly, no significant association is observed between occupation and betel nut chewing ($\chi^2 = 3.850$, $p = 0.278$), with the behavior distributed among different occupational groups, including private enterprise workers, public servants, students, and freelancers. In contrast, education level shows a statistically significant relationship with betel nut chewing behavior ($\chi^2 = 26.553$, $p < 0.01$). The data indicate that individuals with lower educational attainment (e.g., primary or middle school) are more likely to chew betel nut, while those with higher education (e.g., university level) are less likely to engage in this behavior. This suggests that education may be an important factor influencing betel nut chewing behavior.

**Table 25** Relationship between knowledge factors about the effects of betel nut chewing and betel nut chewing behavior.

| Knowledge factors | betel nut chewing behavior | | P-value |
|---|---|---|---|
| | Do not chew betel nut | Chew betel nut | |
| | Number (Percentage) | Number (Percentage) | |
| Low knowledge. (0-8) | 7 (10.00%) | 63 (90.00%) | |
| Moderate knowledge (9-11) | 89(35.46%) | 162(64.54%) | ＜0.01 |
| High knowledge. (12-15) | 44(74.58%) | 15(25.42%) | |

From Table 25, According to Table 24, there is a statistically significant relationship between participants' knowledge of the effects of betel nut chewing and their actual chewing behavior ($p < 0.01$). Specifically, among individuals with low levels of knowledge (scores 0–8), the majority (63 out of 70, or 90%) reported chewing betel nut, with only a small number (7) reporting that they do not. In the moderate knowledge group (scores 9–11), a greater proportion also reported chewing betel nut (162 individuals), while 89 did not. However, in the high knowledge group (scores 12–15), this pattern is reversed—only 15 participants reported chewing betel nut, whereas 44 reported abstaining. This

inverse relationship suggests that increased awareness and understanding of the harmful effects of betel nut is associated with a lower likelihood of engaging in chewing behavior. These findings underscore the importance of targeted health education and knowledge dissemination as effective public health strategies to reduce the prevalence of betel nut use in the population.

# CHAPTER V

# CONCLUSION AND DISCUSSIONS

## Conclusion

This study aimed to investigate the betel nut chewing behavior among residents in Longhua District, Haikou City, Hainan Province, China, and to explore the factors associated with this behavior. A cross-sectional analytical design was employed. A total of 380 participants were selected through simple random sampling, and data were collected using a structured questionnaire.

The findings revealed that the prevalence of betel nut chewing in the study area was notable, with 23.69% of respondents currently chewing betel nut and 41.3% using it in combination with tobacco. The primary motivations for chewing included curiosity, local traditions, and the belief that it aids digestion. The behavior was predominantly initiated during adolescence and early adulthood, with 65.84% of those who had ever chewed betel nut beginning before the age of 25. Furthermore, individuals with low levels of knowledge about the health risks of betel nut were significantly more likely to chew it than those with higher knowledge levels ($p < 0.01$).

In addition, demographic factors such as gender, age, income, and occupation were not significantly associated with betel nut chewing behavior. However, educational attainment and knowledge of the health risks of betel nut showed a statistically significant relationship with the behavior, as those with lower education levels were more likely to engage in betel nut chewing.

These results align with the Health Belief Model, which posits that health-related behaviors are influenced by an individual's perception of risk and severity of health problems. Awareness and knowledge play a crucial role in shaping behavior, particularly in avoiding or ceasing betel nut use.

Based on these findings, the key recommendation is to promote continuous education on the harmful effects of betel nut, especially among individuals with low educational backgrounds and among youth. Such efforts should be culturally sensitive and contextually appropriate in order to foster sustainable behavioral change in the long term.

**Discussion**

The findings from this study on betel nut chewing behavior among residents of Longkunxia Village, Longhua District, Haikou City, reveal a multifaceted and context-specific behavioral pattern influenced by individual, cognitive, and socio-cultural factors. Although the prevalence of current betel nut chewing behavior remains moderate, the study indicates that knowledge and educational background significantly influence such behavior, while demographic variables such as age, gender, income, and occupation do not demonstrate a statistically significant relationship.

Firstly, the onset of betel nut chewing behavior is predominantly observed in younger age groups, especially during adolescence and early adulthood, which aligns with prior research indicating that this life stage is particularly vulnerable to behavioral experimentation and peer influence. Despite the common perception that age may predict risky health behavior, the current findings did not demonstrate age as a significant

determinant, possibly due to the homogeneity in lifestyle and exposure among age groups in the sampled community.

Secondly, the role of education and knowledge levels emerged as pivotal determinants. Individuals with lower educational attainment and limited knowledge about the adverse effects of betel nut use were more likely to engage in chewing behavior. These results reinforce the theoretical proposition of the Health Belief Model (Rosenstock et al., 1988), suggesting that increased perceived susceptibility and severity, shaped through knowledge acquisition, may discourage risky health behavior. Furthermore, the study confirms that individuals with greater awareness of the health hazards—such as addiction potential, oral cancer risks, and social stigma—tend to refrain from betel nut consumption. This finding is congruent with previous studies conducted in similar cultural contexts (Garg, 2022; WHO, 2023).

Thirdly, the analysis highlighted strong socio- cultural influences, particularly familial modeling and traditional practices. Many respondents indicated that family members also chewed betel nut and that the behavior was socially normalized within their community. This is consistent with the Social Learning Theory (Bandura, 1977), which posits that behaviors are learned through observation and imitation of significant others, especially within family structures. The deeply embedded cultural association of betel nut with social bonding, ceremonies, and local identity in Hainan Province further perpetuates its use, despite health education efforts.

Lastly, the behavioral data reveal patterns indicative of psychological dependence. Daily chewing and difficulty in quitting were common among current users. While a substantial proportion had attempted to quit, the high rate of relapse or continued use points toward physiological and psychological addiction mechanisms, particularly among those

who combine betel nut with tobacco. These findings align with the conclusions of the IARC (2012), which classified betel nut as a carcinogenic and addictive substance.

In summary, while demographic factors alone may not be sufficient predictors of betel nut chewing behavior, cognitive awareness ( knowledge) and socio- cultural reinforcement play critical roles. To reduce the prevalence of betel nut use and its associated health risks, public health strategies must incorporate culturally sensitive educational campaigns and community-level interventions. These should especially target adolescents and individuals with low educational attainment, emphasizing not only the health risks but also the social and economic consequences of sustained betel nut use.

Future research may benefit from longitudinal designs to examine causal relationships and the long-term efficacy of educational interventions. Moreover, integrating qualitative approaches could deepen the understanding of personal narratives and cultural meanings attached to betel nut chewing behavior in local contexts.

**Study Limitation**

While this study has yielded insights into betel nut chewing behaviors and associated factors among residents of Longhua District, Haikou City, several limitations warrant consideration in future research and practice.

The study employed simple random sampling (SRS). Despite efforts to ensure sample representativeness, the sample was confined to Longhua District, potentially limiting the generalizability of findings to the broader population of Hainan Province or other regions. Variations in economic status, cultural traditions, and betel nut use patterns across different geographic areas may impact the external validity of the results.

The questionnaire-based survey relied on self-reported data, which is susceptible to social desirability bias or recall bias. For instance, respondents might provide inaccurate information regarding betel nut consumption frequency, cessation attempts, or perceptions of health impacts, thereby affecting data validity.

This study did not incorporate the design and evaluation of intervention strategies, nor did it conduct longitudinal follow-up studies, thus hindering the ability to monitor behavioral trajectories or assess the long-term effects of educational campaigns. Given the addictive and recurrent nature of betel nut use, future research should consider designing long-term follow-up and intervention efficacy validation protocols.

Furthermore, in terms of public health service system development, we recommend establishing a "three-tiered betel nut cessation network": community health centers for initial screening and motivational interviewing; municipal hospitals to provide comprehensive support encompassing psychological, nutritional, and oral health dimensions; and provincial-level support for pharmacological research, including betel alkaloids antagonists, to facilitate the development of clinical intervention drugs. For the 41.25% of individuals exhibiting mixed-use behaviors, we suggest implementing a "betel nut-tobacco co-cessation" program, with the design potentially adapted from the WHO's mhGAP Intervention Guide (WHO, 2021).

**Generalizability**

This study systematically examined the prevalence, cognitive factors, and determinants of betel quid chewing behavior in Longhua District, Haikou City, Hainan Province. Despite its regional specificity, the research findings demonstrate a degree of

external validity in terms of theoretical models, research instruments, and intervention strategies, thus exhibiting strong potential for broader application. The detailed analysis is as follows:

The significant association between knowledge levels and betel quid use, as well as the crucial role of family and cultural background in shaping behavior, observed in this study, aligns closely with patterns in other betel quid-prevalent regions of China, such as Hunan, Guangxi, and Yunnan. These areas share characteristics including widespread betel quid use, inadequate health literacy, and strong reliance on traditional cultural practices. Consequently, the survey instruments and intervention approaches employed in this study, such as tiered educational campaigns and culturally sensitive interventions, can be directly adapted or modified for use in these regions. （Sari et al. (2024)）noted that regions with high betel quid use, including Southeast Asia and southern China, exhibit considerable consistency in behavioral drivers, health risks, and policy responses, making them suitable for cross-regional comparative studies and result comparisons.

Betel quid, a culturally embedded masticatory substance, exhibits widespread utilization across Southeast Asia (e.g., India, Sri Lanka, Myanmar), Pacific Island nations (e.g., Micronesia, Fiji), and South Asia. Research indicates that in these regions, betel quid consumption transcends mere recreational use, deeply intertwined with identity and ritualistic practices. Paulino et al. (2021), in their Micronesian study, highlighted the significant influence of familial transmission and cultural affiliation on betel quid behaviors, underscoring the necessity for culturally sensitive interventions . This study's analysis of the relationship between cultural cognition and health behaviors, along with the proposition of a "cultural substitution" concept, offers substantial relevance for these countries and regions.

This study, grounded in the Health Belief Model (HBM), elucidates the association between knowledge levels and behavioral outcomes, thereby validating the statistical relationship between perceived susceptibility and behavioral choices. The HBM, a widely adopted framework in global health behavior research, demonstrates robust transferability and theoretical adaptability (Rosenstock et al., 1988).Consequently, the variable constructs, questionnaire design, and interpretive pathways employed in this research possess a sound theoretical basis for cross-cultural application.

The proposed intervention strategies, encompassing school-based education, home visits, package warnings, and social media campaigns, have demonstrated positive outcomes in tobacco, alcohol, and betel quid control initiatives across various countries. The World Health Organization (WHO, 2024) explicitly recommends that "schools, communities, and primary health systems should be prioritized as intervention entry points" in its policy recommendations for betel quid control, aligning closely with the findings of this study. Particularly in developing countries or resource-constrained settings, the low-cost, high-participation community education approach advocated herein presents a feasible and practical strategy.

**Recommendation for Further Research**

This study conducted a cross-sectional survey on betel nut chewing behavior among residents in Longhua District, Haikou City, and preliminarily revealed the prevalence characteristics, cognitive status, social and cultural influence mechanisms, and intervention implications of this behavior. Although the research results provide empirical support for local public health intervention, due to the limitations of the research design

and sample scope, there are still many scientific issues and practical paths that deserve in-depth exploration. In order to further promote betel nut behavior intervention from "local exploration" to "systemic governance", this study puts forward the following suggestions for reference by subsequent researchers and policymakers:

This study adopts a cross-sectional design and cannot reveal the dynamic changes in betel nut use behavior. It is recommended that in the future, a longitudinal cohort study be established to track and observe factors such as betel nut behavior, knowledge cognition, and attitude changes in the same population at different time points. In particular, conducting control surveys before and after policy implementation, major health events, or media publicity nodes will help identify the key influencing windows of behavioral changes and reveal the time path of behavioral persistence, relapse, or withdrawal and its related factors. In addition, the life cycle perspective can be combined to explore changes in behavioral patterns in different periods (such as adolescence, marriage and childbearing period, middle-aged and elderly), and clarify the differences in intervention priorities and strategies at different stages.

Existing studies have focused mainly on socio-demographic and knowledge variables, but insufficient attention has been paid to the psychological motivations and addiction mechanisms behind betel nut behaviour. It is recommended that future studies incorporate psychological variables such as anxiety, depression, self-esteem, stress coping styles, etc., and adopt multivariate structural models to analyse how psychological states influence betel nut use behaviour through mediating or moderating pathways.

Meanwhile, by combining neuroscience and behavioural addiction theories, the mechanisms of betel nut dependence, physiological adaptive changes, addiction grading and withdrawal intervention responses should be further explored, so as to provide

theoretical support for subsequent pharmacological treatment and psychological support pathways.

The results of this study show that family influence and cultural identity are important factors supporting the continuation of betel nut behaviour.In the future, we suggest that we start from the perspective of cultural sociology to analyse in depth how the betel nut culture builds up collective identity, ritual symbols and social values, and to construct a path of "cultural substitution" based on this. For example, it is suggested to study whether local residents accept betel nut as a healthy snack, tea or non-addictive social behaviour, and the tension between cultural identity and behavioural change.

Qualitative research methods (e.g., in-depth interviews, focus groups, ethnographic observations, etc.) can be considered to supplement the cultural contextual factors that cannot be revealed by quantitative research, and to promote the localisation of "culturally sensitive" health communication strategies.

Although this study suggests multi-tiered interventions, it lacks validation of actual intervention effects. In the future, community-based intervention pilot studies should be conducted to design control and experimental groups, and to evaluate their short- and long-term effectiveness in different populations through various combinations of interventions such as educational content, communication tools, and withdrawal services.

At the same time, we should take into account the reality of the policy environment, study the actual impact of policy directions (such as restrictions on sales, warning packages, and prohibition of chewing in public places) on the behaviour of the population, and carry out policy simulation experiments and policy acceptance surveys, in order to provide guidance for the introduction of regulations on betel control by the local government. We will also conduct a "policy simulation experiment" and a "policy acceptance survey" to

provide data support and feedback to the local government, so as to enhance the feasibility of the intervention policy and public participation.

This study is limited to Longhua District, Haikou City, with a narrow sample space and limited external validity. It is recommended that the sample coverage be expanded in the future, especially by conducting simultaneous studies in other counties and districts in Hainan Province, urban and rural areas, coastal and inland areas, and ethnic minority areas, so as to compare the similarities and differences in behavioural traits, cultural attributions, and policy environments between different regions.In addition, cross-regional comparative studies can be conducted with Hunan, Guangxi, Yunnan, and other provinces with high prevalence of betel nut use, to test the applicability and commonality of the results of this study, and to enhance the scientific basis and implementation logic of a nationwide betel nut control strategy.

The intervention of betel nut behaviour not only requires the support of public health disciplines, but also the formation of synergistic research mechanisms in the fields of psychology, communication, sociology, law and policy sciences.In the future, a regional betel nut control research platform can be established, integrating the strengths of the government, scientific research institutions, grassroots communities, NGOs and media platforms to promote a closed-loop governance model of "research-intervention-assessment-feedback "The construction of the "research-intervention-evaluation-feedback" closed-loop governance model , to achieve the transformation from "academic output" to "practice on the ground".

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# APPENDIX

# Appendix A

## Interview forms

Factors affecting betel nut chewing behaviour among residents of Longkunxia Village, Longhua District, Haikou City, Hainan Province, China

Consent day Date.....Month.....Year.....

I am Mr. / Mrs. / Miss. . . . . address..... Read the details from the information sheet for participants in the research project and I agree to voluntarily participate in the research project.

I have received a copy of the consent form that I signed and dated, along with an information sheet for research participants. This is before signing the consent form to conduct this research. I was explained by the researcher about the purpose of the research. The duration of the research, research methods, dangers or symptoms that may arise from the research. or from the medicine used Including the benefits that will arise from the research and guidelines for treatment by other methods in detail I have had enough time and opportunity to ask questions until I have a good understanding. The researcher answered various questions willingly and without concealment until I was satisfied.

I have the right to terminate my participation in the research project at any time. There is no need to inform the reason. and termination of participation in this research It will not affect treatment or other rights that I will continue to receive.

The researcher guarantees that my personal information will be kept secret. and will be disclosed only with my consent. Other persons on behalf of the research

sponsoring company Human Research Ethics Committee the Food and Drug Administration may be permitted to inspect and process my information. This must be done for the purpose of verifying the accuracy of the information only. By agreeing to participate in this study, I am giving consent to have my medical history reviewed.

I have read the above and have a complete understanding of it. Willing to participate in research willingly. Therefore, signed this consent document.

.....Sign the person giving consent.

(.....) Name of person giving consent

Date .....Month.....Year.....

I have explained the purpose of the research, the research methods, dangers or adverse reactions or risks that may arise from the research. or from the medicine used Including the benefits that will arise from thorough research. Let the participants in the research project named above know and have a good understanding. Ready to sign the consent document willingly

.....

Signed by the researcher

(.....)

Name of researcher in detail

Date .....Month……..Year…….

…… .....

Witness signature Witness signature

(.....) (.....)

Name of witness in detail Name of witness in detail

Date .....Month…..Year……. Date .....Month……..Year…….

# Appendix B

## Validity and Reliability

**Reliability analysis**

Internal consistency reliability refers to how closely related the items in a questionnaire are to one another. It is commonly evaluated using Cronbach's alpha (α), which can be calculated in software such as SPSS. The value of Cronbach's α ranges from 0 to 1, with higher values indicating stronger internal consistency among the items..

**Overall reliability analysis**

| Reliability simplified format | | |
|---|---|---|
| Cronbach Alpha | sample capacity | number of terms |
| 0.823 | 380 | 35 |

According to the overall reliability coefficient, the standardized reliability coefficient is 0. 823, indicating that the overall credibility of the questionnaire is excellent.

**analysis of validity**

Validity refers to the consistency of the measurement, the higher the validity; otherwise, the lower the validity. The validity test needs to look at the significance of KMO coefficient and Bartlett sphere test. If the KMO coefficient ranges from 0 to 1, the closer to 1, the closer the structural validity of the questionnaire is better. If the significance of Bartlett sphere test is less than 0.05, we can also think that the questionnaire has good structure validity.

| KMO and Bartlett tests | | |
|---|---|---|
| Number of KMO sampling suitability | | 0.776 |
| Bartlett sphericity test | Approximate chi square | 376.544 |
| | free degree | 19 |
| | conspicuousness | 0.001 |

Valvalidity validation using the KMO and Bartlett tests, the KMO test yielded 0. 776 and the Bartlett test was 19, significance =0.001 <0.01, indicating excellent overall validity of the questionnaire.

# Appendix C

# Questionnaire

## Factors related to betel nut chewing behavior among residents of Longkunxia Village, Longhua District, Haikou City, Hainan Province, China

**Dear Participants**

Thank you for participating in this survey. Your responses will help us understand the impact of betel nut chewing on oral health. All information will be kept strictly confidential and used for research purposes only.

The questionnaire is divided into 3 parts as follows:

Part I Personal Information

Part II Knowledge of Betel Nut Chewing Effects

Part III Betel nut chewing behavior

The researcher hopes for your cooperation very much and I would like to thank you very much for this opportunity.

Fei Qidi

Master of Public Health

Chiang Rai Rajabhat University

**Part I Personal factors**

**Guidance:** Please select carefully the answer for each question and choose the answer by marking (√) the response option that best represents.

**Details**

**1. Gender**

( ) Male ( ) Female

2. **Age** ……. years

( ) Under 18 ( ) 19-34

( ) 35-60 ( ) Over 60 years old

**3. Income**

( ) Below 3000 RMB ( ) 3000-5000 RMB

( )5000-8000 RMB ( ) Above 8000 RMB

**4. Occupations ……**

**5. Education Level**

( ) Primary school ( )Junior High School

( ) Senior High School ( )Undergraduate or junior college level

( ) Postgraduate student ( )Doctor

**Part II Knowledge of Betel Nut Chewing Effects**

**Guidance:** Please select carefully the answer for each question and choose the answer by marking (√) the response option that best represents.

**1. Chewing betel nut frequently helps strengthen teeth and gums?**

( ) Yes ( ) No

**2. Chewing betel nut for a long period may increase the risk of oral cancer?**

( ) Yes ( ) No

**3. Alkaloids in betel nut can cause addiction?**

( ) Yes ( ) No

**4. Chewing betel nut has no effect on the digestive system?**

( ) Yes ( ) No

**5. Regularly chewing betel nut can cause teeth discoloration and plaque buildup?**

( ) Yes ( ) No

**6. Chewing betel nut has no effect on social image?**

( ) Yes ( ) No

**7. Chewing betel nut affects oral health, such as causing gum inflammation?**

( ) Yes ( ) No

**8. Chewing betel nut during pregnancy may affect the baby, such as increasing the risk of preterm birth?**

( ) Yes ( ) No

**9. Chewing betel nut can help reduce the risk of heart and vascular diseases?**

( ) Yes ( ) No

**10. Chewing betel nut is often associated with cultural traditions in some areas?**

( ) Yes ( ) No

**11. Long-term betel nut chewing may negatively impact mental health, such as causing addiction?**

( ) Yes ( ) No

**12. Chemicals in betel nut have a stimulating effect on the nervous system, providing temporary refreshment?**

( ) Yes ( ) No

**13. Chewing betel nut benefits gum health and reduces the risk of tooth decay?**

( ) Yes ( ) No

**14. Betel nut chewing is a common cause of addiction, making it difficult for many people to quit?**

( ) Yes ( ) No

**15. Chewing betel nut has no long-term negative effects on oral health?**

( ) Yes ( ) No

**Part III： Betel nut chewing behavior**

**Guidance:** Please select carefully the answer for each question and choose the answer by marking (√) the response option that best represents.

1. Have you ever chewed betel nut or tried chewing it?

( ) 1. Never chewed betel nut

( ) 2. Tried chewing betel nut but no longer chew

( ) 3. Currently chewing betel nut

2. At what age did you first start chewing betel nut?

( ) 1. Under 15 years

( ) 2. 15-24 years

( ) 3. 25-34 years

( ) 4. Over 35 years

3. How often do you chew betel nut?

( ) 1. Every day

( ) 2. 2-3 times a week

( ) 3. Once a month or less

( ) 4. Never chew

4. What is the main reason you started chewing betel nut?

( ) 5. Curiosity

( ) 6. Following local traditions

( ) 7. To aid digestion

( ) 8. Others (please specify _____)

5. What ingredients do you chew betel nut with?

( ) 1. Betel leaf

( ) 2. Tobacco

( ) 3. Sugar

( ) 4. Others (please specify _____)

6. In what situations do you chew betel nut?

( ) 1. While working

( ) 2. During leisure time

( ) 3. When socializing with friends

( ) 4. Others (please specify _____)

7. Have you ever tried to quit chewing betel nut?

( ) 1. Yes, and successfully quit

( ) 2. Yes, but unsuccessfully

( ) 3. Never tried to quit

8. Does chewing betel nut affect your social relationships?

( ) 1. Positively

( ) 2. Negatively

( ) 3. No impact

9. Where do you usually buy betel nut?

( ) 1. Local market

( ) 2. Convenience store

( ) 3. Online

( ) 4. Others (please specify _____)

10. What is your average daily expense on betel nut?

( ) 1. Less than 10 yuan

( ) 2. 10-20 yuan

( ) 3. More than 20 yuan

11. At what time of day do you usually chew betel nut the most?

( ) 1. After meals

( ) 2. Morning

( ) 3. Evening

( ) 4. Others (please specify _____)

12. Do any members of your family chew betel nut?

( ) 1. Yes

( ) 2. No

13. Do you think chewing betel nut is an important part of the culture in your area?

( ) 1. Yes

( ) 2. No

14. Do you smoke?

( ) 1. Frequently

( ) 2. Occasionally

( ) 3. Never

15.Do you drink alcohol?

( ) 1. Frequently

( ) 2. Occasionally

( ) 3. Never

# BIOGRAPHY

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