

CHAPTER I

INTRODUCTION

1.1 Background

Focusing on prevention of disease and promotion of health, public health is currently struggling to control tobacco use across the world. Perhaps it is time for some other addictive substances like betel nut (*areca catechu*) to face the same control measures.

Betel nut (*areca catechu*) is a fruit of a species of palm and different countries have different names for it. In Assam, India it is called *quai*, and in Bhutan people call it *doma*. Pommaret, a French researcher explains that “majority of the westerners are under the impression that betel is the nut. We talk of betel nut and the mistake was made even as early as 1673. The betel (*Piper betel*) is, in fact, the leaf that envelopes the nut and the latter is the areca nut (*Areca catechu*)” (Pommaret, 2000).

However, people still continue to call this fruit betel nut and the same term is used in this study. Betel nut palms grow throughout the Pacific, Asia, and parts of East Africa. The active chemical contents of the nut are *arecaine* and *arecoline*, *alkaloids* which are comparable to *nicotine* in its stimulating, mildly intoxicating and appetite-suppressing effects on the mind. It is also known to contain the alkaloids *arecadine*, *arecolidine*, *guracine* (guacine), *guvacoline* and a number of others (TheFreeDictionary.com).

According to authorities on the subject, betel nut is the fourth most addictive substance in the world (Boucher & Mannan, 2002), being only next to nicotine, ethanol, and

caffeine in order of their use (Norton, 1998). Several authorities on the subject agree that 200 million people in the world, i.e., about 10% of the world's population (Boucher *et al*, 2002, Taylor *et al*, 1992) chew beetle nut and most of the users are concentrated in Asia, while there are more recent studies quoting the figure even up to 15% of the world's population, i.e., 600 million (Nelson & Heischouer, 1999). South and South East Asia, including Indonesia, the Philippines, Taiwan, Papua New Guinea, parts of Micronesia and Melanesia, Zanzibar, the Malagasy Republic, the Island of Reunion and parts of Tanzania are homes for this plant and perhaps that is the reason people in these countries are the current, main chewers of betel nut. Even those users in Australia, USA and UK are migrants from Asia (William *et al*, 2002).

If we consider that 60.8% of the world's population was located in the whole of Asia ¹ in 2000, the betel consuming population, i.e. 15% of the world's population, is concentrated mostly in South Asia and the Western Pacific. Studies, relating oral cancer with the betel chewing habit, also found evidence pointing that oral cancers are most found in the Asian populations. Of the 390,000 annual incidences of oral cancers in the world, 228,000 (58%) are confined to South and South-East Asia (WHO, 2003).

In view of the foregoing, some of the global substance abuse priorities may have to be changed according to the locality and perhaps tobacco control may not be as important as betel nut control in some of the Asian countries or localities (Phukan *et al*, 2001). For example, in the case of Bhutan, an Asian country, where tobacco-use is against the form of Buddhism practiced in the country (Health Division, 1999), there are not as many

¹As per the United Nations Population Division, Briefing Packet, 1998 Revision of World Population Prospects, 60.8% of global population resides in whole of Asia.

tobacco users as betel nut users. According to Dr. Singhadej, the WHO Representative to Bhutan from 1999-2004, Bhutan may be facing more health problems from betel nut use than from tobacco.

But what health problems can result from the chewing of this palm fruit? I myself have been introduced to this habit at an early age and never reflected on this question till one of my friends, a middle-class government official educated in Australia, died of oral cancer at the Jigmi Dorji Wangchuck National Referral Hospital in Thimphu leaving behind the following message for us:

“Dear friends, as I lie dying young because of doma (betel nut), I would like to persuade all my friends to give up the habit. If my words succeed in weaning some of you from the habit, I would have succeeded in preventing many friends facing the situation that I faced in my life. I hope you will value my words and tell your friends about it too.”

Many studies have been conducted to see how betel nut chewing can cause or promote cancers of the mouth, pharynx and esophagus. Scientists have carried out experiments to establish the association between isolated chemical compounds in the betel nut and cancer. For example, studies on the effect of single areca contents like tannin (Morton, 1992) or others have also shown positive association with cancers and tumors but the results are much more conclusive when these compounds are not isolated. Hence, all investigators agree that betel nut is both mutagenic and genotoxic because of the combined action of polyphenols and tannins that the nut contains, and the nitrosation of areca alkaloids and arecadine (Jeng *et al*, 2001). As betel nut quid commonly consists of areca nut, betel leaf, and lime; the lime also contributes to cell proliferation after prolonged use (Thomas & MacLennan, 1992). Further, the sub-mucous fibrosis (a pre-

cancerous condition that can progress to malignant cancer) caused by betel nut chewing tend to last long even after a person has given up the habit (Seedat & van Wyk, 1998).

The carcinogenic and other harmful effects are much more severe when the betel nut chewing habit is combined with tobacco chewing as shown by some studies on chromosome-damaging effects of betel nut (Phukan, 2001, Stich & Stich, 1982). In August 2002, the Monographs Programme of the International Agency for Research on Cancer (IARC) convened an international working group of scientific experts to review the published studies related to cancer and chewing betel quid and areca nut. Although an earlier evaluation in 1985 had agreed that chewing betel quid with tobacco is carcinogenic to humans, the new evaluation concluded that betel quid chewing by itself is carcinogenic to the users. Further, the working group also established that the areca nut itself (without the piper leaf, lime and other ingredients in the betel quid) is carcinogenic to humans.

Studies also tried to establish an association between asthma and betel nut chewing (Kiyingi, 1991). These studies were prompted by the finding in UK that the rate of hospital admission for acute asthma is higher among Asians than other population. These studies tried to relate various chemical components – especially arecoline, a cholinergic alkaloid - of betel nut with broncho-constriction in asthmatic patients, but the results were not conclusive (Taylor *et al*, 1992). Statistics, however, do show a conclusive association between asthma and betel-nut chewing without assigning specific association to any chemical components of the nut.

Another interesting finding is the link between prolonged betel nut intake and diabetes. The more we read about betel nut the more health implications it seems to have. All these problems, according to Boucher and Mannan, Department of Diabetes and Metabolic Medicine, University of London are due to specific arecal alkaloids that act as competitive inhibitors of GABA receptors which have widespread effects in the body, including actions on the brain, cardiovascular system, lungs, gut and pancreas (Boucher and Mannan, 2002).

Because Type 2 diabetes is found mainly among Asians when compared to Caucasians, these two researchers suspected a link between betel nut chewing and Type 2 diabetes. Both laboratory tests on mice and case control studies on 993 Bangladeshis confirmed their suspicions. Not only was there an association between betel nut and Type 2 diabetes, the study also indicated that waste size (obesity) was strongly related to betel use (Mannan, Boucher & Evans, 2000).

How about the action of betel nut on the heart? This matter has been explored, to some extent, by the Taiwan Poison Centre (Deng *et al*, 2001) and the following actions of betel nut from cases were listed:

- tachycardia/palpitations
- tachypnea/dyspnea
- hypotension and sweating
- vomiting, dizziness, and chest discomfort
- abdominal colic, nausea, numbness, and coma
- acute myocardial infarction and related manifestations

Although betel nut effects are transient, the cases reported to the Center revealed that one patient developed probable acute myocardial infarction and ventricular fibrillation and died despite repeated cardiac defibrillation (Deng *et al*, 2001, 357). Hence, the people with heart troubles may have to be warned against the use of this fruit.

Deficiency of the micro-nutrient thiamin (vitamin B1) in humans is known to result from either inadequate intake of thiamin or consumption of food containing anti-thiamin factors. As betel nut contains anti-thiamin factors, thiamin deficiency has been found to be associated with betel nut intake. Fermented fish and betel nut, both containing anti-thiamin factors, are found to be main reasons for thiamin deficiency in north-eastern Thais (Vimokesant *et al*, 1975).

TheFreeDictionary.com indicates that betel nut has “appetite-suppressing” effects on the mind. Most betel nut chewers believe that it causes a lot of salivation whenever a portion is chewed. Hence, salivation during mealtime is substantially reduced leading to difficulties in swallowing solid food. The dulling of the taste buds from its prolonged use is also believed to be the reason for lower appetites in most users.

A study conducted among betel chewers and non-chewers in Papua New Guinea provides one finding that supports the use of betel nut. Although people with brown or black teeth do not look attractive, there is evidence that betel nut chewing protects the teeth from caries (Howden, 1984). However, this positive health effect is in no comparison to the other health hazards it can cause.

Many Asian countries still devote a large amount of resources and efforts to sanitation programs because the old communicable diseases are still with us. If we look at the sanitation aspect of these countries, firstly the betel nut skin itself forms a large bulk of the waste. Secondly, the red spit of the chewers makes the surroundings look 'bloody' and 'dirtier' as it is a common habit among the chewers to spit into every nook and corner they can find. In September 2004, there has been a host of letters addressed to *Kuensel*, Bhutan's National Weekly newspaper, complaining about the sanitation problems caused by betel nut chewers and recommending that betel nut use be controlled like tobacco.

Finally, a problem that is becoming more important nowadays is the industrial combination of betel products with tobacco and promoting them. As tobacco industries face the wrath of the public health workers, they try all other means to promote combined or similar products. Already there is a change in the way people use tobacco and in many countries as many people shift from the smoking to chewing. Simultaneously industries have been quick to jump to this solution using all possible means. For the international public health workers, the availability of mass-produced, pre-packed areca-nut products in many countries recently, is a new cause of concern as this is followed by aggressive advertising, targeted at the middle class and children. The IARC notes that in some part of India, almost one out of three children and teenagers regularly or occasionally chew these products (WHO, 2003).

In short, betel nut is known to cause numerous direct and indirect health problems. Oral, esophageal and pharyngeal cancers, asthma exacerbation, cholinergic crisis,

cardiac arrhythmias, and even acute psychosis and milk-alkali syndrome (William *et al*, 2002) have been known to result from betel nut consumption. Facts also point out that betel nut causes sanitation problems thereby disrupting the sanitation efforts in developing countries where betel nut chewing is usually a common habit. We also now know from literature that betel nut is the 4th most used addictive substance in the world and that 10% of the people in the world – if not more - use it. As most of this burden is confined to the Western Pacific and Asian countries, betel nut chewing should be as much controlled as tobacco in our region if not more. Health problems arising from the abuse of this substance can be prevented like those from other addictive substances. It is time to initiate action to control betel nut chewing as it is a public health problem like tobacco.

To date only Pommaret (2000) has looked at the betel nut chewing situation in Bhutan. Hers was a qualitative study to find out “What is the true significance of the ‘betel’ in the Bhutanese context” and “Can the date of the betel leaf and nut consumption habit be traced back?” Her conclusions were that betel nut plays an important role in the Bhutanese life for socialization as well as important ceremonies like *zhugdrel*. Today (2000) betel nut is perceived by the Bhutanese as signifying a moment of relaxation and conviviality, friendship, and even of intimacy. It is consumed by men and women; laymen as well as monks at all hours of the day. Betel nut, though limited, was in use in Bhutan as early as 1774. However, at that time its scarcity made it an expensive luxury confined to the higher levels of the society. The development of automobile roads in 1960s made it available to the common people.

No one, so far, has looked at the betel nut problem from a health perspective and hence there has not been any control. Further, it is a general impression that the younger generation in Bhutan consumes lesser betel nut than their parents because of esthetic reasons and the “offensive smell” from the betel quid (Pommaret, 2000). However, studies in Taiwan revealed that betel nut use among adolescents is on the rise (Chen & Shaw, 1996). Further, as betel nut use is part of the culture in Bhutan and most parents indulge in it, there may be many youngsters using it even if they are school students and like in Taiwan, the level of use may be different between boys and girls.

1.2 Research Questions

Hence, as a starting point of enquiry into the betel nut chewing problem in Bhutan, the study aims to find out among adolescent students from Grade 7 to 11 in the main town of Thimphu

1. What is the prevalence of betel nut use?
2. What are the factors that affect the practice of betel nut use?
3. What are the relationships between factors and chewing betel nut?

As people in Thimphu have already demanding control of betel nut like tobacco (Letters from the Readers, *Kuensel*, September 2004), public health practitioners could act better with an understanding of the problems generated by the answers to the above questions. This study could also prompt the public health practitioners to explore the problem further in the general population.

1.3 Objectives

With the above intentions in mind, the general objective of the study is *to describe the use of betel nut among adolescent students from grades 7 up to 11 in main town of Thimphu, Bhutan and the factors that may influence.*

The study, therefore, specifically aims to

1. Define the prevalence of betel nut chewing among the students from grades 7 up to 11 in the secondary government schools in the main town of Thimphu,
2. Describe the biological, socio-environmental, and behavioral/psychological factors that may affect betel nut chewing among the students from grade 7 up to 11 in the secondary government schools in the main town of Thimphu, and
3. Assess the relationships between biological, socio-environmental, and behavioral/psychological factors and betel nut chewing.

1.4 Bio-Psychosocial Factors in Betel Nut Use

The Bio-Psychosocial Model has been preferred by the Tobacco Research Implementation Group (TRIG) which was created in 1998. TRIG, consisting of scientists from multiple agencies and institutions, was formed to establish tobacco-related cancer research priorities. They adopted this model as it reflected the complex interplay of social, psychological, and biological/genetic factors that influence addiction of substances like nicotine (Morgan *et al*, 2003). Social influences are broad, including peer and family modeling, peer influences, socio economic factors, cultural approval, marketing and media influences. The last two sub-factors – marketing and media

influences - are not used in this study because in Bhutan there is no marketing of betel nut using public media. Depressed or anxious mood and attention deficit hyperactivity disorders are examples of psychological factors that are known to affect the use of addictive substances, from initiation to maintenance to cessation. Biological factors have been known to be linked to nicotine use and metabolism and difficulties in quitting. In this study genetic factors have been left out as it requires much time, clinical expertise, and laboratory and other support to study them. However, the linkage of biologic factors, i.e., gender and age, with betel nut chewing has been explored as can be seen in Figure 1 which was adapted from the Bio-Psychosocial Model.

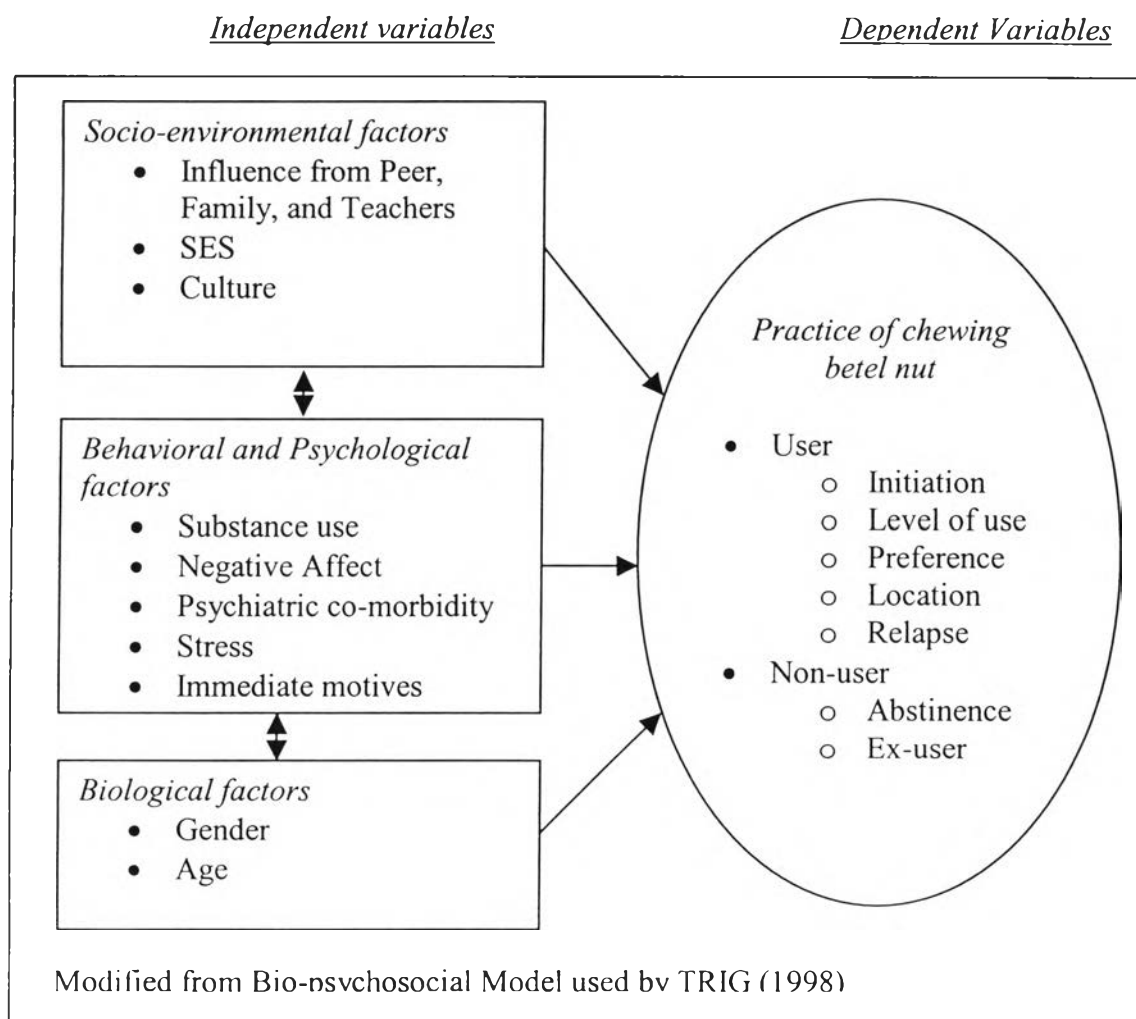


Figure 1: Conceptual framework of the factors affecting the use of betel nut.

This model explains that all these overarching determinants are mediated by behavioural, neurochemical, and physiological factors that influence the use, dependence, cessation, and relapse in the individual of an addictive substance like tobacco. These individual factors are known to be operating in conjunction. According to Haire-Joshu *et al* (1991), their interaction must be considered dynamic over the entire 'carrier' of a smoker.

1.5 Scope of the Study

In short this study was an attempt to describe the practice of betel nut chewing in the following manner:

1. Assess the magnitude of betel nut use in selected adolescent students as a dependent variable.
2. Assess their socio-environmental; behavioral and psychological; and biological conditions as independent variables.
3. Describe the relationship between the independent and dependent variables.

1.6 Variables Employed in the Study

1.6.1 Independent variables

Independent variables are grouped under three headings, socio-environmental factors, behavioral and psychological factors, and biological factors. Socio-environmental factors include models such as peers and family influence, and teachers who have influences on the adolescent student; socio-economic status; and the culture of the family to which an individual student belonged. Behavioral and psychological factors

include use of other substance (tobacco in this case), negative affect, psychiatric co-morbidity (depression), and negative life events that cause stress to an individual. Biological factors include gender and age of the individual.

1.6.2 Dependent variables

Dependent variable is the practice of betel nut chewing, starting from initiation, level of use, preference, location, cessation, relapse, and abstinence in the adolescent students.

1.7 Key Words

Betel nut, areca catechu, substance use, Bhutan, adolescents.

1.8 Operational Definitions of Variables and Their Measurements

1.8.1 Operational definitions of variables used in the study

Family refers to the parents, grand parents, older brothers or older sisters who not only form the immediate environment for the individual adolescent but also serve as role models for the youngsters. Their influence on the individual child can be substantial. In this study family would also include the guardian (uncle, aunt, etc.) with whom a student resides in Thimphu if his actual parents are not present.

Peer refers to close friends of the respondent.

Teacher refers to the people under whom a student learns at school.

Socio-economic status (SES) generally refers to education level, social and economic status. In this study, education refers to the ability of the parent(s) or guardians to communicate fluently in English. Education is differentiated this way because a) those who speak and write English have better access to information on health and hygiene than those who do not and b) the respondents who are school children will not be able to give the actual level of their parents' education.

Social and Economic status were combined as those with higher social status usually have higher income in Thimphu. Hence social and economic status in this study refers to the employment level of the students' parent(s) or guardians which were divided into four Groups - Group 1 for senior white collar, Group 2 for white collar, Group 3 for blue collar, and Group 4 for self employed. Each of these groups was provided with an exhaustive list of sample occupations within the questionnaire.

Culture in this study refers to different ethnic groups in Bhutan. As the main language spoken in the family distinguishes the ethnic groups that have distinctive cultures of their own, the respondents were required to indicate the main language spoken in his or her family. The major languages spoken in the country that represent distinct ethnic groups are 1) *Bumthap, Trongsap, Khengkha*, 2) *Lotshampa* or Nepali, 3) *Ngalongkha* or *Dzongkha*, and 4) *Sharchogpa* or *Kurtoekha*.

Substance use refers to the use of other addictive substances used side by side or together with betel nut use. In this study, tobacco smoking and tobacco chewing were studied.

Negative affect. Human beings face both negative and positive mood swings called affects and more so in the adolescent phase. According to Professor David Watson, Department of Psychology, University of Iowa it was Silvan Tomkins who identified 9 affects out of which 2 are positive, 1 is neutral, and 6 are negative in his *Affect Imagery of Consciousness* (Watson, 2000). Studies in other addictive substances like tobacco proved that negative affect or mood exerts potent effects on the motivation to use addictive substances like tobacco (Wills *et al*, 2002). Negative affective states in this study, like in the study on tobacco use, included lack of perceived control, negative self-concept, and pessimism.

Psychiatric co-morbidity. Study of other addictive substances like alcohol and tobacco (Choi *et al*, 1997) found a co-occurrence of depression and substance use. Hence, in this study too depressive symptoms (sleep disturbance, feeling of tiredness, unhappiness or sadness, hopelessness, nervousness or tense, or worried) of the individuals were explored.

Stress. Negative life events cause stress to an individual to cope. In this study stress refers to personal stress due to negative life events which happened to individuals and, family stress, negative events occurring to their immediate family members.

Immediate motives. Besides the other factors mentioned above there is usually an immediate factor like “boredom” or “trying to fit in a society of chewers” that makes one reach for the betel pouch. In case of other addictive substances it is known to be prompted by social motives (items 1-4 in the immediate motive questionnaire), self-

enhancement motives (items 5-8), boredom relief motives (items 9-10), and affect regulation motives (items 11-15). As this index proved useful in the study of other addictive substances like tobacco (Wills *et al*, 2002), it was used for this study of betel nut as well.

Users refer to respondents who were in the habit of chewing betel nut during the one-year period before data collection. Users include **initiation, level of use, product preference, location of use, relapse and cessation.**

Initiation means the age at which an individual student had started using betel nut.

Level of use. This refers to frequency of betel use in terms of categories like, daily, regular but not daily, only on special occasions, and rarely.

Product preference. Besides the traditional betel quid consisting of areca nut, betel leaf, and lime, many ready-made betel products like *Sakila, Pan Parag, Supari, Mithra Pan, Zarda Pan*, etc. have come into the market from India. Some people also prefer to take areca nut alone with or without lime. Preference in this study means which of the products available in Thimphu is most preferred by the individual student.

Location of use means the place where an individual student usually uses betel nut.

Relapse means an individual who had actually stopped chewing betel nut but has started chewing again.

Cessation refers to an individual who was using betel nut in the past but has stopped the practice for more than one year.

Non-users are those students who were not in the habit of chewing betel nut during the one year prior to data collection. Non-users include those who totally **abstained** from using betel nut and those who had stopped using and become an **ex-users**.

Abstinence means any respondent who has never taken betel nut in his or her life so far.

Ex-users are those who used to chew betel nut but had stopped the habit for one year or longer by the time of data collection.

1.8.2. Variables and their measurement.

Table No. 1 below gives an overview of the variables, a description of the scales for measuring them, and the type of data that was collected for each scale.

Table 1: Overview of the variables, scales and the type of measurement

No	Variable	Scale	Type
1.	Grade	Academic class starting from 7 till 11	Ordinal
2.	Gender	Male and female	Nominal
3.	Age	In number of years	Interval
4.	Peer, family and teachers	A six-item index (adapted from Pierce <i>et al</i> (1998)	Dichotomous
5.	Socio-Economic Status (Education)	A three-item index about the ability to speak and write in English fluently.	Dichotomous
	Socio-Economic Status (Socio-Economy)	Level of employment	Ordinal

Table 1: (Cont.) Overview of the variables, scales and the type of measurement

No	Variable	Scale	Type
6.	Culture	Five category index to show distinct ethnicities	Nominal
7.	Substance	'Yes' or 'No' answer to questions on smoking and chewing tobacco.	Dichotomous
8.	Negative affect	Four-point Likert scale with 12 items (Wills, et al, 2002).	Ordinal
9.	Psychiatric co-morbidity	Four-point Likert sale with 6 items (Choi et al, 1997)	Ordinal
10.	Stress	Twenty-items checklist (Wills, et al, 2001)	Dichotomous
11.	Immediate motives	Four-point Likert scale with 15 items (Wills, et al, 2002)	Ordinal
12.	User/ Non -user	'Yes' or 'No' answer to questions on betel chewing.	Dichotomous
	User (initiation)	The age of using betel nut for the first time in years.	Interval
	User (level)	A four-level scale to indicate daily, regular but not daily, only on special occasions, or rare use.	Ordinal
	User (preference)	An index to show which preparation is preferred.	Nominal
	User (location)	Index to show at which location the students usually chew betel nut (adapted from GYTS, WHO 2001)	Nominal
	User (relapse)	'Yes' or 'No' answer to whether an earlier 'quitter' started to use again.	Dichotomous
	User (cessation)	'Yes' or 'No' answer to whether previous betel nut user no longer uses.	Dichotomous
13.	Non-user (abstinence)	'Yes' or 'No' answer to whether a person ever used betel nut so far in life.	Dichotomous
	Non-user (ex-user)	A five-point scale from GYTS (WHO 2001)	Ordinal