

## **CHAPTER II**

### **LITERATURE REVIEW**

Broad search of the existing literature has been carried out for this study. It was surprising to see the amount of literature that exists on the subject of betel nut. However there are only few studies done on the actual prevalence of betel nut use among adolescent students. In case of Bhutan, there is only one study done on betel nut use and that was a qualitative research to find out why betel nut is important to Bhutan traditionally and culturally.

The search then was been narrowed down to the following broad areas to suit the purpose of this study.

#### **2.1 Betel Nut**

Pommaret, Françoise is a French lady who had stayed and worked in Bhutan several years and carried out a number of studies on Bhutan. One of her studies was on betel nut with the title, *The Tradition of Betel and Areca in Bhutan* which she completed in 2000. Through a series of qualitative enquiries with notable people in Bhutan, she described the betel nut use in Bhutan and how chewing betel quid has become part of the Bhutanese tradition. She also pointed out that the normally used term, betel nut, is a misnomer because the nut is that of palm, *areca catechu* and betel is the leaf from the plant, betel piper.

Encyclopedias have been checked to find out further information on the properties of the nut, its chemical contents, and the geographical locations where the plant usually grows.

## **2.2 Magnitude of the Betel Users**

Although most of the betel nut researchers and the High Times Encyclopedia of Recreational Drugs estimate that 10% of the world's population chews betel nut, there are some more recent researchers (Nelson and Heischober, 1999) who even estimate the users to be as high as 15% of the world's population. The idea about the geographical locations where betel nut grows is obtained from the research work of Williams, Chowdhury & Chauhan, (2002).

Very little literature exists on the prevalence of betel nut use among adolescent students. The findings of the study in Bhutan have been compared with the following studies carried out in Taiwan:

1. Betel nut chewing: the prevalence and the intergenerational effect of parental behavior on adolescent students, Wang *et al*, 2003.
2. A study on betel chewing behavior among Kaohsiung residents aged 15 years and above, Chen and Shaw, 1996.
3. The prevalence of betel chewing among the students of the different senior high schools in southern Taiwan, Ho *et al*, 2000.
4. Prevalence and related risk factors of betel quid chewing by adolescent student in southern Taiwan, Yang *et al*, 1996.

### **2.3 Health Problems from Betel Nut Chewing**

Researchers like Boucher and Mannan (2002), Winstock (2002) and Norton (1998) are consistent in their estimates that betel nut is the fourth most addictive substance in the world, after tobacco (nicotine), alcohol (ethanol), and caffeine.

From readings it is also known that betel nut use causes major health problems like cancer, asthma, diabetes, circulatory problems which have bearing on the heart, thiamin deficiency, appetite loss, and loosening of the teeth. It also affects the immediate environment because of the filth it generates from its skin, red spit, spots from lime which the chewers wipe everywhere.

Some researchers (Phukan *et al*, 2001) point out that for some Asian localities, betel nut use may account for more health problems than tobacco.

A number of studies point to the association between betel nut use and cancer. However, these scientific papers were rather outdated and there is a lack of such studies in recent times. Maybe by then it was well established that betel nut use causes cancer as has been shown by IARC (the International Agency for Research on Cancer) and WHO.

In August 2002, the Monographs Programme of IARC, WHO 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, a later

evaluation concluded that betel quid chewing by itself is carcinogenic to the users. Finally in 2002, the IARC working group established that the areca nut itself (without the piper leaf, lime, and other ingredients in the betel quid) is carcinogenic to humans.

In 2001, Phukan *et al* from the Regional Medical Research Centre, Indian Council of Medical Research, North East Region, Assam, India had studied and published a paper called, *Betel nut and tobacco chewing: Potential risk factors of cancer of the oesophagus in Assam, India*. This study was carried out because cancer of the oesophagus was the commonest diagnosed cancer in Assam and so was the practice of chewing betel nut with or without tobacco. There was a case control study to find out the risk associated with different types of betel nut chewers. Three hundred and fifty-eight newly diagnosed male patients and 144 female patients have been interviewed together with 2 control subjects for each case chosen at random from among the attendants who accompanied patients to hospital. There were significant trends and risk ratios associated with the frequency of chewing betel nut each day, with the duration of chewing in years and with the age at which the habit was started. Allowances were made for other risk factors, notably tobacco smoking and alcohol consumption in the study. The adjusted ratios, in comparison with non-chewers, were 13.3 for males and 5.7 for females who chewed more than 20 times a day; 10.6 for males and 7.2 for females who had chewed for more than 20 years; and 10.3 for males and 5.3 for females who had started before the age of 20. This study also found that the risk from tobacco chewing was much less than that from betel nut in Assam.

Many other studies including those indicated below also support the association between oral cancer and betel-chewing habit:

1. Singh, M. B., and Von Essen, C. F.(1966). Buccal mucosa cancer in south India. *American Journal of Roentgenol Radium Therapeutic Nuclear Medicine* 96, pp 6-14.
2. Samuel, K.C., Navani, H. and Logani, K. B.(1969), Epidemiology of oral carcinoma in eastern districts of Uttar Pradesh, *Journal of Indian Medical Association* 53, pp. 179-186.
3. Senewiratne, B. and Uragoda, C. G. (1973), *Betel chewing in Ceylon*, *American Journal of Tropical Medicine and Hygiene* 22, pp 418-422.
4. Kwan H. W. (1976). A statistical study on oral carcinomas in Taiwan with emphasis on the relationship with betel-nut chewing: a preliminary report. *Journal of Formosa Medical Association* 75, pp 497-505.

In addition to oral cancers, some studies like those by Reichart, Mohr, Srisuwan, *et al* (*Precancerous and other oral mucosal lesions related to chewing, smoking and drinking habits in Thailand*, 1987), Sinor, Gupta & Murti, *A case-control study of oral submucous fibrosis with special reference to the etiologic role of areca nut*, 1990) and Ko, Huang, Lee *et al* (*Betel quid chewing, cigarette smoking and alcohol consumption related to oral cancer in Taiwan*, 1995) have shown that betel nut chewing alone or in combination with drinking and smoking is related to oral leukoplakia and submucosal fibrosis (pre-cancerous state).

The literature also indicated that betel nut chewing aggravates asthma. In 1991, Kiyingi conducted a study in Papua New Guinea (*Betel nut chewing may aggravate asthma*) and concluded that betel nut chewing may aggravate asthma. However, causation was not established and further study is required.

Taylor, al-Jarad, John, Conroy, and Barnes of the London Chest Hospital in UK studied four asthma patients who were Bengalis in the habit of chewing betel nut and observed them during a betel nut challenge (Taylor *et al*, 1992). Three showed adverse effects, one showed a 30% fall in FEV1 (Forced Expiratory Volume in 1 s) by 150 minutes after chewing. The effects were reproducible. They also reported that the rate of hospital admission for acute asthma is higher among Asians (who are chewers usually) than other groups and suggests that betel nut chewing may be one of several factors that affect asthma and the severity of attacks.

Another interesting finding is the link between prolonged betel nut intake and diabetes. According to Boucher and Mannan, Department of Diabetes and Metabolic Medicine, University of London, the effects of betel nut on diabetes 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. Since Type 2 diabetes is found mostly in Asians compared to Caucasians, these two researchers suspected a link between betel nut eating and Type 2 diabetes. Both their laboratory tests on mice and case control studies on 993 Bangladeshis confirmed their suspicions (Boucher *et al*, 2002).

Not only there is an association between betel nut and Type 2 diabetes but the above study also indicated that waste size (obesity) was strongly related to betel use. .

Further, the Taiwan Poison Centre (Deng *et al*, 2001) listed the following actions of betel nut from cases reported to them:

- 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”.

In 1975, Vimokesant, Hilker, Nakornchai, Rungruangsak, and Dhanamita from the Department of Biochemistry, Faculty of Science, Ramathibodi Hospital, Mahidol University, Bangkok, Thailand conducted dietary survey in northeastern Thailand. 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. Fermented fish and betel nut, both containing anti-thiamin factors, were found to be main reasons for thiamin deficiency in north-eastern Thais because abstention from the use of both resulted in a significant reduction of thiamin

pyrophosphate effect. This effect again increased significantly when the subjects resumed chewing betel nut or eating fermented fish (Vimokesant *et al*, 1975).

In terms of sanitation problems, Williams *et al* (2002) in their study on sociocultural aspects of areca nut use note that “betel nut chewers may be considered a public nuisance because they may expectorate the red mixture of saliva and betel residues in the streets and on the pavement”. TheFreeDictionary.com comments that “trails of bright red sputum lining the sidewalks are a sure indication of the popularity of betel chewing in the area”. Public opinion expressed in *Kuensel*, Bhutan’s national newspaper, lists more problems in case of Bhutan. “The sight of red stain and the white dash on everything in Thimphu town,” says one on 1 January 2005, “is a nuisance and eyesore.” “And the *doma* (betel nut) skin filth everywhere,” says another. A host of comments follow, finally ending in one voice for *doma* ban following the ban on tobacco smoking in the country which came into effect on 17 December 2004.

## **2.4 Exploration of Conceptual Frameworks and Choosing the Bio-Psychosocial Framework of Substance Use**

For framing the concept for this study, established health behavior models like Becker’s Health Belief Model, Green’s Precede-Proceed Model, etc. have been explored. Finally, the bio-psycho-social model, which was found useful by researchers like Haire-Joshu, Morgan, and Fisher for studying addiction from cigarette smoking, was adapted and used as betel nut is also an addictive substance. Even in the United States, the Measures Guide for Youth Tobacco Research developed by the National Cancer Institute, National Institutes of Health appears to be based on this model as all the bio-psycho-social variables included in this model were there.

This model has been preferred by the Tobacco Research Implementation Group (TRIG), created in 1998 and consisting of scientists from multiple agencies and institutions to establish tobacco-related cancer research priorities as this model reflects 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. Depressed or anxious mood and attention deficit hyperactivity disorder are examples of psychological factors that are known to affect the use of addictive substances, from initiation to addiction to cessation. Biological factors like genetics, neurobiological effects of nicotine exposure, hormonal, and metabolic effects have been known to be linked to nicotine use and difficulties in quitting.

The model further explains that the interaction of all these clusters of factors are overlapped and must be considered dynamic over the entire 'carrier' of a smoker.

## **2.5 Instruments**

Literature has also been explored to define the variables used in this study. Depression Anxiety Stress Scale (DASS), Beck's Depression Inventory (BDI), Cigarette Dependence Scale (CDS both the long and the short versions), and Tomkins Affect Theory have been studied to see how these psychological factors are measured. The Youth Tobacco Research Instruments developed and deposited in the public domain by the National Cancer Institute, National Institutes of Health, United States have been found useful in terms of measuring psychosocial variables. When it came to the actual

prevalence of betel nut use, the survey instruments developed by the World Health Organization for Global Youth Tobacco Studies have been used after adapting them to suit this study.