



Areca Nut Addiction: Tools to Assess Addiction

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19.1 Introduction

Areca nut (AN) otherwise known as betel nut has been reported as the world's fourth most commonly used psychoactive substance after tobacco, alcohol, and caffeine [1] and it is reported to be used by one fifth of the world's population [2].

The use of areca nut is widely prevalent and considered acceptable culturally and socially in Asian countries such as India, Sri Lanka, Maldives, Bangladesh, Myanmar, and Taiwan [3].

Its use is also reported among people of South Pacific islands [3] as well as in parts of Thailand, Indonesia, Malaysia, Cambodia, Vietnam, Philippines, Laos, and China and migrants from the above countries living in the United Kingdom, the United States of America, South and East Africa, and Australia [2, 4].

Researchers have tried to highlight its dependence potential and the fact that it fulfils the criteria for a dependence syndrome during the last few decades [5].

An historical account citing colloquial Anglo-Indian words and phrases reports that *“They are always chewing Arecca, a certaine Fruit like a Peare, cut in quarters and rolled up in leaves of a Tree called Bettre (or Vettele), like Bay leaves, which having chewed they spit forth. It makes the mouth red. They say they do it to comfort the heart, nor could live without it”* [6].

In this chapter we would be looking into the concepts of addiction, dependence, assessment, and measurement of addiction/dependence. We examine the evidence on whether there is addiction to AN and if so how to assess it.

Learning Goals

- Goals of this chapter are to review the concepts of addiction and dependence, and to outline the methods of measurement/assessment of addiction/dependence. We propose to explore the evidence supporting an addiction or dependence to areca nut (AN) and if there is confirmed evidence how to assess such behaviours in clinical practice.

19.2 Dependence or Addiction to a Substance

The concept of substance dependence syndrome appears largely to have developed from the seminal work of Edwards and Gross in the mid-1970s [7]. Their paper highlighted a group of features which they called a syndrome which included craving, impaired control over substance use, stereotyping of use, and prioritizing of substance use, and physiological features of tolerance and withdrawal. Saunders reports that prior to this, such behaviours were termed either as “abuse“ and or

“addiction“ due to the mental and social complications, externalizing behaviours and denial of the problem [8].

The term substance dependence and its psychometric properties have been supported by numerous studies [8]. In a memorandum published in 1981, the World Health Organization proposed a classification system in the field of drug- and alcohol-related problems [9]. The *Diagnostic and Statistical Manual* also included the term “dependence“ in its version III (DSM-III) [10] and this terminology was continued in its next revision, i.e., DSM IV [11].

Definition

Addiction has been defined as the development of tolerance and withdrawal upon discontinuation of a substance or refer to compulsive use of a substance known by the user to be physically, psychologically, or socially harmful [12].

Dependence on the other hand is defined as a ‘cluster of physiological, behavioural and cognitive phenomena in which the use of a substance or a class of substances takes on a much higher priority for a given individual than other behaviours that once had greater value’.

Key concepts such as loss of control, tolerance, withdrawal and craving are central but not essential components to the diagnosis of dependence to any substance [8].

However, O’Brien argues that the word ‘dependence’ was already in use for many years prior to DSM-III-R to describe the adaptations that occur when medications that act on the central nervous system are ingested with rebound if the medication is discontinued abruptly. He argues that it is addiction rather than dependence which describes the collection that stands for compulsive, uncontrolled, drug-seeking behaviour [13].

It appears that the DSM and ICD classification preferred the word dependence over addiction as it was less stigmatizing [14].

In order to address these problems, DSM-5 has included certain changes including elimination of a diagnoses of substance dependence and amalgamated all those criteria (abuse and dependence) together under a single category called “substance use disorder“ [15].

However, ICD-11, beta draft has chosen a somewhat different approach. It retains the diagnosis of substance dependence and describes substance dependence as, “a disorder of regulation of the use of a psychoactive substance arising from repeated or continuous use of the substance. Its central feature is a strong internal drive to use the substance, manifested by impaired ability to control use, increasing priority given to use of the substance over other activities, and persistence of use despite harm and adverse consequences.” [16].

For the purpose of this chapter, we will use the term dependence to describe a diagnosis of intense craving, tolerance, withdrawal symptoms, to areca nut..

19.3 Methods of Assessment of Addiction/ Dependence

19.3.1 Diagnostic Criteria and Screening Tools

In clinical practice and more specifically as per Samel et al. research, the instrument used for substance use assessment could make the difference between null and significant findings [17].

In addition to the clinician led interviews several screening tools have been utilized to assess/ screen for and or measure dependence over the years. Some of these are clinical diagnostic criteria such as the Diagnostic and Statistical Manual fifth version (DSM 5) developed by the American Psychiatric Association and the International classification of diseases tenth version (ICD 10) developed by the World Health Organization [15, 18]. These are mostly used in the day-to-day clinical practice.

ICD 10 has a set of criteria developed specifically for the research setting (ICD 10 research diagnostic criteria). In addition there are several structured tools such as the (Addiction Severity Index (ASI); Composite International Diagnostic Interview (CIDI); Structured Clinical Interview for DSM-IV (SCID); Psychiatric Research Interview for Substance and Mental Disorders (PRISM); and Semi-Structured Assessment for Drug Dependence and Alcoholism (SSADDA) [19–23].

All the above instruments have been shown to have good reliability, validity, and acceptance in clinical research settings as well as in the community setting [16].

All of the above are clinician administered tools. However, there are several self-administered tools developed to screen for substance dependence, such as the adult substance use survey (ASUS), drug abuse screening test (DAST), the drug Use Screening Inventory-Revised (DUSI-R) or the “Drinksmeter”. The self-reported instruments are available in paper-and-pencil questionnaires, computer assisted self-interviews or interactive voice recordings [24, 25].

These scales (either self - administered or interviewer administered) are most of the time specific for one particular substance. e.g CAGE and the alcohol use disorders identification test (AUDIT) was developed to screen for alcohol misuse while some are more generalizable. Some of these scales have additional items to detect associated disabilities (Alcohol Use Disorders and Associated Disabilities Interview Schedule (AUDADIS); [26–28].

Such structured interviews provide more robust and reliable information regarding substance use especially for a research purpose by providing diagnostic consistency and avoiding misclassification.

19.3.2 Biological Assessment Techniques

In addition, biological measures of substance use have been used at times as an alternative or an adjunct to screening tools especially in medico-legal settings such as analysing of hair, saliva or urine samples.

19.3.3 Limitations of Existing Instruments for Measuring and or Screening for Dependence

As per Conway et al. [29] despite most of the instruments having proven utility, reliability, and validity, they appear to have certain limitations [29]. The authors mention that the instruments which are currently available are based on a variety of related but different constructs of addiction severity such as behavioural and social consequences, quantity or type of DSM symptoms that are fulfilled, use patterns within and across substances, and number of different DSM diagnoses. In addition, they report that the content of existing measures does not fully reflect the full range of addiction severity.

In addition, most of the scales have been developed in the Western countries to reflect the substances that are prevalent in those settings. To our knowledge, even though these scales and diagnostic criteria have been used to assess/screen or measure substance dependence prevalent in other parts of the world none are validated in measuring dependence to areca nut or related substances.

19.4 Pharmacology of Areca Nut

The primary route of areca nut administration is oral and it is systemically absorbed through the buccal and sublingual mucosa [5]. The onset of effect in the majority of areca chewers is reported to be within 5 min of ingestion and it is reported to last for about 2–3 h [5].

During the last few decades, areca nut and related substances have been available around the globe in preparations called “pan masala” which may have areca in a more refined form which might have different absorption times to the ones mentioned above [30].

Areca nut is also reported to have a stimulant effect through several psychoactive alkaloids which it contains

[31]. Out of these, arecoline has been reported as the chemical that is predominantly present [5].

Studies report that betel quid (primary ingredient areca nut) has both the sympathetic and parasympathetic effects such as changes in the size of the pupil, heart rate and blood pressure [32–34]. These effects on the autonomic nervous system are thought to be possibly dose-dependent, with the parasympathetic activity enhanced at higher doses [35].

The reported effects of areca nut in the central nervous system include a sense of well-being and euphoria [36]. In addition Atukorala et al. report, that areca nut chewing produces a warm sensations of the body, sweating, salivation, palpitation and heightened alertness, and tolerance to hunger [37].

Electroencephalographic studies suggest an increase in both alpha, and particularly beta, rhythms which may explain the so called “stimulant effect” [38].

Some researchers suggest that areca nut increases relaxant qualities through arecaidine which appears to act on GABA uptake inhibitors [39]. Winstock had suggested that areca nut has stimulant and anxiolytic effects similar to tobacco [5].

19.5 Does Areca Nut Fulfil the Operational Criteria for a Dependence Syndrome?

Winstock has highlighted that the potential for abuse of any substance could be modified by its preparation, route of use, as well as by the sociocultural factors [5].

In countries in which the areca nut use is prevalent, existing cultural and ritualistic associations with areca could influence its dependence through the conditioning and reinforcement of its use [5].

Even though most psychoactive drugs have complex pharmacological effects on the brain, the final common pathway of pharmacological effects of dependence is accepted as mediated through release of dopamine at the nucleus accumbens of the ventero-tegmental dopaminergic limbic pathway [40].

Winstock describes tolerance and withdrawal as the core biological components of a dependence syndrome and that areca nut use would strongly support the existence of a dependence syndrome [5].

A study done among Cambodian women suggests that areca nut has an addictive potential as strong as cigarettes [41].

The UK study on areca nut users has suggested that tolerance to the above-mentioned stimulant effects may occur in regular users [42].

In the first ever study which investigated the psychological profile of areca use Winstock et al. [42] report that participants had used areca nut for an average of 35 years with the mean age of first use at 13 years. They

also report that most participants reported beneficial psychosocial effects including ten out of the eleven reporting cessation withdrawal effects. Their study reported the mean Severity of Dependence Score of 7.3 in the Severity of Dependence Scale (SDS) [42].

A study by Bhat et al. in India found that about 44% met at least one of the following symptoms: continued use despite illness or mouth wounds, difficulty in refraining from chewing in forbidden places, or craving during periods of abstinence [43]. They also report that the dependence scores were positively correlated with frequency of chews per day [43]. This study had used the modified versions of several scales; namely the Fagerström Tolerance Questionnaire, Cigarette Dependence Scale (CDS-5) and the Smokeless Tobacco Dependence Scale (STDS) [44–46].

In another study Benegal et al. report that 38.8% of persons using areca nut preparations without tobacco additives met diagnostic criteria for dependence as per the DSM-IV as well as the ICD-10 criteria respectively [47]. Interestingly none of the above had met the “giving up activities to use the substance” criteria as per DSM IV and or ICD 10. “According to Benegal et al. the areca nut users were significantly older, more likely to be women, from rural backgrounds and from lower socio-economic levels than non-users [47].

In the above study Benegal et al. also had found that the participants who used only areca were significantly younger and more educated than those who used both areca and tobacco [47].

In a relatively larger study conducted in 2011 Mirza et al. reported that individuals using areca nut with tobacco additives were significantly more likely to have a dependency syndrome (OR = 2.17, 95% CI 1.39–3.40) as assessed with DSM IV diagnostic criteria [3].

In addition, there are also a couple of case reports that have documented neonatal withdrawal syndromes in children prenatally exposed to areca [48, 49].

However, there are only a couple of studies which have looked into the reasons for areca nut chewing [50–52]. Kuo et al. in their study which was conducted among Taiwanese taxi cab drivers [52], suggest that individuals chew betel-quid for some of the same reasons that individuals smoke tobacco. A large cross-sectional school-based survey conducted among 2200 participants in Karachi, Pakistan [51] has reported that those participants who believed that BQ chewing relaxed them were twice as likely to be dependent on BQ (OR = 2.36, 95% CI (1.20–4.65) as compared with others [51].

Sullivan et al. in a cross-sectional study of 70 people with schizophrenia report that betel quid chewers (areca nut) with schizophrenia scored significantly lower on the positive ($P = 0.001$) and negative ($P = 0.002$) sub-scales of the PANSS than did non-chewers, indicating that areca nut chewing is associated with milder symptomatology

and avoidance of more harmful recreational drugs [53]. A study conducted in India among 988 patients treated for major psychiatric disorders found that about 24% of the sample reported recent areca nut use, and 10% reported severe use suggesting dependence [54]. It also mentions that common reasons for use included to improve mood (31% of users), socialization (31%), digestion (22%), or performance (7%) and to decrease aches and pains (6%). In addition predictors for areca nut use among the participants of this study included lower education levels, diagnosis of bipolar disorder, and current tobacco use.

In a subsequent study among patients with schizophrenia, Sullivan et al. reported that high-consumption betel quid had significantly milder positive symptoms than low-consumption chewers over 1 year as measured by the PANNS. In addition, the use of betel quid was associated with tobacco use but not with cannabis or alcohol in this population [55].

In a large community based study conducted in northern Taiwan, Lin et al. found that areca nut chewing had an odds ratio (OR) of 1.828 (95% CI: 1.165–2.869) with common mental illnesses [56].

In a hospital-based study conducted among 1000 patients with mental health issues in Sri Lanka, 20.9% participants were found to chew betel quid (95% CI: 18.4–23.4%) [59]. The rates of betel quid chewing among patients with and without a mental illness in this study had been 20.7% (95% CI: 17.0–24.4%) and 21.0% (95% CI: 17.6–24.5%) [57]. The authors did not find a statistically significant difference between the occurrence of positive or negative symptoms and or extrapyramidal side effects in patients with schizophrenia with betel quid use [57].

Hung et al. reports that the frequency of betel quid chewing is higher among patients with depression and that patients who chewed betel-quid showed more severe depressive symptoms [58]. In addition, they mentioned that, following antidepressant therapy, the addictiveness to betel quid was significantly reduced by 4 times [58].

19.6 Development of Scales to Measure Betel Quid Dependence/Use

We briefly outline the studies that have so far used different scales to measure dependency to areca nut.

19.6.1 Betel Quid Dependence Scale (BQDS)

Lee et al. were the first to develop an instrument designed specifically for measuring betel quid dependence—the Betel Quid Dependence Scale (BQDS) [59]. The items of BQDS were originally developed in Chinese, It con-

sists of three factors: “physical and psychological urgent need,” “increasing dose,” and “maladaptive use.” It was found to have good internal consistency ($\alpha = 0.92$) and construct validity. However, there are some limitations in its development, such as it was developed and evaluated depending on retrospective information. Not being validated among females and the psychometric properties of the original scale had not been evaluated in English [59] (see ► Box 19.1 below) .

Box 19.1: The Items of Betel Quid Dependence Scale (BQDS)

1. Have you ever felt that you can not go on without betel quid?
2. Have you found yourself having trouble stopping chewing betel quid once you start?
3. Have you ever chewed betel quid non stop?
4. Have you experienced strong craving for betel quid after you reduce or completely stop chewing betel quid?
5. Whenever you want to chew betel quid but not available, would you spend a lot of time to find it?
6. Whenever you want to chew betel quid but not available, would you take extra steps and travel a great distance trying to buy it? For example, even suffer from fatigue by long journey.
7. Have you felt agitated, irritated or anxious after you reduce or completely stop chewing betel quid?
8. Have you experienced difficulty in concentrating or focusing after you reduce or completely stop chewing betel quid?
9. Have you experienced depression or drowsiness after you reduce or completely stop chewing betel quid?
10. Do you have a situation that amount of betel quid is gradually increased every time you chew it from the first time you experienced it?
11. Have you felt the need to increase the amount of betel quid chewing periodically in order to achieve a pleasant or refreshing effect?
12. Have you often found yourself chewing more betel quid than expected and/or spending more time in chewing betel quid than expected?
13. Would you continue chewing betel quid if you find your teeth loosened or wiggled?
14. Would you continue chewing betel quid if you have sensitive teeth (to hot or cold food)?
15. Would you continue chewing betel quid if you experience canker sores or mouth ulcers?
16. Have you reduced or given up any of your social, work or leisure activities because of betel quid chewing?

In order to overcome this, Herzog et al. had validated the BQDS among a sample of English-speaking male and female betel quid chewers living in Guam [60]. They report that confirmatory factor analysis revealed an adequate fit with the hypothesized three-factor measurement model and also that the BQDS is valid for current English-speaking male and female chewers in Guam. They also found that the overall levels of betel quid dependence were high among the study population and that measures using the BQDS are similar to those observed for nicotine dependence.

19.6.2 Reasons for Betel-Quid Chewing Scale (RBCS)

The Reasons for Betel-Quid Chewing Scale (RBCS) is a 10-item measure adapted from several existing “reasons for smoking” scales. The confirmatory factor analysis of this measure revealed a three-factor structure: reinforcement, social/cultural, and stimulation. Further tests revealed strong support for the internal consistency and convergent validity of this three-factor measure [61] (► Box 19.2).

Box 19.2: Individual Items in the Reasons for Betel-Quid Chewing Scale (RBCS) Reinforcement Construct

1. I like the taste.
2. I like to have something in my mouth at all times.
3. Social/cultural construct.
4. All of my friends chew.
5. My family members chew.
6. It's rude not to chew.
7. People will not respect me if I don't chew.
8. Stimulation construct.
9. It relaxes me.
10. It gives me energy.
11. It helps me make decisions.
12. I like the way it makes me feel.

19.6.3 DSM-5 Betel-Quid Use Disorder

Lee et al. from the Asian Betel-Quid Consortium defines DSM-5 betel quid use disorder (BUD) as follows [62].

Users of betel quid (BQ) who met all the DSM-5 substance use disorder (SUD) diagnostic criteria are considered as having a BUD [62].

Lee et al. conducted six cross-sectional studies concurrently across East Asia (Taiwan and mainland China), Southeast Asia (Malaysia and Indonesia), and South Asia (Nepal and Sri Lanka) to test for this concept [62].

The authors used eleven DSM-5 symptoms to assess BUD for current users [62] (see ► Box 19.3 below).

Box 19.3: DSM-5 Betel-Quid Use Disorder

1. Larger amount or longer history of betel-Quid use.
2. Unsuccessful cutdown.
3. Time spent using betel-Quid.
4. Craving.
5. Neglected major roles.
6. Social or interpersonal problems.
7. Given up activities.
8. Hazardous use.
9. Continued use despite knowing problems.
10. Tolerance.
11. Withdrawal.

Lee et al. reported that a positive diagnosis of BUD required the presence of at least 2 of the 11 symptoms within the 12 months before they conducted the interviews with the participants. Further, current users of BQ with 0 to 1 symptom was classified as having no BUD, those with 2 to 3 symptoms as having mild BUD, those with 4 to 5 symptoms as having moderate BUD, and those with 6 or more symptoms as having severe BUD. The above study had been conducted under a single framework using an identical protocol, measuring tools, and diagnostic instruments across all the study sites. However, the above study was conducted in a cross-sectional manner which precluded any causal interpretations which is a major limitation.

19.6.4 Self-Report Screening Test for Areca Quid Abuser (SSTAA)

Areca nut is generally consumed with tobacco and betel leaves. Chen et al. developed the Self-report Screening Test for Areca quid Abuser (SSTAA) to identify whether an areca quid chewer has reached the level of substance abuse [63]. The authors developed a specific self-reporting questionnaire modified from the SCAN system (65), DSM-IV [11] and ICD-10 [18]. The authors screened 125 areca quid users. The final self-report measure has 11 questions (► Box 19.4) where a person filling the form answers with a score of 4 or more in these 11 questions would be considered an areca quid abuser. The authors developed this for use in Taiwan and therefore further studies will be needed for its generalizability in other countries.

Box 19.4: SSTAA Self-reporting questionnaire

1. Do you like chewing betel quid?
2. Have you ever found that once you start chewing, you are unable to stop?
3. When you cut down on or completely quit chewing betel quid, do you have the desire for them?
4. Do you feel cheerful and spiritual when you have betel quid?
5. Have you ever felt that you have to chew betel quid?
6. When you feel your teeth are sensitive to hot or cold food do you still chew betel quid?
7. When you cut down on or completely quit chewing betel quid, do you find it hard to concentrate?
8. Are you able to give up the habit of betel quid chewing at any time you want?
9. Have you ever tried to quit or cut down on betel quid but didn't succeed?
10. When you feel your teeth are loose, do you still chew betel quid?
11. When you suffer from oral cavity ulcer pains, do you still keep on chewing betel-nuts?

19.7 Conclusions and Future Perspectives

Current evidence indicates of the existence of an areca nut dependence disorder. Further longitudinal prospective studies on areca nut use and its correlates will enhance the knowledge of this substance and formal inclusion of the substance in currently accepted diagnostic guidelines of SUDS .

Summary

Chewing of areca nut either on its own or in a quid is a socially acceptable practice in the Indo-Asia-Pacific region. In fact a large proportion of people living in this region and Asian migrant communities in Western countries are reported to use areca nut. Arecoline is the principal active agent in the areca nut and has been found to have effects on the prevailing mood and alertness. Tolerance and withdrawal symptoms have been observed in long-term areca nut users. Studies undertaken in several countries indicate that areca nut use in certain people amounts to dependence and meet formal diagnostic criteria.

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