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Arecanut (Areca Catechu L.) Chewing Causes Cancer,OSF and Others in Humans: is It Not A Mistaken Identity- An Overview

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Abstract: Arecanut or betel nut is the endosperm of the fruit of Areca catechu L. of Palmae family. This nut is also called as supari in Hindi. Arecanut is marketed mainly in two types, one called red supari, which is prepared from immature nuts; whereas the other type called white supari is prepared from ripe nuts. The arecanut is generally chewed along with several other ingredients such as the leaf or inflorescence of Piper betle vine, calcium hydroxide, catechu, tobacco etc. Such wet chewing mixture is called betel quid. Recently, several forms of dry chewing mixtures with or without arecanut have flooded the market in different trade names such as pan masala, gutkha,zarda, khaini, naswar, etc. The properties or the contents of such chewing mixtures naturally differ from that of sole arecanut. Nowadays, lots of Scientific and review articles were published with the title 'arecanut chewing is cancerous to humans' or similar to that. If one goes through such articles critically it is seen that in most of the papers the data were collected either on betel quid, gutka or similar other chewing products and wrongly titled as arecanut chewing. It shows that such researchers and reviewers treated all these chewing mixtures as arecanut without understanding the differences between them. Such ambiguous research papers and review articles are retrieved, discussed and projected in this write up.

Keywords:*arecanut, betel quid, gutkha, human cancer, wrong aetiology.*

I. INTRODUCTION

Since time immemorial, arecanut has been used for chewing as it has lots of medicinal properties [1]. The history of its chewing goes back to a few thousands of years. The skeleton remains of humans dated back to about 3000 BC bearing evidence of arecanut chewing have been found in Duyong Cave in the Philippines [2]. Similar proof has been reported from Vietnam, where the fossil remains of human beings of Bronze Age (1200-3300 BC) with stains of arecanut in their teeth was noticed [3].

In India, arecanut chewing has been mentioned as early as in 650 BC in the work of the famous Sanskrit poet, Magha in Sisupala Vadha of the epic Mahabharata [4]. Arecanut has an important place in the

ancient Indian system of medicine such as Ayurveda, Unani and Homeopathy [5]. The seeds of arecanut have been widely used in clinical practices in China and other South and Southeast Asian countries [6-8]. The World Health Organization (2009) has categorised Areca catechu L. as a medicinal plant and listed out as many as 25 different beneficial effects of arecanut in their book on Medicinal Plants of Papua New Guinea [9]. In spite of this, there are several research papers, review articles and booklets highlighting arecanut chewing as dangerous and even cause cancer in humans. Several such papers are reviewed to find out whether the observations made in them really substantiate their statement?

II. WHAT IS ARECANUT?

Botanically, arecanut is the nut or fruit of an oriental palm called Areca catechu L. of Palmae family. But, commercially, the word arecanut is coined for the endosperm of this nut. It is also called as betel nut in several countries as this nut is mainly chewed along with the leaf of a vine called betel vine (Piper betle L.) of Piperaceae family. In Hindi, arecanut is commonly called as supari [10]. Areca palm is mostly grown in South and Southeast Asian countries such as India, Sri Lanka, Myanmar, China, Bangladesh, Thailand, Indonesia, Malaysia, Vietnam, the Philippines, etc [11].

Arecanut is marketed mainly as two types. One type called 'red supari' is obtained by dehusking tender or unripe arecanut at different stages of its maturity, slicing or without slicing the endosperm / nut, boiling, coating with kali (the concentrated liquid obtained after boiling unripe arecanut) and drying under sunlight for 10 to 15 days. Another type, called 'white supari' is obtained by drying ripe arecanut along with its husk for 40 to 45 days under bright sunlight and dehusking it later on and marketing the dried endosperm as whole nut. This type is also called 'chali' [12].

Whole arecanut (without husk) contains polyphenols, polysaccharides, fibres, alkaloids, minerals, fats and fatty acids. However, there is significant variation in the percentage of these compounds depending on the maturity of the nuts. Polyphenols, total ash and free fatty acids which are more in tender arecanuts, decrease with maturity, whereas polysaccharides, alkaloids, fats and fibres increase with maturity of the nut. Alkaloids, especially arecoline, which is totally absent in very tender arecanut reach up to 0.22% in ripe nut; whereas polyphenols, which are 43.85% and 47.94% in very tender and tender nut stages, respectively decrease up to 17.81% in ripe nuts [13].

In addition to arecoline, the alkaloid contents of arecanut includes arecaidine, guvacine, guvacoline, isoguvacoline and arecolidine[14]. Arecanut also contains Vitamin B6 and Vitamin C [15]. As many as 36 minerals are already identified in arecanut [10]. Among the fatty acids, lauric (19.5%), myristic (46.2%) and palmitic (12.7%), oleic (6.2%), linoleic (5.4%) and hexadecenoic acids (7.2%) are the prominent ones. Minor proportions of stearic, decanoic and monoethylenic C12 and C14 acids are also present in this nut [16]. Among the proteins, peroxidases such as catechin, epicatechin and procyanidin B1 are reported in arecanut [17].

III. WHAT IS BETEL QUID?

Betel quid or Tambula in Sanskrit is a wet form of chewing mixture containing mostly the ingredients such as dry or fresh arecanut, fresh betel leaf, slaked lime (calcium hydroxide), etc [10,18]. Some people also add a piece of tobacco (processed leaf of Nicotiana tabacum) into this chewing mixture. Other ingredients such as catechu, colloquially known as katha (a resinous extract from the bark of acacia tree, Acacia catechu), copra (dry kernel of coconut - the nut of Cocos nucifera L.), cardamom (seeds / pods of Elettaria cardamomum), clove (dried flower buds of Syzygiumaromaticum), ginger (rhizome of Zingiber officinale), sugar, etc are also added by some others to such betel quids depending on their personal preferences and taste. In certain countries such as Palau and Guam islands people commonly use the whole tender arecanut along with its husk instead of dry kernel of arecanut [10,18]. In certain other countries such as Papua New Guinea, Taiwan, etc, people generally use the inflorescence or tender stem of P. betle instead of its leaf and immature whole arecanut (along with its

husk) [19]. Apart from that, the people in Papua New Guinea and Taiwan generally don't use tobacco in such chewing mixtures. As there is such a vast difference in the ingredients of betel quids, the properties or the actions of such chewing mixtures will also vary considerably. Hence researchers should spell out clearly the actual contents of the chewing mixture while conducting any research on betel quid.

IV. OTHER COMMERCIAL CHEWING PRODUCTS

Nowadays, several ready to use dry chewing products containing several items mentioned above are marketed as pan masala, gutkha, etc. in different trade names [20]. Generally, pan masala is a packaged form of dry chewing mixture containing arecanut, lime, catechu, certain condiments, flavouring agents, artificial sweeteners, etc. but without tobacco. When tobacco is mixed with such chewing mixtures, they are called gutkha. Zarda, khaini and naswar are chewing products containing only tobacco and slaked lime. Sweet supari is a form of sweetened, packaged chewing product containing only arecanut [21]. However, in certain packaged chewing products, the actual ingredients used and the quality of such ingredients are not properly disclosed [22]. There are reports that certain packaged chewing products are found adulterated with some hazardous phytochemicals, toxic metals and even pesticides such as DDT and BHC isomers much above the permissible limit [23]. Several dangerous volatile aldehydes, such as formaldehyde, crotonaldehyde, propionaldehyde, isobutyraldehyde, etc., were also detected in some brands of pan masala [24].

Thus, there is enough clarity between arecanut, betel quid and other commercial chewing products with or without arecanut. In spite of that, several researchers did not care to differentiate between these chewing products correctly but wrongly treated all such chewing substances as arecanut. Several such research papers and review articles with erroneous aetiology are cited and discussed here.

V. RESEARCH PAPERS WITH WRONG TITLES

A study was conducted at Bhavnagar, Gujarat with the objective to elucidate the aetiology of oral submucous fibrosis [25]. The publication was titled as 'A case-control study of oral submucous fibrosis with special reference to the etiological role of areca nut' and published in Journal of Oral Pathology & Medicine. In the abstract column of the publication, the authors wrote "The work was carried out on 60 oral submucous fibrosis patients at a dental clinic. Among them 98% chewed areca nuts regularly in one form or the other. Areca nut chewing was practiced most commonly in the form of mawa: a mixture containing mainly areca nut, some tobacco, and a few drops of lime. Mawa chewers and those who chewed mawa along with other chewing habits showed very high relative risks". From these statements it is clear that the authors wrongly treated mawa as arecanut and tagged this nut as the most important etiologic factor in oral submucous fibrosis.

In a South African study entitled 'The areca nut chewing habit and oral squamous cell carcinoma in South African Indians', published in South African Medical Journal, though the objective was to find out the effect of chewing arecanut on the incidence of oral cell carcinoma, exclusive figure for chewing sole arecanut was not given in the paper [26]. While describing Table No IV on the occurrence of oral habits in relation to the oral cancers, the authors mentioned "(Note that the figures shown are not mutually exclusive)". This shows that there is no exclusive data for sole arecanut chewing. Still, the paper is titled as arecanut chewing habits.

A paper entitled 'Oral submucous fibrosis, areca nut and pan masala use: A case-control study' was written by Hazare et al and published in 'The National Medical Journal of India' [27]. Though the title is on arecanut and pan masala use, the authors did not give any instance of sole arecanut use. Instead, several areca nut and tobacco chewing habits were reported in this study. The most common (50%) among them was the use of pan masala. The authors clearly defined Pan masala as betel quid mixture, a commercially manufactured product almost always containing tobacco and areca nut. The next most popular chewing habit among patients was the use of kharra, a local preparation containing pieces of areca nut (7-8 g), a small amount of tobacco

flakes, and drops of slaked lime, mixed, homogenized and wrapped in a cellophane paper ball. Other chewing habits were tobacco-lime and betel quid in different combinations. There was no mention of sole arecanut use.

There is one paper from Assam, India with the title 'Betel nut and tobacco chewing; potential risk factors of cancer of oesophagus in Assam, India' published in 'British Journal of Cancer'[28]. The authors studied the chewing habits of 328 oesophageal cancer patients, but none was chewing sole betel nut (arecanut). The authors further mentioned that "the adjusted ORs associated with taking just green or red betel nut along with betel leaf are 1.9 for males and 0.5 for females, neither differing significantly from the risk in non-chewers". This shows that chewing of betel nut along with betel leaf is not a risk factor for oesophageal cancer. On the other hand, for those who chewed tobacco alone (Chadha) the risk was clearly seen (the adjusted OR for men was 4.9, $P < 0.001$ and for women 3.4, $P < 0.001$). No data were given for sole betel nut chewing. Still betel nuts are also projected as the potential risk factor of cancer in the title.

There is another paper published in the British Journal of Cancer - 'Risk of betel chewing for oesophageal cancer in Taiwan'[29]. In that paper the authors summarised by saying "Among 104 cases of squamous-cell oesophageal carcinoma patients and 277 controls in Taiwan, after adjusting for cigarette smoking, alcohol consumption, and other confounders, we found that subjects who chewed from 1 to 495 betel-year and more than 495 betel years (about 20 betel quid per day for 20 years) had 3.6-fold (95% Cl = 1.3–10.1) and 9.2-fold risk (95% Cl = 1.8–46.7), respectively, of developing oesophageal cancer, compared to those who did not chew betel". From this it is clear that the authors mistook betel quid chewing as betel (arecanut) chewing and highlighted betel chewing as the risk factor for oesophageal cancer.

Similarly, in another paper published in the same journal from Taiwan with the title 'Relationship between site of oesophageal cancer and areca chewing and smoking in Taiwan' the authors had defined areca chewers as those who regularly chewed betel quid for at least 6 months [30]. From this statement it is clear that the authors did not differentiate between arecanut and betel quid. They further summarised the results by saying "we found that chewing areca and smoking cigarettes were associated with lesions in the upper and middle thirds of the oesophagus, respectively" without any data on sole arecanut chewers.

'Constituents of areca chewing related to esophageal cancer risk in Taiwanese men', published in the journal "Diseases of the Esophagus" is a paper where the authors mentioned "There are two most common types of arecachewing habits noted in Taiwan: 1. raw betel fruit with Piper betle inflorescence and 2. raw betel fruit folded in betel leaf" [19]. The authors further reported that out of the 65 areca chewers with oesophageal carcinoma, 61 (93.9%) chewed areca with Piper betle inflorescence, none chewed areca with betel leaf and four (6.1%) chewed both. Sole areca chewers were not reported in the study. But the title of the paper gives a wrong impression that chewing areca constituents leads to esophageal cancer.

'Areca (betel) nut chewing habit among high-school children in the Commonwealth of the Northern Mariana Islands (Micronesia)' is a paper written by Oakley et al. and published in the Bulletin of the World Health Organization [31]. In the results column it is mentioned "Two students were chain-chewers and 21 (7%) reported chewing more than 20 areca quids per day. The preferred nut was the soft variety and most school children added powdered lime to the quid mixture. Piper betel leaf was also often consumed with the nut". This shows that the authors wrongly considered betel quid chewing as arecanut chewing and titled the paper as arecanut chewing.

There is a paper entitled 'Strong association between areca nut use and oral submucous fibrosis (OSF) authored by Stephen Porter published during 2006 in the journal 'Evidence-Based Dentistry' wherein the author concluded by saying "The present study confirms the strong association between areca nut use and OSF" [32]. If one goes through the table given in that paper it is seen there was no significant risk ($p= 0.078$) associated with sole arecanut use and OSF. Still the author misled people by tagging arecanut as the aetiological factor for OSF both in the title as well as in the conclusion.

In the research paper entitled 'Prevalence of Arecanut Chewing Habit among High School Children in Kanpur - A Cross Sectional Study in North India' published in 'International Journal of Preventive & Clinical Dental Research' where the entire study was carried out on those School children who were chewing either sweet supari, pan masala, gutkha or misti pan [33]. Of the 3,513 students interviewed in the age group of 14-18 years from 16 high schools in Kanpur, UP, the frequency of chewing sweet supari was 89.01%, followed by pan masala (4.79%), gutkha (6.06%) and mistee pan (0.12%). Not a single individual was reported chewing only arecanut in its pure form, but the title is on areanut chewing and not on sweet supari, gutkha, misti, etc.

There is a research paper entitled 'Screening for oral potentially malignant disorders among areca (betel) nut chewers in Guam and Saipan' written by Paulino et al and published in the journal 'BMC Oral Health' wherein the authors mentioned that there were two types of betel nut chewing patterns identified in Guam and Saipan: Class 1 (predominantly areca nut users sometimes chewed with betel leaf - often ingested) and Class 2 (areca nut often chewed with betel leaf, lime, and tobacco - often discarded), with the majority (74%) being Class 2 chewers [34]. It shows that sole arecanut chewers were not included. Still the authors highlighted the word "areca (betel) nut chewers" in the title.

In a research paper entitled 'Prevalence of oral submucous fibrosis among betel nut chewers dental patients of Patna' published in 'International Journal of Current Research and Review' the authors gave the inclusion criteria for betel nut chewers group, in the Materials and Methods column, as those chewing areca nut/pan/gutkha for more than3 years, with a frequency of more than 5 times per day [35]. From this it is clear that all those who chewed pan/gutkha were wrongly treated as betel nut chewers.

In the paper entitled 'Correlation between Areca/Betel Nut Chewing Habit with Facial and Dental Characteristics in School Going Children - A Prospective Cross-Sectional Survey' published in 'IOSR Journal of Dental and Medical Sciences' the actual chewing substance was not defined at all, but vaguely mentioned as arecanut chewing habits [36].

Another interesting paper is titled 'Prevalence of areca nut chewing among rural population in India' and published in 'Journal of Oral Health and Dentistry'[37]. The objective of this paper, as stated by the authors, was to investigate the frequency of usage of areca nut among rural population and to mark the deleterious effects on health among such chewers. However, data were collected not on sole arecanut chewers, but on two groups of chewers, viz., Areca nut chewers with other flavonoids and areca nut chewers with betel leaf and other components. Still the title is on the prevalence of arecanut chewing.

VI. REVIEW PAPERS WITH ERRONEOUS HEADINGS

Several review papers were prepared and published in renowned journals highlighting arecanut as the culprit by compiling the works not on arecanut but mostly on betel quid, pan masala, gutkha, etc. Some of such reports with such erroneous headings are discussed here.

One such review articles entitled 'Etiology of oral submucous fibrosis with special reference to the role of areca nut chewing' published in the Journal of Oral Pathology and Medicine, wherein the authors reviewed several chewing habits together but highlighted only arecanut in the title [38]. In one place the authors wrote "In Bhavnagar town, Gujarat, India, there was a sudden upsurge of OSF condition with 275 cases being recorded in a recent 5-yr period as compared to very few cases observed earlier. This trend corresponded with the increase in an arecanut (mawa) chewing habit in that area". The fact is that 'mawa' is a chewing mixture containing arecanut, tobacco and lime [10]. That means that the authors wrongly considered 'mawa' as only arecanut and titled this review.

In the paper entitled 'Areca nut use: an independent risk factor for oral cancer' written by Warnakulasurria et al and published in the journal 'BMJ Clinical Research' the authors highlighted arecanut as

an independent risk factor for oral cancer, but reviewed mostly the papers on chewing mixtures and not on sole arecanut [39]. The authors wrote "An increased risk for the development of oral malignancy in areca nut only users is reported" by citing two reference papers in which the one cited in Sl no 6 is titled as 'Paan without tobacco: an independent risk factor for oral cancer' where the word paan was described as "a quid of Piper betel leaf that contains areca nut, lime, condiment, sweeteners, and sometimes tobacco, which is also used extensively". Like this, independent use of arecanut was not there in any of the papers cited by Warnakulasurria et al.

'The oral health consequences of chewing areca nut' isthe title of a review paper written by Trivedi et al and published in 'Addiction Biology' wherein it is mentioned in the abstract as "In chronic chewers a condition known as betel chewer's mucosa, a discoloured areca nut-encrusted change, is often found where the quid particles are retained" [40]. This shows that the authors mistook arecanut to quid and wrote this review paper.

In an authenticated report given by WHO – IARC on 'The evaluation of carcinogenic risks to humans: betel-quid and areca-nut chewing and some areca-nut-derived nitrosamines' it is noticed that there is no mention of anything on the carcinogenicity of arecanut to humans in its evaluation part in page Nos 238-239, but in its overall evaluation part in page No 239 it is mentioned: "Arecanut is carcinogenic to humans (Group 1)" [10]. How all of a sudden, this statement has come in the overall evaluation part which is not there in the evaluation part sans proper scientific evidence. To substantiate this statement, the report said: "the Working Group noted that a common component of all betel-quid preparations is the areca nut. This evaluation is based on strong evidence that areca nut causes oral submucous fibrosis, a precancerous condition in humans, and sufficient evidence of carcinogenicity in experimental animals. In addition, there is strong supporting evidence for this conclusion". This shows that there is no direct scientific evidence on humans to highlight arecanut is carcinogenic to them but all with indirect evidences and evidences on experimental animals.

There is a paper entitled 'Areca Nut or Betel Nut Control is Mandatory if India Wants to Reduce the Burden of Cancer Especially Cancer of the Oral Cavity' published in International Journal of Head and Neck Surgery by Chaturvedi of Tata Memorial Hospital, Parel, Mumbai, wherein the author highlighted arecanut as highly dangerous to humans[41]. Again, it may be noted that the author did not give any solid evidence on sole arecanut users to substantiate his statement. In the figures from 1-3 the author shows the photographs of several commercial chewing products in sachets. In figure no 4 the author shows a photograph of a patient with mouth cancer. The citation is like this "A young lady having mouth cancer due to areca nut chewing. She was consuming gutkha for 6 years and got this cancer at the age of 18 years". In the first sentence it is mentioned as arecanut chewing and in the second sentence the author mentions that she was consuming gutkha. This shows that the author mistook gutkha as arecanut and titled the paper.

There is a paper entitled 'Association of betel nut with carcinogenesis: revisit with a clinical perspective' published by Sharan et al in PLoS ONE wherein the authors mentioned "The PUBMED database was searched to retrieve all relevant published studies in English on BN and BQ, and its association with oral and oropharyngeal cancers [42]. Only complete studies directly dealing with BN/BQ induced carcinogenesis using statistically valid and acceptable sample size were analyzed. Additional relevant information available from other sources was also considered". The methodology employed shows that the authors treated both betel quid and betel nut same.

The primary objective of the review paper entitled 'Arecanut as an emerging etiology of oral cancers in India' written by Shah et al and published in Indian Journal of Medical and Paediatric Oncology was to review the literature on arecanut as an aetiology for oral cancer [43]. While going through the paper it is seen that in table no 3 on Epidemiologic studies, 18 papers were cited, most of them were on betel quid and not a single one was there on sole arecanut. This shows that these authors also considered betel quid and arecanut as the same.

In the paper entitled 'Areca nut and its role in oral submucous fibrosis' published in Journal of Clinical and Experimental Dentistry by Prabhu et al [44], it is written "Various epidemiological studies and histopathological effects on fibroblast and keratinocytes support the chewing of areca nut as one of the most important risk factors for OSF" by citing the paper of Ahmad et al, 2006, (Sl No 14 in the reference) which was titled as 'Epidemiological and etiological study of oral submucous fibrosis among gutkha chewers'. This shows that Prabhu et al mistook gutkha as areca nut and wrongly titled the review paper as arecanut and its role in OSF.

'Betel nut chewing and its deleterious effects on the oral cavity' is another paper where betel nut was again wrongly highlighted [45]. In this paper written by Anand et al and published in 'Journal of Cancer Research and Therapeutics' the authors seem to be totally confused on the aetiology. In one place they wrote as betel nut, but in several other places as betel quid, arecanut with tobacco, etc. Further, in betel quid they categorised three types: 1. Quid with betel nut but without tobacco products (betel nut quid) which may involve chewing only the betel nut or betel nut quid wrapped in betel leaf (paan); 2. Quid with tobacco products but without betel nut(tobacco quid) including chewing tobacco, chewing tobacco plus lime, mishri (burned tobacco applied to the teeth and gums), moist snuff, dry snuff, niswar (a different kind of tobacco snuff), and naas (a stronger form of niswar); 3. Quid with betel nut as well as tobacco products (tobacco and betel nut quid). All these show that the authors mixed up everything together and wrongly blamed only betel nut without any data on sole betel nut (arecanut) chewing.

In the Materials and Methods column of an exhaustive review entitled 'Areca Nut Use and Cancer in India' written by Gupta and Ray and published in 'Biomedical Research Journal' it is mentioned that "Literature on carcinogenicity of areca nut and its products (areca nut, betel quid or paan, gutkha, pan masala, mawa) was surveyed" [46]. Further, in the Results column of the same review the prevalence of areca nut use in India is mentioned like this: "The report of the Global Adult Tobacco Survey for India (GATS) showed betel quid with tobacco was used by 7.5% men and 4.9% women, and mixtures of areca nut and tobacco without betel leaf (gutkha and mawa) used by 13.1% men and 2.9% women". However, the report did not provide any data for sole arecanut. Still, the review paper is titled as arecanut use.

The paper entitled 'Arecanut and its effects on the human body' written by Kumar et al and published in 'American Journal of Oral Medicine and Radiology' wherein it is stated "Areca-nut chewing has significant effects on the hard and soft tissues of the oral cavity" [47]. To substantiate their statement the authors cited the paper of Trivedi et al (Sl No 21 in the reference column) which was titled as 'The oral health consequences of chewing areca nut' published in Addiction Biology. In this reference paper, even though the title is given as arecanut, the authors collected data on quid and not on sole arecanut as seen by their statement given in the abstract – Areca induced lichenoid lesions mainly on buccal mucosa or tongue are reported at quid retained sites. From these facts it is seen that the authors of both these papers treated quid and arecanut as same and did not care even to correctly identify the chewing substance but erroneously titled their review papers as arecanut.

In a review paper entitled 'Areca nut an ignored carcinogen of Asian continent in a nutshell' published in Journal of Global Oral Health by Gupta and Rao the authors cited six papers in the reference column, but none of them was on original paper dealing with sole arecanut [48]. All the cited papers are again review papers, though titled as arecanut reviewed on different chewing mixtures and not on sole arecanut. For example, the paper cited in Sl no 5 was titled as 'Areca nut use: An independent risk factor for oral cancer' but the paper was mainly on betel quid or paan chewers. This shows that Gupta and Rao did not read the cited papers fully but titled their review papers also as arecanut.

There is an exhaustive review entitled 'Areca Nut and Oral Cancer: Evidence from Studies Conducted in Humans' by Warnakulasuriya and Chen published in 'Journal of Dental Research'[49]. In the abstract of the paper the authors wrote "The risk of oral cancer increases in a dose-response manner with the daily number of quids consumed and the number of years chewing. In the Indian subcontinent and in Taiwan, approximately

half of oral cancers reported are attributed to betel quid chewing". Further, in the sub title on the Evidence for Carcinogenicity of Areca Nut in Humans (page no 1140) it is mentioned "A meta-analysis of 26 observational studies published between 1933 and 2013 assessed the relationship between chewing BQ and the risk of cancers of the oral cavity". The irony is that there is no mention of sole arecanut users in the entire paper. Still, the authors claim that they have reviewed systematically on the carcinogenicity of arecanut in humans.

The public awareness pamphlet entitled 'Beware of arecanut' compiled by Alok Lati et al also targeted arecanut by reiterating arecanut chewing as highly dangerous [50]. But these authors also did not cite any original research work on sole arecanut chewing to substantiate their claim.

VII. CONCLUSION

Ample number of research papers, review articles and even booklets have emerged with the title - arecanut chewing is highly dangerous to humans and even causes cancer in them and so on. While going through such publications it is seen that the chewing substance was not authenticated by any experts in plant science, though the chewing substance mostly contains plant materials. Botanically speaking, arecanut is only arecanut and nothing else. The work carried out on any chewing mixture containing arecanut as one of the materials cannot be called as arecanut. No scientist will agree with this. Hence, in order to know the actual aetiology, the researchers should authenticate the chewing substance correctly with proper experts and frame the title accordingly. If a researcher wants to work on arecanut he should work only on arecanut and not on any chewing mixture and blame arecanut for the ill effect, if any.

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