Oral Submucous Fibrosis in Childhood

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Contents

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5.1 Introduction

Oral submucous fibrosis (OSF) is generally regarded as a disease of the adults where the peak incidence is reported between 20 and 40 years of age [1, 2]. However, in the recent past, cases were reported occurring among paediatric and adolescent population in different geographic locations [3].

With OSF being a progressive and insidious disease, it is highly likely that the condition may have devastating outcomes when the children grow older with more morbidity and likely malignant transformation. Areca nut chewing is the only well-established etiological factor [4]. Older adults who develop OSF in their mouths are generally known to have been exposed to areca nut for a substantial period of time when they develop the condition. This is not the case in very young children who develop OSF. It is therefore likely that these children do have a genetic susceptibility to develop OSF in addition to exposure to areca nut from a young age. This chapter aims to discuss the epidemiology, aetiology, clinical features among children and potential outcomes and avenues for prevention.

Learning Goals

The objective of this chapter is to provide readers an insight into the involvement of children with oral submucous fibrosis. Readers will be able to understand the early initiation of areca nut chewing, which is influenced by the socio-economic and cultural practices. It is important to learn the early signs of OSF among children and help the vulnerable children to be screened to detect OSF at its early stage.

5.2 Epidemiology

OSF cases have been reported from South and Southeast Asian countries such as India [5], Sri Lanka [6], China [7], Pakistan [8], Bangladesh [9], Taiwan [10], Thailand [11], Malaysia [12] and Cambodia [13] and among migrants to the Western countries [14–16]. The prevalence of OSF varies across children and adolescents, and no exact data are available.

Table 5.1 gives a summary of the cases reported among children and adolescents since 1985. The age range of the children affected varies from country to country

Table 5.1 Demographic, symptom and habit information among children diagnosed with OSF

Author, year	Country	Number of cases	Age (y)	Sex	Presenting complaint	Mouth opening	Biopsy findings	Habits
Hayes, 1985 [15]	Canada	1	4	F	Restricted mouth opening	11 mm	Hyperorthokeratotic and atrophic epithelium, subepithelial hyalinization, patchy lymphocytic infiltrate in the deeper tissues	Pan supari since the age of 2 years
Anil and Beena, 1993 [37]	Andaman and Nicobar islands	1	12	F	Difficulty in opening the mouth, protruding the tongue and tolerating spicy food	17 mm	Atrophic epithelium with absence of rete ridges, connective tissue showed hyalinization and moderate chronic inflammatory cell infiltration	Pan supari chewing since the age of 7 yrs
Mundra et al., 1999 [38]	India	1	8	F	Difficulty in opening the mouth, fever, chills and rigors	20 mm	Intact squamous epithelium with focal aggregates of chronic inflammatory cell Infiltration.	Betel nut chewing for 6 months
Shah et al., 2001 [16]	UK	1	11	F	Recurrent oral ulceration, discomfort and a burning sensation for spicy foods	N/A	N/A	Regular Supari use since the age of 10
Yusuf and Yong 2002 [39]	Bangladesh	1	12	M	Difficulty opening his mouth and occasional difficulty in swallowing	21 mm	N/A	Paan supari since the age of 8 years

Table 5.1 (continued)

Author, year	Country	Number of cases	Age (y)	Sex	Presenting complaint	Mouth opening	Biopsy findings	Habits
Hazare et al., 2007 [40]	India	2	9	F	N/A	N/A	N/A	N/A
			12	M	N/A	N/A	N/A	N/A
Sitheeque et al., 2010 [29]	Sri Lanka	5	3	F	White discolouration of lips	Normal	Mildly-atrophic squamous epithelium, with increased amount of collagen in the upper Corium, Fibrosis extends into muscle in a few foci. No inflammatory infiltrate	Areca nut 2–3 times per day
			3	M	Loss of lip pigmentation	Normal	Mild atrophic changes in surface epithelium, features suggestive of OSF, no significant increase in fibrosis of a lesser degree	Areca nut 2–3 times per day
			3	M	Whitish shade of lip	Normal	N/A	Betel with areca nut 1–2 per day
			3	M	Loss of lip colour	Normal	N/A	Betel with areca nut 2–3 per day
			2	F	Loss of lip pigmentation	Normal	N/A	Areca nut only Frequency N/A
Agrawal et al., 2011 [41]	India	1	9	F	Inability to open the mouth for 4 yrs, burning mouth for spicy food	16 mm	Thick parakeratinized epithelium dense fibrous tissue stroma and chronic inflammation	Areca nut (Sweet Supari) 3–4 per day
Dhariwal et al., 2012 [42]	India	2	10	M	Difficulty in opening mouth and taking spicy food for 3 months	15 mm	N/A	Chewing gutkha 2–3 per day for 1 year
			12	F	Burning sensation on having food for the last 3–4 years	19 mm	N/A	Pan masala daily for 7 years
Deshpande et al., 2013 [43]	India	1	14	F	Difficulty in opening the mouth and burning sensation for spicy food	30 mm	N/A	Chewing flavoured areca nut and scented tobacco, 2 packets/day since 1 year.

(continued)

Table 5.1 (continued)

Author, year	Country	Number of cases	Age (y)	Sex	Presenting complaint	Mouth opening	Biopsy findings	Habits
Gupta et al., 2013 [31]	India	2	11	F	Reduced mouth opening, discomfort and a burning sensation particularly when eating spicy foods	14 mm	N/A	Areca nut chewing since seven year
			10	M	Reduced mouth opening, discomfort and a burning sensation particularly when eating spicy foods	13 mm	N/A	Areca nut chewing since six year
Duggirala et al., 2015 [44]	India	3	9	F	Burning sensation on taking spicy foods was noticed since 1 year with increase in severity and progressive restriction of the mouth opening since 6 months	14 mm	N/A	Sweetened form of areca nut continuous
			13	M	Progressive inability to open the mouth since 1 year and severe burning sensation on taking spicy foods since 2 years.	22 mm	N/A	Pan 2–3 times a day since 4 years
			15	F	Recurrent oral ulcers since 6 months and burning sensation in the mouth particularly when eating hot and spicy foods since 1 year	28 mm	N/A	Sweet supari for several minutes for 6–7 times in a day since 4 years.
Khandelwal et al., 2018 [45]	India	1	14	M	Difficulty in opening the mouth for 3 years, burning sensation for spicy food for 4 months	14 mm	N/A	Tobacco and areca nut (Gutkha) 3–4 per day for 6 yrs
Talla et al., 2019 [46]	India	1	5	F	Limited mouth opening for 3 months and burning sensation for spicy food	15 mm	N/A	Areca nut
Kariya et al., 2020 [47]	India	1	5	M	Restricted mouth opening since 3–4 months, Intolerance to spicy food	6 mm	N/A	Sweet supari for since the age of 3.5 yrs

Table 5.1 (continued)

Author, year	Country	Number of cases	Age (y)	Sex	Presenting complaint	Mouth opening	Biopsy findings	Habits
More et al., 2020 [28]	India	36	12	M	Occasional mild burning sensation on eating spicy food	N/A	N/A	Flavoured areca nut/2–3 large sachets per day
			11	F	Nil	N/A	N/A	Flavoured areca nut/1–2 large sachets per day
			11	M	Occasional mild burning sensation on eating spicy food	N/A	N/A	1–2 nuts per day
			14	M	Burning sensation on eating spicy food Loss of taste sensation Xerostomia	N/A	N/A	Gutkha 2–3 small sachets per day
			14	M	Nil	N/A	N/A	Flavoured areca nut/4–5 large sachets per day
			9	M	Loss of taste sensation	N/A	N/A	Baked arecanut, 1 big nut per day
			14	M	Nil	N/A	N/A	Betel leaf with areca nut but without tobacco 4–5 times per day
			10	F	Occasional mild burning sensation on eating spicy food	N/A	N/A	Flavoured areca nut/2–3 small sachets per day
			13	M	Occasional mild burning sensation on eating spicy food	N/A	N/A	Flavoured areca nut/4–5 small sachets per day
			14	M	Burning sensation on eating spicy food	N/A	N/A	Flavoured areca nut/7–8 large sachets per day
			13	M	Mild burning sensation on eating spicy food	N/A	N/A	Flavoured areca nut/8–9 large sachets per day
			14	M	Mild burning sensation on eating spicy food Xerostomia	N/A	N/A	Flavoured areca nut/8–9 large sachets per day

(continued)

Table 5.1 (continued)

Author, year	Country	Number of cases	Age (y)	Sex	Presenting complaint	Mouth opening	Biopsy findings	Habits
			15	M	Mild burning sensation on eating spicy food	N/A	N/A	Pan Masala, 5–6 small sachets per day
			10	F	Loss of taste, excessive salivation	N/A	N/A	Flavoured areca nut/9–10 small sachets per day
			15	M	Occasional mild burning sensation on eating spicy food	N/A	N/A	Mawa 1–2 balls per day
			16	M	Mild burning sensation on eating spicy food excessive salivation	N/A	N/A	Pan Masala, 7–8 large packets
			11	M	Occasional mild burning sensation on eating spicy food	N/A	N/A	Flavoured areca nut/4–5 large sachets per day
			16	M	Loss of taste, xerostomia	N/A	N/A	Betel leaf with areca nut but without tobacco 4–5 times per day
			14	M	Burning sensation on eating spicy food	N/A	N/A	Flavoured areca nut/5–6 large sachets per day
			14	F	Occasional mild burning sensation on eating spicy food	N/A	N/A	Flavoured areca nut/4–5 small sachets per day
			12	M	Nil	N/A	N/A	Flavoured areca nut/4–5 small sachets per day
			14	M	Loss of taste	N/A	N/A	Betel leaf with areca nut but without tobacco 2–3 times per day
			13	F	Occasional mild burning sensation on eating spicy food	N/A	N/A	Flavoured areca nut/5–6 small sachets per day
			15	M	Burning sensation on eating spicy food	N/A	N/A	Mawa 2–3 balls per day
			15	M	Burning sensation on eating spicy food	N/A	N/A	Pan masala 5–6 small packets per day

Table 5.1 (continued)

Author, year	Country	Number of cases	Age (y)	Sex	Presenting complaint	Mouth opening	Biopsy findings	Habits
			11	M	Burning sensation on eating spicy food	N/A	N/A	Flavoured areca nut, 5–6 large sachets
			12	M	Loss of taste	N/A	N/A	Backed areca nut, 1–2 whole nuts per day
			15	M	Burning sensation on eating spicy food, Loss of taste, excessive salivation	N/A	N/A	Gutkha, 4–5 large sachets per day
			13	F	Occasional burning sensation on eating spicy food	N/A	N/A	Flavoured areca nut/5–6 small sachets per day
			14	M	Burning sensation on eating spicy food	N/A	N/A	Mawa 4–5 balls per day
			10	F	Loss of taste	N/A	N/A	Flavoured areca nut/4–5 small sachets per day
			15	M	Mild burning sensation on eating spicy food	N/A	N/A	Pan masala, 5–6 small packets
			13	M	Loss of taste	N/A	N/A	Betel leaf with areca nut without tobacco 5–6 times per day
			12	F	Nil	N/A	N/A	Flavoured areca nut/2–3 small sachets per day
			15	M	Occasional burning sensation on eating spicy food, excessive salivation	N/A	N/A	Pan masala 4–5 small packets per day
			14	M	Burning sensation on eating spicy food	N/A	N/A	Mawa 4–5 balls per day

N/A Not available

with a mean age of 8.7 years, with the youngest child being 2 years of age. Childhood OSF is more common among male children with a female-to-male ratio of 1:1.8.

5.3 Aetiology

The use of areca nut with or without betel quid or tobacco is the only known risk factor [17]. The relationship of areca nut chewing with OSF and pathogenic mechanisms are described in later chapters in this book. Areca nut chewing habit is commonly seen in South and Southeast Asian countries and among Pacific Islanders, where OSF is highly prevalent.

Addiction to areca nut chewing is a serious health concern among South and Southeast Asian populations where about 600 million people are impacted by this substance disorder [18]. Areca nut is the fourth most abused addictive substance after alcohol, caffeine, and tobacco [19]. Among those populations where areca nut use is prevalent, there is a deep-seated cultural link from ancient past to date [18, 19]. Areca nut use is more commonly seen among the middle age to elderly men and women. However, case reports and some studies confirm that children and young adults are also addicted to areca nut [20–26]. Table 5.2 provides a summary of the prevalence of the areca nut chewing among school children. Among the children studied, males have the higher prevalence of chewing areca nut than females.

It is generally regarded that OSF develops over a long period of time after the initiation of areca nut chewing. However, the reported cases indicate that the children have developed at least the initial signs of OSF after a short exposure. This raises the question if these affected children are genetically more susceptible for the development of OSF.

5.4 Vulnerability Factors for Areca Nut Chewing Habits and Developing OSF

A recent review reported that the mean age of initiation of areca nut chewing habit among children was 7.40 years (2–13 years) with some having consumed with a frequency of 15 times a day. The mean duration of areca nut consumption was reported to be 43 months (6–84 months). The presence of clinical features was dependent on the site they kept the quid in the mouth [3].

Multiple social factors influence the children to embark on areca nut chewing, making them more vulnerable to develop OSF at a very young age (Table 5.3). Most children start chewing areca nut due to the influence from their parents, grandparents, siblings and other relatives and through peer pressure. Areca nut chewing is a strongly deep-seated practice with strong cultural bonds. Having parents, grandparents and siblings in family environment who jointly

Table 5.2 Prevalence of areca nut-chewing habit among children

Author, year	Country	Population	Sample size	Habit prevalence (%)			% of OSF cases
				Overall	Males	Female	
Lu et al., 1993 [20]	Taiwan	Junior high school	2367	4.7	9.2	0.9	NA
Ho et al., 2000 [21]	Taiwan	High school	2083	5.4	NA	NA	
Shah et al., 2002 [22]	Pakistan	Preschool children	159	75.0	72.0	30.0	NA
Oakley et al., 2005 [23]	N. Mariana Island	High school children	309	63.0	73.0	54.0	8.8
Khandalwal et al., 2012 [24]	India	Middle school children	3896	27.0	34.6	17.8	NA
Singhvi, 2016 [25]	India	Primary school children	1174	34.5	35.2	33.8	3.4
		High school children	1672	72.8	74.6	70.7	
Wazir et al., 2017 [26]	Nepal	High school children	1359	30.4	38.0	23.2	NA

NA not available

enjoy the use of areca nut would likely influence the children to use the same. Lack of awareness on the harmful effects of areca nut chewing supports the cultural setting to thrive and pass the areca nut chewing to the next generation.

Table 5.4 summarises the reported reasons for initiation of areca nut chewing. In addition to the family influence and peer pressure, various other reasons were reported as determinants for initiation of areca nut chewing. They include the belief that chewing areca nut increases the appetite, aids digestion, reduces tiredness, increases social interaction and helps to look mature. Further, some chewed areca nut due to the attractiveness of packaging, to distract family violence and to avoid pressure of studies.

5.5 Clinical Features

Clinical features of OSF in children are not different from that in adults. The most common presenting complaint of children with OSF was mild burning sensation in parts of the oral mucosa. This was followed by restricted mouth opening. A minority of children had presented with a complaint of loss of taste sensation and depigmentation (Fig. 5.1). Table 5.5 summarises the reported symptoms and signs based on the case histories reported in the literature.

More et al. suggested a classification system for OSF based on the clinical and functional changes [27]. A recent case series from India reported that of the 36 cases, the majority (n = 29, 81%) were stage I cases in which stomatitis and/or blanching of oral mucosa were the prominent clinical features [28]. However, a narrative review of existing literature between 1952 and 2016 on OSF in 18 children reported that over 50% were at the advanced stages (Stage 3/4) of the condition [3].

Restricted mouth opening could perhaps be the most devastating outcome of OSF among children considering the likely further deterioration. Table 5.1 summarises the reported interincisal mouth opening in the reported cases. Of the 24 cases included in Table 5.1, the average mouth opening of 16 patients was 17.2 mm (6–30 mm).

Depigmentation of the oral mucosa is one of the early signs of OSF (Fig. 5.1). Sitheeque and colleagues reported five cases presenting with the initial complaint of depigmentation of the lips [29]. None of these children had restricted mouth opening, and hence depigmentation can be considered as a very early sign of the disease among children. This feature is very important as an initial finding to suspect potential OSF in children, and hence all clinicians who provide dental care for children should take a thorough social history on areca nut use through their parents. This will enable for prevention of the condition progressing further.

Important

It is important to carefully examine the oral mucosa of vulnerable children to exclude early features of paediatric OSF such as depigmentation. Careful parental social history of areca nut chewing is helpful to identify such vulnerable kids. This will enable practitioners to prevent young children from being affected with devastating advanced OSF later in life.

Table 5.3 Social circumstances influencing areca nut chewing among children

Child labour: to reduce appetite and tiredness when working as housemaid; chewing with peers while watching cows
Parents at work: no one at home to look after while parents at work as labourers
Influence from friends who chew areca nut
Grandparents regularly offered areca nut
Family chews after dinner including children
Living with multiple families together who consume areca nut
Siblings chew areca nut

Adapted from More et al., 2020; Chitguppi C, Brar T., 2017

Table 5.4 Reported reasons for chewing areca nut

Peer pressure
Family influence
To avoid pressure of studies
Taste of areca nut
Distract from domestic violence
Attractiveness of packaging
To increase social interaction
Considered a digestive agent
Belief that chewing reduces appetite
Belief that chewing reduces tiredness
To look mature

Adapted from More et al. (2020), Chitguppi and Brar (2017)

Fig. 5.1 (**a**) Depigmentation of lower lip, (**b**) Depigmentation of gingiva, (**c**) Depigmentation of the left buccal mucosa and lower lip, (**d**) Depigmentation of right buccal mucosa (Illustrations courtesy of Dr Ruwan Jayasinghe, University of Peradeniya, Sri Lanka)

Table 5.5 Clinical features of childhood OSF

Symptoms
Burning sensation [16, 28, 31, 42–47]
Difficulty in opening the mouth [15, 37–39, 41–47]
Oral depigmentation [29]
Loss of taste [28]
Reduced saliva [28]
Excessive salivation [28]
Signs
Restricted mouth opening [15, 37–39, 41–47]
Blanching of the oral mucosa [29, 31]
Fibrous bands in buccal mucosa [15, 16, 37–42]
Leathery mucosa [43]
Erosions or ulcerations [16, 44]
Altered shape of uvula [3, 38, 42, 44, 45, 47]
Depapillation of the tongue [28, 37, 42, 44]
Tongue fibrosis [28]

5.6 Diagnosis

Diagnosis of OSF is easy and simple at its advanced stages and can be made based on the clinical presentations alone [28]. In most cases, biopsy might not be necessary and clinical diagnosis is sufficient if no dysplasia is suspected with concomitant potentially malignant lesions such as leukoplakia and erythroplakia. However, diagnosis at early stages may be complex and difficult due to the absence of classic features. In these cases, a thorough history with regard to possible areca nut chewing is needed. Of the cases reported in Table 5.1, only six cases had biopsies performed to confirm the diagnosis, and the rest were diagnosed on the basis of clinical features and history of areca nut chewing habit. The most common histological feature was the atrophic epithelium.

5.7 Management

No specific treatment for OSF has been reported to date [30]. Essentially, the management should aim at preventing the disease progression and malignant transforma-

tion. The management of children with OSF should be done through a multidisciplinary approach, which includes oral medicine specialists, paediatric dentists, general dentists and dietitians/nutritionists with additional behavioural support if required. All children and their parents should be educated on the strong association between areca nut chewing and development of OSF and potential outcomes. Although no malignant transformation of childhood OSF has been reported, children can be considered a more vulnerable group for malignant transformation due to the fact that they have more years to live. Hence, the affected children need to be followed up carefully for a long period of time while paying attention to the general oral health. Due to the progressive nature of OSF that may lead to restricted mouth opening, their oral health can deteriorate. Hence, regular oral prophylaxis at primary healthcare settings is recommended in view of improving oral health and minimising the morbidity associated with dental diseases.

Tip

Depigmentation of oral mucosa or gingiva in young children could be an early sign of OSF that should raise suspicion and needs further investigation.

5.8 Prevention

Given that no treatment is currently available for OSF, prevention is the main strategy. It is pivotal to recognise paediatric areca nut chewing and OSF as a public health problem. It is apparent that the children acquire the areca nut chewing habit from sociocultural environment in which they are living. Studies report that the highest risk of children initiating areca nut habit falls between the ages of 5 and 12 years [3, 31]. It is also likely that the children continue areca nut chewing until adulthood and probably the rest of their life thereafter if there is no early intervention. Moreover, daily consumption of areca nut makes the children more vulnerable to develop OSF [32, 33].

As primary prevention, parents should be educated, and grandparents and families consuming areca nut should be encouraged to quit. They should also be encouraged to avoid promoting the use of areca nut among the children. Primary prevention can be done at various levels using primary healthcare workers, schoolteachers, and community and religious leaders to encourage to quit and prevent the areca nut-chewing habit.

Screening at clinical levels, especially paediatric dental clinic and general practitioner level, to identify cases through the history of areca nut use and the presence of early clinical features of OSF should be encouraged. Parents can be educated at this level to improve their awareness on the dangers of areca nut chewing.

Parents and teachers can also play a significant role in the early detection of OSF among vulnerable children. Dentists, oral health therapists and other allied health workers need to be educated regarding paediatric OSF and the early clinical features. Strong links of areca nut chewing with the sociocultural background must be considered in case identification and prevention [30].

Important

OSF develops among young children after being exposed to areca nut for a short period. Hence, genetic susceptibility for the development of OSF should be explored in future studies in childhood cases.

5.9 Malignant Transformation and Associated Risk Factors of Malignant Transformation

A recent systematic review of adult OSF in 9 longitudinal studies reported that 292 OSF cases developed carcinomas out of 6337 with the pooled proportion of 4.2% (95% CI: 2.7–5.6%) and an annual transformation rate of 0.73% [34]. However, to date, no follow-up studies are available reporting malignant transformation (MT) of childhood OSF [35, 36].

Summary

OSF among children is very rare. However, if children are affected with OSF, they are more likely to have advanced disease with significant disability before reaching adulthood. Children can develop OSF at a very early age with a mean age of the disease initiation being 8.7 years. With areca nut being the only known aetiological factor, it is very important to educate the parents to prevent their young children from initiating the chewing of areca nut. The parents and schoolteachers need to be educated on the danger of the habit of areca nut chewing. Vulnerable children should be screened for likely OSF, and prompt action should be taken to prevent further progression of the disease. Dentists and dental specialists need to be aware of early signs and symptoms of childhood OSF and screen the vulnerable children.

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