

## ORIGINAL ARTICLE

## Association of Body Mass Index and the Risk of Oral Submucous Fibrosis in Maharashtra, India

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**ABSTRACT:**

**Background:** Oral submucous fibrosis is an oral premalignant condition which is irreversible. This condition generally presents as restricted mouth opening due to formation of fibrous bands, stiffening of the tongue, alteration in the pigmentation of oral mucosa and smoothed texture of mucosa. The aim of the present study was to evaluate this association and to find out whether body mass index can be considered as a predictor and risk factor for oral submucous fibrosis in a Maharashtrian population. **Materials and methods:** The present cross sectional survey was conducted in the Department of Dentistry, Government Medical College and Hospital, Maharashtra State during a period of one year i.e. from June 2016 to July 2017. Subjects aged more than 35 years were included in the study. The case group consisted of 50 subjects who had oral submucous fibrosis and the intervention group had 50 controls. A predesigned and pre structured proforma was used for filling the details of the subjects. Every subject's body mass index was calculated using the formula of weight in kilograms divided by height in meter square. BMI was further divided into quartiles for ease of distribution of subjects. BMI of less than 18 Kg/m<sup>2</sup> was categorised as first quartile, BMI between 18-21 Kg/m<sup>2</sup> was regarded as quartile 2, BMI between 21-24 Kg/m<sup>2</sup> was taken as quartile 3 and BMI of more than 24 Kg/m<sup>2</sup> was taken as quartile 4. All the data was arranged in a tabulated form and analysed using SPSS software. Student t test was used for analysis. Probability value of less than 0.05 was considered significant. **Results:** There were a total of 50 cases and 50 controls. Majority of the subjects in cases group were between 46-55 years of age. There were 34% cases in this group. Majority of the subjects in control group were between 35-45 years of age. There were 40% subjects in this age group. There were 12% cases and 14% controls who were more than 65 years of age. There were 36% males and 44% females in the case group who were in quartile 1. There were 28% males and 24% females in the control group who were in quartile 1. There were 34% males and 22% females in the case group who were in quartile 2. **Conclusion:** From the above study we can conclude that BMI was inversely associated with the risk of oral sub mucous fibrosis in a Maharashtrian population.

**Keywords:** Oral submucous fibrosis, Body mass index (BMI), premalignant

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**INTRODUCTION**

Oral submucous fibrosis is an oral premalignant condition which is irreversible. The prevalence of oral submucous fibrosis in Maharashtra is 0.32%.<sup>1</sup> It has been estimated by various reporters that the rate of malignant transformation of oral submucous fibrosis in a 17 year follow up period is 7.6%.<sup>2</sup> Majority of Indian population, South African population is affected by this condition. It may also occur in regions where there are Indian migrants. This condition generally presents as restricted mouth opening due to formation of fibrous bands, stiffening of the tongue, alteration in the pigmentation of oral mucosa and smoothed texture of mucosa. The main stay of treatment is antioxidants and

vitamin supplementations. If forceful mouth opening is tried manually then there is recurrence of the fibrous band formation leading to limitation in mouth opening again. Chewing of tobacco and areca nut are considered as main risk factors for oral submucous fibrosis. As per a study conducted in India, the relative risk of only areca nut chewing is 60.6 and the relative risk for both areca nut chewing and tobacco chewing is 9.4.<sup>3</sup> Body mass index is also considered as a predictor of overall health and nutritional status of the subjects. Reduction in body mass index is generally found to be associated with oral cancer<sup>4</sup> as it indicated poor health and socioeconomic status. Risk of certain cancers is elevated by obesity while certain others are reduced by the same. It has been found

that the risk of breast and colorectal cancer is directly proportional to body mass index whereas risk of oesophageal and oral cancer is inversely associated with body mass index.<sup>5</sup>The exact physiology behind these associations is not well understood, it may be due to variability in fat distribution or due to sex hormones. Association of leukoplakia with body mass index has been established in previous studies<sup>6</sup> but there have been very little studies on the association of oral submucous fibrosis with body mass index. Association of body mass index with the risk of oral submucous fibrosis has been studied in a Kerala population<sup>14</sup>, but has not been studied in Maharashtrian population, The aim of the present study was to evaluate this association and to find out whether body mass index can be considered as a predictor and risk factor for oral submucous fibrosis.

## MATERIALS AND METHODS

The present cross sectional survey was conducted in the Department of Dentistry, Government Medical College and Hospital, Maharashtra state during a period of one year i.e. from June 2016 to July 2017. Subjects aged more than 35 years were included in the study. The case group consisted of 50 subjects who had oral submucous fibrosis and the intervention group had 50 controls. A predesigned and pre structured proforma was used for filling the details of the subjects. All the subjects were informed about the study and a written consent was obtained from all in their vernacular language. Prior ethical committee clearance was obtained from the institute's ethical board. Complete demographic details of the subjects were noted. Patient's age, gender and level of education were noted in the proforma. Patient's occupation and religion were also given

emphasis. Patients visiting the out patient department of dentistry were checked by dentist for presence of oral submucous fibrosis and such subjects formed the cases group. Healthy subjects without any habit were included in the study as controls. Every subject's body mass index was calculated using the formula of weight in kilograms divided by height in meter square. BMI was further divided into quartiles for ease of distribution of subjects. BMI of less than 18 Kg/m<sup>2</sup> was categorised as first quartile, BMI between 18-21 Kg/m<sup>2</sup> was regarded as quartile 2, BMI between 21-24 Kg/m<sup>2</sup> was taken as quartile 3 and BMI of more than 24 Kg/m<sup>2</sup> was taken as quartile 4. All the data was arranged in a tabulated form and analysed using SPSS software. Student t test was used for analysis. Probability value of less than 0.05 was considered significant.

## RESULTS

There were a total of 100 subjects enrolled in the study, out of these 50 were cases and 50 were control. Table 1 denotes the demographic details of the study subjects. Majority of the subjects in cases group were between 46-55 years of age. There were 34% cases in this group. Majority of the subjects in control group were between 35-45 years of age. There were 40% subjects in this age group. There were 12% cases and 14% controls who were more than 65 years of age. There were 32% cases and 20% controls that were between 56-65 years of age. There was no significant difference in age between the two groups. In the case group there were 78% (n=39) males and 22% (n=11) females. In the control group there were 62% (n=31) males and 38% (n=19) females. There was no significant difference in the gender distribution between the two groups.

**Table 1:** Demographic details of study population

CHARACTERSTICS	CASES (n/%)	CONTROLS (n/%)	P VALUE
<b>Age</b>			0.063
35-45	11/22%	20/40%	
46-55	17/34%	13/26%	
56-65	16/32%	10/20%	
>65	6/12%	7/14%	
<b>Gender</b>			0.057
Male	39/78%	31/62%	
Female	11/22%	19/38%	
<b>Education</b>			0.078
Illiterate	21/42%	9/18%	
Primary	13/26%	13/26%	
Middle	9/18%	10/20%	
High	4/8%	13/26%	
Bachelor	3/6%	5/10%	
<b>Religion</b>			0.066
Hindu	37/74%	34/68%	
Muslim	9/18%	11/22%	
Christian	4/8%	5/10%	
<b>Occupation</b>			0.071
None	4/8%	3/6%	
Business	10/20%	20/40%	
Labourer	29/58%	23/46%	
Others	7/14%	1/2%	

**Table 2:** Body mass index amongst the subjects

BMI	MALES		FEMALES		P VALUE
	Cases	Controls	Cases	Controls	
Quartile 1	18/36	14/28	22/44	12/24	0.03
Quartile 2	17/34	14/28	11/22	10/20	
Quartile3	10/20	13/26	9/18	12/24	
Quartile 4	5/10	9/19	2/4	16/32	

Majority of the subjects in the case group were illiterate and majority of the subjects in control group were high school educated. There were 26% cases and 26% controls that were educated till primary level. There were 18% cases and 20% controls that were educated till middle school. There were 6% cases and 10% controls that had bachelor's degree. There was no significant difference in the level of education between the cases and controls as the p value was more than 0.05. Majority of the subjects both amongst cases and controls were Hindu. There were 18% cases and 22% controls who were Muslims. Least number of subjects was Christians. Business was occupation of 20% cases and 40% controls. There were 8% cases and 6% controls that were unemployed. There was no significant difference in the level of education between cases and controls.

Table 2 denotes the body mass index amongst the subjects. There were 36% males and 44% females in the case group who were in quartile 1. There were 28% males and 24% females in the control group who were in quartile 1. There were 34% males and 22% females in the case group who were in quartile 2. There were 28% males and 20% females in the control group who were in quartile 2. There were 20% males and 18% females in the case group who were in quartile 3. There were 10% males and 4% females in the case group who were in quartile 4. There were 26% males and 18% females in the control group who were in quartile 3. There were 19% males and 4% females in the control group who were in quartile 4. There was a significant difference in the BMI between the cases and controls as the p value was 0.03.

## DISCUSSION

According to definitions, oral submucous fibrosis is defined as a disease of insidious onset, chronic in nature affecting any part of the oral cavity and sometimes the pharynx. It is generally preceded by vesicle formation and there is associated juxta epithelial inflammatory reaction along with fibroelastic changes in lamina propria and epithelial atrophy which ultimately leads to trismus and difficulty in eating.<sup>7,8</sup> The prevalence of potentially malignant lesions is reported to be 29.8% amongst the potentially malignant disorders.<sup>9</sup> Oral leukoplakia has been found to occur in 46.1 cases out of 1000 cases and oral submucous fibrosis is seen in 16.4 cases amongst every 1000 cases.<sup>10</sup> According to a study by Sinor et al<sup>11</sup>, male predominance is seen in oral submucous fibrosis cases. This male predominance can be due to the fact that there are more number of areca nut chewers amongst males and they are more easily accessible and susceptible to changes in lifestyles. According to our study in the case group there were 78% (n=39) males and 22% (n=11)

females. In the control group there were 62% (n=31) males and 38% (n=19) females. There was no significant difference in the gender distribution between the two groups. Majority of the subjects in the case group were illiterate and majority of the subjects in control group were high school educated. There has been an inverse relationship between body mass index and oral cancer in literature<sup>4</sup> and the same is true for various oral premalignant lesions like leukoplakia.<sup>6</sup> This association is dicey as the lesion itself is associated with weight loss. In cases of oral submucous fibrosis, there is limitation in mouth opening and hence restriction in food intake which can lead to weight loss. In our study, there were 36% males and 44% females in the case group who were in quartile 1. There were 28% males and 24% females in the control group who were in quartile 1. There were 34% males and 22% females in the case group who were in quartile 2. There were 28% males and 20% females in the control group who were in quartile 2. There were 20% males and 18% females in the case group who were in quartile 3. There were 10% males and 4% females in the case group who were in quartile 4. There were 26% males and 18% females in the control group who were in quartile 3. There were 19% males and 4% females in the control group who were in quartile 4. There was a significant difference in the BMI between the cases and controls as the p value was 0.03. However according to a study by Kabat et al, weight loss due to oral conditions might not be able to explain the association between body mass index and oral cancer.<sup>4</sup> Body mass index is dependent on the total caloric intake so it is difficult to predict the association between both. This association may also be altered by the socio economic status as well as the nutritional status of the individuals. Both of these are risk factors for oral lesions. The basic physiology behind the association between body mass index and oral submucous fibrosis can be due to alteration in the immune system or levels of hormones. Obesity can lead to alteration in the immune response as it causes increase in total leukocyte count, increased rate of granulocytic phagocytosis and there is increase in oxidative activity.<sup>12</sup> Therefore an increase in body weight can be effective against oral cancer. Studies have also demonstrated association of body mass index with estrogen receptor-alpha genotypes.<sup>13</sup> In cases of oral cancer and oral leukoplakia, oestrogen receptors have been detected in the cytosol of the cells. In a study conducted by Mia Hashibe et al<sup>14</sup> they found that BMI was inversely associated with oral submucous fibrosis amongst the population of Kerala in both the genders. Reduced body mass index is associated with certain confounding factors like poor nutrition, poor

socioeconomic status and smoking and hence increasing the risk of malignant and premalignant conditions. Perhaps the exact pathophysiology behind the association between oral submucous fibrosis and body mass index is not clear.

### CONCLUSION

From the above study we can conclude that there is a significant difference in the BMI amongst the patients with oral submucous fibrosis and the controls. Therefore lower BMI can be considered as a risk factor for premalignant conditions of oral cavity. But more studies with larger sample size are needed to validate this. The exact physiology behind this association is still unknown. Similar studies with larger sample size are needed to further validate our results.

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