

# Establishing basic Parameters in Normal Subjects of Parsa District of Nepal to Assess Alterations in Oral Submucous Fibrosis – A Baseline Study

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## A B S T R A C T

**Introduction:** Oral submucous fibrosis (OSF) is a potentially malignant disorder largely seen in the South-Asian countries where areca nut is used enormously as a part of custom and tradition and as a psychoactive substance mainly by the youths. The objective of the present study was to establish parameters of normal mouth opening (mo), tongue protrusion (tp) and cheek flexibility (cf), as these values play an important role in the early diagnosis, grading and initiation of treatment of OSF that is characterized by reduced mo, tp and cf to varying degrees.

**Material and Methods:** The study group consisted of 200 patients (100 males and 100 females) of age ranging from 18 years to above 50 years attending the regular OPD of M. B. Kedia Dental College, Birgunj, Parsa, Nepal for routine dental treatment.

**Results:** Our study showed that the mean values of mo, tp and cf in males were 47.6 mm, 26.9 mm and 9.2 mm respectively and in females the mean values were 43.7 mm, 25.6 mm and 9.0 mm respectively.

**Conclusion:** These values can serve as a guideline to assess the alteration that occurs in mo, tp and cf in patients suffering from OSF.

**Key words:** Oral Submucous Fibrosis, Mouth Opening, Tongue Protrusion And Cheek Flexibility.

## INTRODUCTION

Due to the rapid industrialization and urbanization, human beings are subjected to physical and mental stress which is being relieved by various stress relieving methods like smoking, alcohol consumption, betel nut chewing, paan chewing etc. which continuously keeps on abusing the oral cavity. Due to these habits, medical and dental practitioners often come across a wide spectrum of oro-mucosal lesions; one of which is Oral Sub-mucous Fibrosis (OSF).

Pindborg and Sirsat have defined OSF as an “insidious, chronic disease affecting any part of the oral cavity and sometimes the pharynx. Although, occasionally preceded by and/or associated with vesicle formation, it is always associated with juxta epithelial inflammatory reaction, followed by a fibroelastic change of the lamina propria, with epithelial atrophy leading to stiffness of the oral mucosa and causing trismus and inability to eat”.<sup>1</sup>

Submucous fibrosis of the oral cavity was first described by Schwartz in 1952 as “atrophica idiopathica mucosae oris” which was later replaced by the term oral submucous fibrosis by S. G. Joshi in 1953.<sup>2,3</sup>

The rate of malignant transformation ranges between 7 – 13%.

The main etiology of OSF is areca nut chewing.<sup>4</sup> Chewing betel quid and areca nut is considered as a part of custom and tradition in most of the communities throughout the Indian subcontinent including Nepal and Pakistan. There is deposition of dense fibrous tissue in the submucosal layer of the pharynx, palate, tongue, cheeks, lips, floor of the mouth and esophagus. The underlying muscles of mastication may also be affected.

It is characterized by mucosal rigidity of varying intensity due to the presence of palpable taut (fibrotic) bands that appear vertically in the buccal mucosa, along the contours of the faucial pillars and circumorally, leading to narrowing of the rima oris thus resulting in progressive inability to open the mouth and restriction of tongue movements to varying degrees, depending on the severity of the disease process.<sup>5-9</sup>

In Nepal, areca nut is commonly known as “supari”. It is the most common psychoactive substance being used by the teenagers and the youngsters who are generally more attracted to the commercially available areca nut products like “Gutkha” and “Paan masala” due to their wide publicity, marketing and easy availability.

According to a workshop being held in Kuala Lumpur in 1996, OSF can be diagnosed clinically on the basis of the

presence of one or more of the following characteristics like history of areca nut chewing, burning sensation, reduced mouth opening, mucosal blanching, palpable taut (fibrotic) bands, reduced cheek flexibility and reduced tongue protrusion with histopathology confirming the diagnosis.<sup>10</sup> Early recognition of decreased or limited functioning of oro-facial structures is very necessary for prompt diagnosis and to plan the treatment judiciously.

But, there is no clear cut definition as to what should be the extent of maximum mouth opening, how much flexible the cheek should be and how much the tongue should protrude below which OSF can be suspected. It, therefore, becomes essential to establish what constitutes normal for that specific population.

Keeping these points into mind and because of the increasing trend of chewing areca nut in Nepal, the current study was undertaken to establish the basic parameters that could help in the early detection of this potentially malignant condition for better outcome.

The aim of the study was to establish a baseline for mo, tp and cf with the objective that would help in early detection and grading of OSF on the basis of restriction of mo, tp and cf and to evaluate the response of the treatment during follow up.

## MATERIAL AND METHODS

This was a hospital based prospective study conducted in the Department Of Oral Medicine and Radiology of M. B. Kedia Dental College Pvt. Ltd. Birgunj, Parsa district of Nepal, between the period of February 2019 to September 2019. Before starting the study, ethical clearance was obtained from the institutional research and ethical board (73/REB/Adm/2019/2075). The participants were explained about the study, and a written consent to participate in the study was obtained from the subjects. The study sample consisted of 200 normal subjects with their ages ranging from 18 years to above 50 years who were selected from the patients attending the college OPD for routine dental checkup.

### Inclusion criteria:

1. Subjects without any deleterious habits like chewing areca nut, betel leaves, pan masala or tobacco.
2. Subjects without any oro-dental lesions that could interfere with mo, tp and cf such as pericoronitis, impactions, temporomandibular joint disorders, tongue tie, etc.

### Exclusion criteria:

Subjects with deleterious habits and with oro-dental infections that could interfere with mo, tp and cf were excluded from the study.

The patients were divided into 4 age groups; Group I: 18-29 years, Group II: 30-39 years, Group III: 40-49 years and Group IV: 50 years and above. Each age group consisted of 50 subjects; 25 males and 25 females. (Table I)

The instruments used for measurement were mouth mirror, probe, vernier caliper, graduated metal ruler and a good source of illumination.

The subject was comfortably seated in a dental chair. A thorough clinical examination was performed and the

required variables namely maximum mouth opening, maximum tongue protrusion and cheek flexibility were recorded in the proforma specially structured for the study. Three readings were taken for each individual and their average was recorded as the final reading.

Maximum mouth opening (mmo) was measured using standard protocol. The subjects were asked to open their mouth maximally until no further opening was possible. The distance between the center of incisal edge of maxillary central incisors and mandibular central incisors was recorded in millimeters using a vernier caliper.<sup>11</sup> For tongue protrusion, the subjects were asked to protrude the tongue as much as possible at maximum mouth opening. The distance between the mesio-incisal angle of lower left/right central incisor and the tip of the tongue was recorded in millimeters using a graduated metal scale.<sup>11</sup> Cheek flexibility was measured by drawing a line joining the tragus of the ear and angle of the mouth. An imaginary perpendicular line from the outer canthus of the ipsilateral eye was extended downwards to intersect the angle-tragus line. The point of intersection was marked as a reference point. This was done on both the sides. The distance between the two reference points was recorded at normal centric occlusion as  $c_1$ . The subject was then asked to blow the cheeks fully with lips closed and the distance between the reference points was recorded again and marked as  $c_2$ . The difference between  $c_2$  and  $c_1$  was taken as a measure of cf and recorded in millimeters.<sup>12</sup>

Statistical comparison for the values recorded between the males and females of the same age group was done using Statistical Package for the Social Science (SPSS) version 20.00 (IBM Corp., Armonk, N.Y, USA) statistical analysis software and the results were obtained by applying paired t-test.

## RESULTS

The age of the patients ranged from 18 to above 50 years. They were divided into 4 age groups with 25 males and 25 females in each group making a total of 200 patients. (Table 1)

The mean mo for group I males was 46.7 mm  $\pm$  5.1 whereas for females it was 41.2 mm  $\pm$  6.5. For group II males, mo was 47.4 mm  $\pm$  7.0 whereas for females it was 40.6 mm  $\pm$  6.6. In group III, the mo for males was 48.6 mm  $\pm$  6.2 whereas for females it was 42.1 mm  $\pm$  5.8. Group IV males showed an average of 47.8 mm  $\pm$  6.1 whereas for females it was 42.8 mm  $\pm$  6.0. (Table 1)

The mean tp in group I males was 26.2 mm  $\pm$  3.6 while for females it was 24.6 mm  $\pm$  4.5. For group II, the average tp for males was 26.4 mm  $\pm$  3.9 while for females it was 25.6 mm  $\pm$  5.1. In group III, the average tp for males was 27.5 mm  $\pm$  5.6 while for females it was 26.2 mm  $\pm$  5.0. The group IV males showed an average tp of 27.6 mm  $\pm$  4.6 while for females it was 26.1 mm  $\pm$  5.8. (Table I).

The mean cf for group I males was 8.9 mm  $\pm$  3.0 while for females it was 8.4 mm  $\pm$  2.4. For group II, the average cf for males was 10.2 mm  $\pm$  2.8 while for females it was 10.0 mm  $\pm$  2.6. In group III, the average cf for males was 9.0 mm  $\pm$  3.1 while for females it was 9.4 mm  $\pm$  3.0. The group IV males showed an average cf of 8.8 mm  $\pm$  2.6 while for females it

Age group	Gender	N	Mouth Opening (mm)		Tongue Protrusion (mm)		Cheek Flexibility (mm)	
			Mean	S.D	Mean	S.D	Mean	S.D
18-29 Yrs	Male	25	46.7	± 5.1	26.2	± 3.6	8.9	± 3.0
	Female	25	41.2	± 6.5	24.6	± 4.5	8.4	± 2.4
30-39 Yrs	Male	25	47.4	± 7.0	26.4	± 3.9	10.2	± 2.8
	Female	25	40.6	± 6.6	25.6	± 5.1	10.0	± 2.6
40-49 Yrs	Male	25	48.6	± 6.2	27.5	± 5.6	9.0	± 3.1
	Female	25	42.1	± 5.8	26.2	± 5.0	9.4	± 3.0
≥ 50 Yrs	Male	25	47.8	± 6.1	27.6	± 4.6	8.8	± 2.6
	Female	25	42.8	± 6.0	26.1	± 5.8	9.0	± 2.8

**Table-1:** Mean values with S.D of mo, tp and cf in different age groups.

Age group	Gender	N	Mouth Opening (mm)	Tongue Protrusion (mm)	Cheek Flexibility (mm)
18-29 Yrs	Male	25	33.6 – 76.2	19.2 – 40.6	4.8 – 17.1
	Female	25	32.4 – 62.1	16.5 – 35.4	4.9 – 15.6
30-39 Yrs	Male	25	36.2 – 75.4	17.6 – 35.8	5.1 – 21.7
	Female	25	34.8 – 58.2	19.8 – 36.2	5.2 – 15.8
40-49 Yrs	Male	25	36.8 – 74.4	17.4 – 43.2	4.0 – 16.4
	Female	25	31.6 – 56.2	16.6 – 40.2	4.6 – 21.1
≥ 50 Yrs	Male	25	37.6 – 70.0	16.8 – 42.4	4.4 – 16.9
	Female	25	30.8 – 60.2	18.4 – 40.1	3.9 – 19.8

**Table-2:** Range of mo, tp and cf at 95% confidence interval in different age groups.

Gender	Number	Mouth Opening (mm)	Tongue Protrusion (mm)	Cheek Flexibility (mm)
Male	100	47.6 ± 0.79	26.9 ± 0.72	9.2 ± 0.6
Female	100	43.7 ± 0.97	25.6 ± 0.73	9.0 ± 0.7

**Table-3:** Mean values of mo, tp and cf.

Parameters	Values	18-29 Yrs	30-39 Yrs	40-49 Yrs	≥ 50 Yrs
Mouth Opening	t value	3.32	3.53	3.82	2.92
	p value	0.0017	0.009	0.004	0.0053
Tongue Protrusion	t value	1.388	0.623	0.865	1.0131
	p value	0.17	0.53	0.39	0.31
Cheek Flexibility	t value	0.6507	0.2617	0.4636	0.261
	p value	0.5183	0.79	0.64	0.794

**Table-4:** Level of significance between male and female means of mo, tp and cf.

was 9.0 mm ± 2.8. (Table I).

The range of mo, tp and cf at 95% confidence interval are shown in Table II.

The average mo for males was 47.6 mm ± 0.79 and for females it was 43.7 mm ± 0.97. The average tongue protrusion in males was 26.9 mm ± 0.72 while in females it was 25.6 mm ± 0.73. The average cheek flexibility in males was 9.2 mm ± 0.6 and for females it was 9.0 mm ± 0.7. (Table III)

Paired t-test was applied to find the levels of significance for values recorded between the males and the females of the same age group as far as mo, tp and cf were concerned. Mouth opening was higher in males than the females in all the age groups. The results showed statistically significant difference between males and females of all age groups as far as mo were concerned. The values of tp and cf were also higher in males than females in different age groups except in the age group of 40 - 49 years, in which cf was higher in females than males, but the results were statistically not

significant. The t values and the respective p values are shown in Table IV.

## DISCUSSION

Early recognition of decreased or restricted mo, restricted tp and reduced cf in many pathological conditions is necessary for the prompt diagnosis and to plan the treatment options judiciously. Therefore, it becomes utmost important to establish what constitutes normal for the particular population. As with any other disease or condition, the aim of the treatment is to restore the mo, tp and cf to its normal value.

With this aim, the current study was designed to consider the applicability of this method as an index to measure the maximum mo, tp and cf.

The mean values and the standard deviation of all 3 parameters of 200 patients recorded are shown in Table I. Mouth opening and tongue protrusion seem to increase with

age but the values were statistically not significant. This is consistent with earlier reports by S.C. Cox (1997) for the Nepalese population and Ranganathan K, et al (2001) for South Indian population.<sup>12,13</sup>

The mean values for all the three parameters were seen to be higher in males than females as shown in Table II. The difference can be accounted for due to the basic difference in the morphology, facial size and difference in rate of growth between males and females. Same findings have been observed and reported in studies by other investigators.<sup>12-15</sup>

While comparing our findings with that of other studies, there was difference in all three parameters.

The mean mo in South Indian males and females as reported by K. Ranganathan, et al in 2001 was 47.5 mm and 44.6 mm, in Nepalese healthy individuals, the mean mo was 47.1 mm as reported by S C Cox, et al in 1997 whereas the mo as reported by Mathur RM, et al in North Indian males and females, in 1993 was 50.3 mm and 44.9 mm respectively.<sup>12-14</sup>

In recent studies, the mean mo in Indian males and females as proposed by V Sharon, et al in 2019 was 52 mm and 45 mm, as proposed by Jayshree Agrawal, et al in 2015, it was 50.3 mm in males and 49.9 mm in females whereas as proposed by Ravleen Nagi, et al in 2017, the mean mo was 51.0 mm in males and 46.3 mm in females respectively.<sup>15-17</sup> However, in our study, the mean mo for males and females of Parsa district of Nepal was 47.6 mm and 43.7 mm respectively.

The mean tp in North Indian males and females as reported by Mathur RM, et al in 1993 was 67 mm and 61 mm respectively whereas in South Indian males and females, the mean tp was 24.9 mm and 24.8 mm respectively as reported by K. Ranganathan, et al in 2001.<sup>12,14</sup> However, in our study, the mean tp for males and females of Parsa district of Nepal was 26.9 mm and 25.6 mm respectively. The reason behind too much difference in tp between the North Indian and South Indian populations was due to the use of different reference points.

The mean cf in North Indian males and females as reported by Mathur RM, et al in 1993 was 12 mm whereas in South Indian males and females, the mean cf was 9.7 mm and 9.0 mm respectively as reported by K. Ranganathan, et al in 2001.<sup>12,14</sup> However, in our study, the mean cf for males and females of Parsa district of Nepal was 9.2 mm and 9.0 mm respectively.

## CONCLUSION

The average maximum mo for males and females in Parsa district of Nepal is  $47.6 \pm 0.79$  mm and  $43.7 \pm 0.97$  mm respectively. The mouth opening seems to increase with age in males. The mouth opening is significantly less in females than males in all the age groups. The average tp for males and females in Parsa district of Nepal is  $26.9 \pm 0.72$  mm and  $25.6 \pm 0.73$  mm respectively. Similarly, average cf for males and females in Parsa district of Nepal is  $9.2 \pm 0.6$  mm and  $9.0 \pm 0.7$  mm respectively.

These baseline values regarding maximum mo, maximum tp and maximum cf may serve as an indicator to assess the alterations of these parameters in various oral diseases like OSF to grade them and to formulate a specific treatment plan.

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