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Effect of fixed orthodontic treatment on the oral healthstatus of patients aged 11-25 years – A cross - sectional study

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Abstract

Health is a valuable asset not only for any individual but also for any country. World Health Organization defined health as, a state of complete physical, mental and social well- being and not merely an absence of disease or infirmity and the ability to lead a socially and economically productive life.

Good oral health is recognized as an important need to enjoy overall health. Sir William Osler has rightly stressed the significance of the oral cavity as the 'mirror' of general. Oral health is a state of being free from pain, periodontal disease, tooth decay, tooth loss, cancer and other diseases.

Poor oral health and untreated oral conditions have an adverse effect on quality of life. The prevalence and the recurrence of the oral diseases represent a growing and silent epidemic.. The frequency of these diseases, according to data from literature, varies and depends on a number of factors such as gender, age, patient's motivation, physical and mental development, oral hygiene degree, the effect of dental alloys.

Aim: To assess the effect of Fixed orthodontic treatment on the oral health status of patients aged 11- 25 years.

Objectives

1. To assess prevalence of dental caries, periodontal disease and oral mucosal lesions among patients undergoing fixed orthodontic treatment and those who are not.
2. To compare prevalence of dental caries, periodontal disease and oral mucosal lesions among patients undergoing fixed orthodontic treatment with those who are not.

3. To assess the relationship between prevalence of dental caries, periodontal diseases and oral mucosal lesions with duration of treatment.
4. To provide adequate information regarding oral hygiene practices.

Methods

Study design: The present study is a cross-sectional study.

Study Population: The study population consisted of 400 patients, 200 cases and 200 controls aged between 11 - 25 years.

Sampling Design: The study cases were randomly selected from the outpatient Department of Orthodontics and Dento-facial Orthopedics and Department of Oral Medicine and Radiology at Buddha Institute of Dental Sciences, Patna, Bihar.

Conclusion: The findings of present study conclude that oral health status of majority of patients undergoing fixed orthodontic treatment is better when compared to those who are not undergoing treatment.

These results are due to constant motivation and repeated instructions regarding good oral health at regular intervals, should be given great emphasis during the course of orthodontic treatment. Moreover, from a public health perspective, problem of poor oral health among controls is an alarming challenge and warrants significant attention from both patient and clinician. Outcome of orthodontic treatment as well as its consequences on oral health during the course of treatment should be kept in mind, both by clinician and patient to enjoy the quality of life.

Keywords: Oral Hygiene Behavior; Orthodontic Treatment; Fixed Appliance.

Introduction

'A healthy smile is a curve that sets everything straight.' - Phyllis Diller Health is a valuable asset not only for any individual but also for any country. World Health Organization defined health as, a state of complete physical, mental and social well-being and not merely an absence of disease or infirmity and the ability to lead a socially and economically productive life.

Poor oral health and untreated oral conditions have an adverse effect on quality of life. The prevalence and the recurrence of the oral diseases represent a growing and silent epidemic.

An adverse effect of fixed orthodontic appliances is irritation of oral mucosa due to injuries caused by improper fitting bands, ligature wire cutting into the gingiva or by accessory attachment such as auxiliary springs impinging on gingiva and/or buccal mucosa.

Although, the lesions of oral mucosa are painful and uncomfortable, they usually heal fast. However, descriptions of changes in the oral health status of dental patients during orthodontic therapy are sparse in the literature.

The available scientific literature has assessed oral health status before and after the orthodontic therapy.

Hence, an attempt has been made to assess the oral health status in patients who are currently undergoing fixed orthodontic treatment at the Department of Orthodontics and Dento facial Orthopedics and Oral Medicine and Radiology of Buddha Dental Institute. Of Dental Sciences and Hospital, Patna.

Aim of Study

To assess the effect of Fixed orthodontic treatment on the oral health status of patients aged 11- 25 years.

Objectives of the study

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Pilot survey:

A pilot survey was carried out on patients undergoing fixed orthodontic treatment in order to study the feasibility of survey procedures and to find out the constraints. Clinical examination of the study subjects was done after collecting the required and relevant information pertaining to study.

Method of collection of data

- Randomly selected patients who were undergoing fixed orthodontic treatment.
- The same number of patients who were not undergoing fixed orthodontic treatment had also been selected for comparison.

After selecting the subjects, structured questionnaire was filled and detailed oral examination was conducted by the examiner.

Oral examination had been carried out and findings were recorded on WHO ORAL HEALTH ASSESSMENT FORM (1997).

Inclusion Criteria

- Patient aged: 11-25 yrs.
- Patient undergoing fixed orthodontic treatment
- The control group consisted of patients who were not undergoing fixed orthodontic treatment. They were matched with cases for age and gender as far as possible.
- Those patients who volunteered to participate in the survey.

Exclusion Criteria

- Patient with any systemic disease.
- Patient with cleft lip and cleft palate.
- Patient undergoing periodontal treatment

Organizing the Survey

1. Approval from authorities

Permission to conduct the survey was obtained from concerned authorities.

2. Ethical clearance

Prior to the start of the study, a protocol of the intended study was presented to the Institutional Ethical Review Board and later ethical clearance for the present study was obtained.

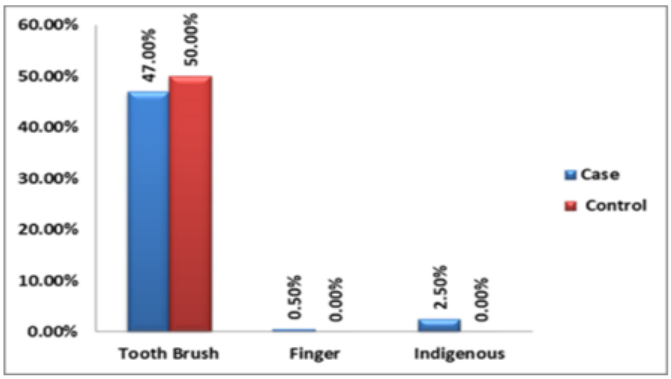
3. Schedule of the Survey

A survey was systematically scheduled for a period of four months from. May 2022 to August 2022 Schedule for the examination had been prepared well in advance.

On an average 10 -12patients were examined per day during the survey period.

Table1: Distribution of subjects according to gender

Gender	Case	Control	Total
Male	56 (14.00%)	88 (22.00%)	144 (36.00%)
Female	144 (36.00%)	112 (28.00%)	256 (64.00%)
Total	200 (50%)	200 (50%)	400 (100%)



Graph 1

Graph 2

Table 2: Distribution of subjects according to dentition status and treatment needs:

Group	Case	Control	Total
Fissure sealant	16 (4%)	34 (8.50%)	50 (12.50%)
One surface filling	4 (1.00%)	32 (8.00%)	36 (9.00%)
Two or more surface filling	2 (0.50%)	21 (5.25%)	23 (5.75%)
Crown for any reason	5 (1.25%)	0 (0.00%)	5 (1.25%)
Veneer or laminate	0 (0.00%)	109 (27.25%)	109 (27.25%)
Pulp care and restoration	0 (0.00%)	31 (7.75%)	31 (7.75%)
Extraction	0 (0.00%)	0 (0.00%)	0 (0.00%)
Not recorded	0 (0.00%)	0 (0.00%)	0 (0.00%)

Table 3: Association between DMFT & Duration of treatment:

Duration of Treatment	DMFT									Total
	0	1	2	3	4	5	6	7	9	
0	0	0	0	2	2	0	0	0	0	4
1	26	20	10	4	6	4	0	2	0	72
2	42	36	26	10	4	2	2	0	0	122
3	0	2	0	0	0	0	0	0	0	2
Total	68	58	36	16	12	6	2	2	0	200

Table 4: Mean dt, mt, ft, dmft among Case and Control

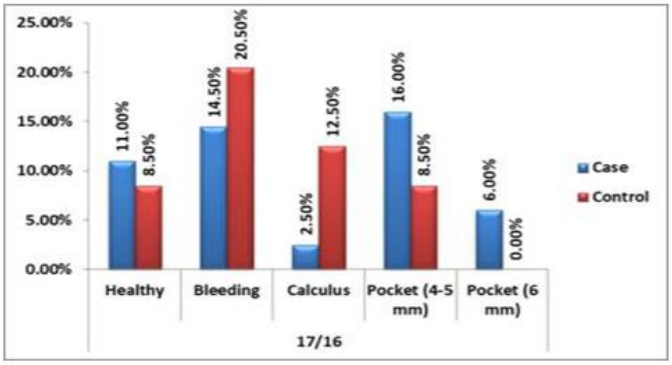
	Decayed	Missing	Filled	DMFT
Case	0.22±0.58	0.02±0.14	1.17±1.35	1.41±1.52
Control	2.27±1.74	0.03±0.22	0.80±0.91	3.09±1.91
P value	<0.001(S)	0.99 (NS)	0.016 (S)	<0.001(S)

Distribution of subjects according to their mean CPI INDEX (Periodontal Status among those undergoing fixed ortho. treatment and those who are not

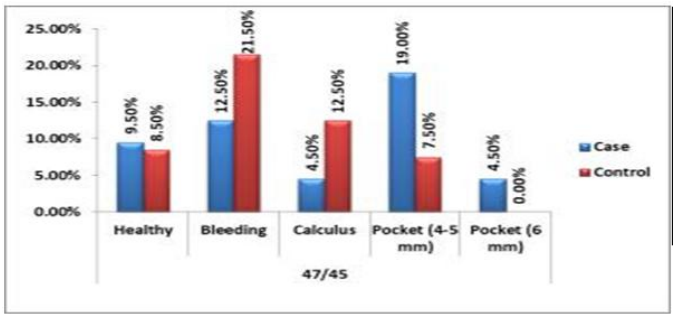
Table 5:

CPI	26/27					Total
	Healthy	Bleeding	Calculus	Pocket (4-5 mm)	Pocket (6 mm)	
Case	28 (7.00%)	52 (13.00%)	14 (3.50%)	80 (20.00%)	26 (6.50%)	200 (50%)
Control	38 (9.50%)	100 (25.00%)	16 (4.00%)	42 (10.50%)	4 (1.00%)	200 (50%)

Chi square = 44.78, df= 4, P = <0.001(Significant)



Graph 1:



Graph 2:

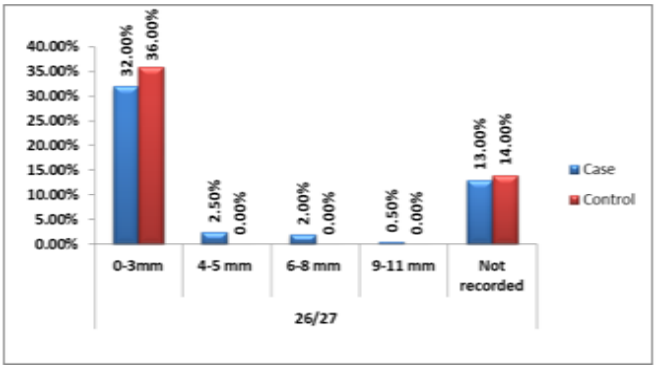
Table 6:

CPI	31				Total
	Healthy	Bleeding	Calculus	Pocket (4-5 mm)	
Case	88 (22.00%)	70 (17.50%)	34 (8.50%)	8 (2.00%)	200 (50%)
Control	36 (9.00%)	68 (17.00%)	94(23.50%)	2 (0.50%)	200 (50%)

Chi square = 53.56, df= 3, P = <0.001(Significant)

Distribution of subjects according to Loss of Attachment among those who are undergoing ortho. T/t and those who are not.

Graph 3:



Graph 4:

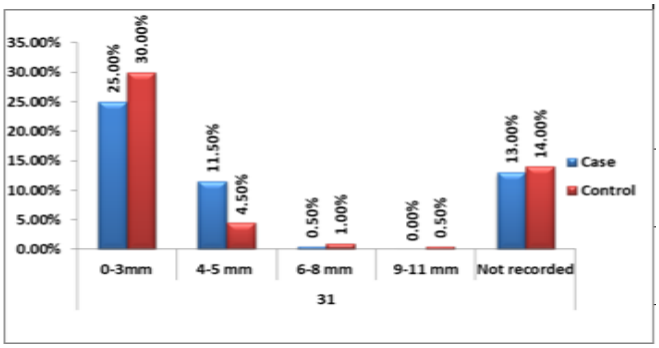


Table 7:

LOA	47/46				Total
	0-3mm	4-5 mm	6-8 mm	Not recorded	
Case	136 (34.00%)	4 (1.00%)	8 (2.00%)	52 (13.00%)	200 (50%)
Control	142 (35.50%)	2 (0.50%)	0	56 (14.00%)	200 (50%)

Chi square = 8.944, df= 3, P = 0.030(Significant)

Table 8:

LOA	36/37				Total
	0-3mm	4-5 mm	6-8 mm	Not recorded	
Case	134 (33.50%)	6 (1.50%)	8 (2.00%)	52 (13.00%)	200 (50%)
Control	140 (35.00%)	4 (1.00%)	0	56 (14.00%)	200 (50%)

Chi square = 8.68, df= 3, P = 0.0339 (Significant)

Association between CPI & Duration of treatment:

Table 9:

Duration of treatment	17/16					Total
	Healthy	Bleeding	Calculus	Pocket (4-5 mm)	Pocket (6 mm)	
0	0	0	2	2	0	4
1	22	20	4	18	8	72
2	20	38	4	44	16	122
3	2	0	0	0	0	2
Total	44	58	10	64	24	200

Chi-square, df(32.04,12),P-value=0.0014

Table 10:

Duration of treatment	26/27					Total
	Healthy	Bleeding	Calculus	Pocket(4-5 mm)	Pocket(6 mm)	
0	0	0	2	2	0	4
1	14	20	10	20	8	72
2	24	28	6	54	10	122
3	0	2	0	0	0	2
Total	38	50	18	76	18	200

Chi-square, df (24.06, 12), P value=0.02

Table 11:

Duration of treatment	47/46					Total
	Healthy	Bleeding	Calculus	Pocket(4-5mm)	Pocket(6mm)	
0	0	0	2	2	0	4
1	8	28	4	26	6	72
2	20	22	8	52	20	122
3	0	2	0	0	0	2
Total	28	52	14	80	26	200

Table 12:

Duration of treatment	36/37					Total
	Healthy	Bleeding	Calculus	Pocket(4-5mm)	Pocket(6mm)	
0	0	0	0	0	4	4
1	18	18	4	24	8	72
2	30	24	4	46	18	122
3	0	2	0	0	0	2
Total	48	44	8	70	30	200

Association between Loss of Attachment & Duration of treatment.

Table 13:

Duration of treatment						Total
	0-3 mm	4-5 mm	6-8 mm	9-11 mm	Not recorded	
0	0	4	0	0	0	4
1	28	14	0	0	30	72
2	72	28	2	0	20	122
3	0	0	0	0	2	2
Total	100	46	2	0	52	200

Chi-square, df (10.36, 4), P value=0.0348

Table 14:

Duration of treatment	36/37				Total
	0-3mm	4-5mm	6-8mm	Not recorded	
0	4	0	0	0	4
1	36	0	6	30	72
2	94	6	2	20	122
3	0	0	0	2	2
Total	134	6	8	52	200

Chi-square, df (11.47,4),P - value=0.0218

Table. Association between Oral Mucosal Lesions & Duration of treatment.

Table 15:

Oral mucosal lesion	Duration				Total
	0	1	2	3	
Normal	4	28	38	2	72
Malignant	0	0	0	0	0
Leukoplakia	0	0	4	0	4
Ulceration	0	44	80	0	124
Total	4	72	122	2	200

Discussion

Thedatacollectedfromclinicalfindingswerediscussedunderfollowingbroadheadings:

1. Oral hygiene practices
2. Dental Caries
3. Periodontal Status
4. Oral mucosal lesions

Interventional Urgency

In the present study a total of 400 subjects participated of which 64.1% were males and 34.9% were females. Many of the subjects belong to upper and upper middle (Kuppuswamy's Classification) class.

Oral Hygiene Practices

- Approximately388 (97.00%) of the patients in this study used soft bristled toothbrush along with fluoridated toothpaste 384 (96.00%), with majority232 (58.00%) brushing twice a day.
- Majority of the patients 202 (50.50%) followed Horizontal technique while a little less 154(38.50%) followed Combination of all techniques**.**
- Majority 100 (25.00%) used orthodontic Brushes while 76 (18.00%) used Oral mouth Rinse compared with the other oral hygiene Aids like Flossing 4(1.00%)and Inter dental Brushes 6(1.50%)similar

to studies by of Blink horn A S and other study by Christou V, Timmerman MF, Vander Velden U, Vander Weijden FA(1998) .

It is recommended that effective oral hygiene measures should be included.

1. Mechanical plaque removal –tooth brushing, flossing, and regular prophylaxis
2. Fluoride therapy–at-home use of fluoridated toothpaste and mouth rinse and use of topical fluoride
3. Mechanical protection of tooth surfaces–sealant sand glass ionomers cements
4. Diet–reduction in consumption of foods that cause acidity in the oral environment
5. Motivational communication– discussion of proper oral hygiene promotion and disease prevention directly to the patients before treatment, repeating instructions during and at the end of treatment with emphasis on oral health and esthetic benefits. Besides orthodontic treatment, the importance of dental hygiene maintenance procedures and treatment should also be emphasized.

Contradictory findings were encountered in studies of Pejda S, Juric H, Repic D, Jokic D, Medvedec I, Sudarevic where adverse effects of fixed orthodontic appliances present complex problem in clinical practice even in the patients who have improved their oral hygiene habits during fixed orthodontic therapy,

The controls were having significantly higher proportion of Decayed component P value <0.001(S) when compared to cases whereas Filled component was significantly more P value= 0.016 (S) than in controls. The results were statistically significant when Cases and Controls were compared with p<0.05.

Periodontal Diseases

It was observed that maximum of the total subjects participated had some form of gingival health problem.

Most Healthy periodontal condition among cases was found in sextant 11 where it was (27.50%), and 26/27(7%) compared to controls where highest core was for sextant 11(31%) sextants 17/16 and 47/46 had equal scores (8.5%).

Cases had Heal their periodontal condition when compared to controls. The results were statistically significant with p<0.001.

The knowledge, attitude and practice on gingival health among orthodontic patients were poor. Maintaining high oral hygiene standards may be conducive to excellent orthodontic treatment outcomes. Similar results as this study was found in study done by Baranovic M, Stipeti C M, Baricevic, Cimic A, and Blazevic Conversely, the lack of orthodontic therapy in adolescence does not appear to influence subsequent development or non-development of periodontal disease in adults., but in another study by Nasir N, Ali S, Bashir U, Atta Ullah the results showed that patients undergoing orthodontic treatment do show the signs of periodontal disease. The controls had poorer oral hygiene findings. Only a small number of fixed orthodontic appliance wearers had inflammatory changes of higher intensity (5%). A significant correlation between oral mucosal inflammation and type of orthodontic appliance was not found. They concluded that orthodontic appliance wearers had better oral hygiene and less frequent inflammatory changes. Bleeding on probing score in cases was maximum in sextant 11(20.50%) when compared to controls where maximum score was in sextant 26/27(25%), which showed that cases had better condition Calculus around the tooth was observed in

most of the controls examined where maximum score was found in sextant 31(23.5%), while in cases it was maximum in sextant 31 (8.50%) These results showed that oral health was better in cases than in controls.

However pocket depth in nearly all the sextants was found more among cases due to the Bands and other orthodontic appliances. The results were statistically significant with p<0.001 Present study results showed that when the duration of treatment was two years, there was significant increase in pocket depth during this period in sextants:

17/16(P value =0.0009),

26/27 (P value=0.02),

47/46 (P value =0.0028) and

36/37(P value=0.0014

Which was in agreement with the study done by Nasir N, Ali S, Bashir U, Atta Ullah?

It was found to be in contrast with the study done by Alstad S, Zachrisson BU where they found that there was no statistically significant difference between the test and reference subjects before and during the orthodontic treatment period, in plaque score and gingival condition. Loss of attachment (LOA) among cases for sextant 17/16 was more when compared to controls except for 0-3mm. It was found to be more in cases for all the sextants observed with the results statistically significant, similar to the results found in study done by Sinclair PM, Berry CW, Bennett CL, Israelson H. where pocket depths did show significant increase (p<0.05). It was also found that Loss of attachment (LOA) was significant when the duration of treatment was two years for sextants 31 (P value=0.0348) and 36/37 (P value=0.0218). Loss of attachment was not recorded for study subjects below 15 years of age because there may be pseudo- pocket formation. As the age group selected was between 11-25 years, not much periodontal destruction was encountered

Extra Oral Appearance

Majority 310 (77.50%) of study subjects showed normal Extra Oral Appearance while 62 (15.50%) of cases showed ulcerations, sores, erosions, fissures (commissures) when compared to controls 18 (4.50%)

Oral Mucosal Lesions

Lesions among cases were more 128 (32.00%) when compared to controls where it was only 42 (10.50%). Similar results were found in study of Baricevic M, Stipetic MM, Majstorovic M, Baranovic M, Baricevic D, Loncar B. where Mucosal lesions were more present in wearers of fixed orthodontic appliances than in non-wearers. Gingival inflammation, erosion, ulcerations were the most common findings in orthodontic patients. Maximum Ulcerations among cases was found when the duration of treatment was two years. The results were found statistically significant with P value = 0.0262Enamel Opacities were found to be more in Cases compared to Controls in all the sextants observed .The result for the sextants were statistically significant with, P = <0.001 which is in line with the study done by Martignon S, Ekstrand KR, Lemos MI, Lozano MP, Higuera C. where they found that total of 96% had ≥1 white opacity in the test group versus 56% in the reference group (p<0.001).

Deieterious Habits

Habit of tongue thrusting ,Mouth Breathing and Bruxism respectively were found more among cases 38 (9.50%),8 (2.00%) and 10 (2.50%) when compared to controls where it was only 26 (6.50%) ,0 and 4 (1.00%) respectively.144(36.00) of cases practiced none of the habits while 170 (42.50%) of controls practiced none of the habits.

Treatment Needs

An overall 63.5 % of the subjects needed some form dental treatment. Treatment needs among controls was found to be more when compared to cases, which indicated that dentition status in controls was poor when compared to cases.

Conclusion

The findings of present study conclude that oral health status of majority of patients undergoing fixed orthodontic treatment is better when compared to those who are not undergoing treatment. The result was statistically significant with, P = <0.001.

Conclusion

The findings of present study conclude that oral health status of majority of patients undergoing fixed orthodontic treatment is better when compared to those who are not undergoing treatment. These results are due to constant motivation and repeated instructions regarding good oral health at regular intervals, should be given great emphasis during the course of orthodontic treatment. Moreover, from a public health perspective, problem of poor oral health among controls is an alarming challenge and warrants significant attention from both patient and clinician. Outcome of orthodontic treatment as well as its consequences on oral health during the course of treatment should be kept in mind, both by clinician and patient to enjoy the quality of life.

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