



Prevalence of White Spot Lesion during Orthodontic Treatment with Fixed Appliance

Dr. Md Ali kawsar^{1*}, Dr. Md. Nurul Islam², Moutithi Sen³, Dr. Subodh Chandra Chakraborty⁴,
Dr. Muhammad Tanvir Siddiqui⁵

AFFILIATION:

- Dr Md Ali kawsar**
Assistant professor & head
Department of orthodontics
TMSS medical collage Dental unit.
- Dr Md. Nurul Islam**
Associate Professor and head
Department of orthodontics .
Saphena women 's Dental College, Malibagh, Dhaka
- Dr. Moutithi Sen**
Assistant Professor and head of the department of Orthodontic,
Delta Medical College, Dental unit.
- Dr. Subodh Chandra Chakraborty**
Assistant Professor Saphena women's dental College
- Dr Muhammad Tanvir Siddiqui**
OSD(DGHS),Mohakhali,Dhaka;
on deputation, Dept. Of orthodontics,BSMMU.

Article info.

Received: 1st January, 2019

Accepted: 15th March, 2019

Volume: 9, Issue-2 October, 2019

DOI: <https://doi.org/10.3329/updcj.v9i2.43739>



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Publisher: Update Dental College, Dhaka, Bangladesh

Web: www.updatedentalcollege.edu.bd

E-mail: updcj@hotmail.com

* Corresponding Author

Dr. Md. Ali kawsar

Assistant professor & head

Department of orthodontics

TMSS medical collage Dental unit.

E-mail: dralikowsar@gmail.com

Cell: +8801816811192

ABSTRACT

Background: White spot lesions (enamel demineralization) is one of the most common and a significant risk associated with orthodontic treatment.

Objective: To determine the prevalence of white spot lesion during fixed orthodontic treatment. **Method:** This prospective observational study and was conducted in the Department of Orthodontics and Dentofacial Orthopedics from January 2016 to December 2017 over a period of two years. Patients with fixed orthodontic appliance age between 12-30 years of both sex attended for follow up were included in this study. After taking written consent, a questionnaire included socio-demographic data, clinical and outcome variables including routine clinical photographs to examine WSL were filled up for each patient. Routine clinical photographs to examine WSL were taken after 6 months and 12 months of fixing orthodontics appliance. Qualitative data were expressed as frequency distribution and percentage. **Results:** Maximum patients were in age group 12 – 16 years and prevalence of WSL was also sought maximum in this group. Out of 36 cases with WSL, 14 (38.9%) were male and 22 (61.1%) were female. Prevalence of WSL after six month of fixing orthodontic appliance was 21.8% and 26.1% after 12 months. Prevalence of WSL after six month of fixing orthodontic appliance in male was 26.4% & in female was 19.6% and after 12 month of fixing orthodontic appliance it was 30.2% in male and 24.1% in female. After six months of fixing orthodontic appliance 1-3 WSLs was found in 17.0% cases and ≥ 4 WSLs in 4.8% cases. After twelve months of fixing orthodontic appliance 1-3 WSLs was found in 19.4% cases and ≥ 4 WSLs in 6.7% cases. Maximum WSL was found in maxillary incisors. **Conclusion:** This study showed that 21.8% of the study subjects developed white spot lesions during orthodontic procedure and incisors were the most common affected teeth.

KEY WORDS:

White spot lesion, Orthodontic treatment, Fixed appliance

INTRODUCTION:

Three main types of appliances are used in orthodontic therapy: active, passive and functional. These can be fixed or removable. Particularly fixed active appliance treatment has become an integral part of modern orthodontics.^[1] Unfortunately, this type of treatment can cause adverse effects. Among these, white spot lesions (WSL) are prominent. These lesions have a negative effect on the esthetic outcome of orthodontic treatment.^[2] These WSL manifest them as subsurface enamel porosities that might progress into carious lesions and are therefore a problem of clinical relevance. The overall prevalence of WSL in orthodontic patients was reported between 2% and 97%.^[3-5]

WSL are the result of prolonged accumulation of bacterial plaque on the enamel surface adjacent to the fixed appliances^[6], commonly due to inadequate oral hygiene^[4] and a frequent intake of carbohydrates^[7,8], resulting in a disbalance between remineralization and demineralization with various stages being either reversible or irreversible. If the demineralization process is not being stopped, an intact enamel surface eventually collapses and cavitates. WSL are



Citation

Dr. Md Ali kawsar, Dr. Md. Nurul Islam, Moutithi Sen, Dr. Subodh Chandra Chakraborty, Dr. Muhammad Tanvir Siddiqui, Prevalence of White Spot Lesion during Orthodontic Treatment with Fixed Appliance. Update Dental College Journal. 2019 October; 9(2): 40-42

DOI: <https://doi.org/10.3329/updcj.v9i2.43739>

considered the precursor of enamel caries but can be reversed (Chambers *et al.*, 2013).^[9,10] WSL developed during orthodontic treatment, however, have limited ability to regress after appliance removal and in many cases these lesions will therefore remain visible as permanent scars of the enamel.^[11] Two types of WSL are noncarious and carious WSL. Rough, opaque, porous surface and smooth shiny surface is the prime differentiating point between carious WSL and noncarious WSL.^[12] Tooth surfaces that are more exposed to dietary carbohydrate with less exposure to saliva are common sites for demineralization to occur (maxillary anterior teeth). They are most frequently seen on lateral incisors, canines, first premolars, second premolars, central incisors.^[4] WSL usually occurs in cervical areas of the orthodontic brackets.^[13]

Insertion of fixed orthodontic appliances creates stagnation areas for plaque and some important contributing factors including poor oral hygiene, limited cleaning effect of the saliva and consumption of high carbohydrate, highly fermentable food over time aggravate the WSL formation.^[14,15] The aim of this study is to determine the prevalence of white spot lesions among the patients attending in Department of Orthodontics & Dentofacial Orthopedics,

METHODS:

This prospective observational study and was conducted in the Department of Orthodontics and Dentofacial Orthopedics from January 2016 to December 2017 over a period of two years. Patients with fixed orthodontic appliance age between 12-30 years of both sex attended for follow up were included in this study. Patients with multiple restorations on labial surface, enamel hypoplasia due to fluorosis and any systemic disease, cysts, clefts or any other congenital malformations were excluded from this study. After taking written consent, a questionnaire included socio-demographic data, clinical and outcome variables were filled up for each patient. Photographs to examine WSL were taken after 6 months and 12 months of fixing orthodontics appliance. Qualitative data were expressed as frequency distribution and percentage. The summarized data was interpreted accordingly and was then presented in the form of tables.

RESULTS:

Table 3.1: Demographic profile of the study subjects (N=165)

Age (year)	White spot lesion		Total (n=165)
	Present (n=36)	Absent (n=129)	
Age (years)			
12 – 16	17 (47.2)	44 (34.1)	61 (37.0)
17 – 21	8 (22.2)	51 (39.5)	59 (35.8)
22 – 26	8 (22.2)	27 (20.9)	35 (21.2)
>26	3 (8.3)	7 (5.4)	10 (6.1)
Gender			
Male	14 (38.9)	39 (30.2)	53 (32.1)
Female	22 (61.1)	90 (69.8)	112 (67.9)

Maximum patients were in age group 12 – 16 years and prevalence of WSL was also sought maximum in this group. Out of 36 cases with WSL, 14 (38.9%) were male and 22 (61.1%) were female.

Table 3.2: Frequency of patients with WSLs (N=165)

	No. of WSL n (%)	WSL present (%) n (%)
After 6 months	94 (57.0)	36 (21.8)
After 12 months	118 (71.5)	43 (26.1)

Prevalence of WSL after six month of fixing orthodontic appliance was 21.8% and after 12 months it was 26.1%.

Table 3.3: Differences between male and female patients in relation to WSL formation (N=165)

	Male (n=53) n (%)	Female (n=112) n (%)
After 6 months	14 (26.4)	22 (19.6)
After 12 months	16 (30.2)	27 (24.1)

Prevalence of WSL after six month of fixing orthodontic appliance in male was 26.4% & in female was 19.6% and after 12 month of fixing orthodontic appliance it was 30.2% in male and 24.1% in female.

Table 3.4: Number of white spot lesion (N=165)

	1 – 3, WSLs n (%)	≥ 4 WSLs n (%)
After 6 months	28 (17.0)	8 (4.8)
After 12 months	32 (19.4)	11 (6.7)

After six months of fixing orthodontic appliance 1-3 WSLs was found in 17.0% cases and ≥ 4 WSLs in 4.8% cases. After twelve months of fixing orthodontic appliance 1-3 WSLs was found in 19.4% cases and ≥ 4 WSLs in 6.7% cases.

Table 3.5: Affected teeth (N=165)

Affected teeth	Number of teeth	Percentage (%)
Maxillary	54	32.7
Central incisor	17	10.3
Lateral incisor	16	9.7
Canine	11	6.7
First premolar	6	3.6
Second premolar	4	2.4
Mandibular	27	16.4
Central incisor	8	4.8
Lateral incisor	6	3.6
Canine	6	3.6
First premolar	4	2.4
Second premolar	3	1.8

Maximum WSL was found in maxillary incisors.

DISCUSSION

White spot lesions (WSL) are one of the most undesired iatrogenic draw backs of orthodontic therapy with fixed appliances. Fixed appliances serve as plaque retention sites, and, in the absence of good oral hygiene, plaque accumulates and acidogenic bacteria cause marked demineralization. Aim of this study was to determine the prevalence of white spot lesion during fixed orthodontic treatment. One hundred sixty five patients were examined for WSL during fixed orthodontic treatment after 6 months and after 12 months from the commencement of treatment. In this study, 21.8% of subjects had WSL after 6 months which was lower comparing 38.0% in the study of Tufekci *et al.*^[16], 39.7% in the study of Farishta *et al.*^[17], 40.0% in the study of Lucchese and Gherlone^[18]. The findings of the present study showed that there was an increase in the number of subjects with white spot lesion

present after 12 months comparing after 6 months which is in agreement with the studies done by Gorelick et al.^[2] and Tufekci et al.^[16]. In this study, study subjects were between 12-30 years. Studied subjects were 12 – 28 years age group in the study of Farishta et al.^[17] and 12-24 years age group in the study of Sagarika et al.^[19].

In this study, 21.8% subjects had WSL which was further categorized in males (26.4%) and females (19.6%). Our results agree with those of Boersma et al.^[3], who reported a prevalence of 40% in male and 22% in female patients, they indicated that males are having greater risk of developing WSL. In the study of Farishta et al.^[17] WSL was 17.6% in males and 22.1% in females. There is still some controversy about the frequency of WSLs on different types of teeth. In the present study, there was a high prevalence of WSLs on central incisors (10.3%) followed in decreasing order by lateral incisors (9.7%), canines (6.7%), first premolar (3.6%) and second premolar (2.4) in maxilla. Similarly, high prevalence of WSLs on central incisors (4.8%) followed in decreasing order by lateral incisors (3.6%), canines (3.6%), first premolar (2.4%) and second premolar (1.8) in mandibula. A high prevalence of WSLs was observed on lateral incisors and canines, followed by central incisors, second premolars, first molars, and finally first premolars in the maxilla^[18] which is consistent with this study result. Our analysis supports the results of Chapman *et al.*^[4], who showed that the order of incidence was lateral incisors, canines, premolars, and central incisors. The results of Geiger *et al.*^[20] also agree with our conclusions, showing that lesions occurred most frequently on maxillary lateral incisors, mandibular first molars, and canines.

CONCLUSIONS:

This clinical study showed prevalence of WSL was 21.8% after 6 months and 26.1% after 12 months of the commencement of treatment and WSL was observed more in incisors of maxillary teeth.

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