FREQUENCY OF WHITE SPOT LESIONS IN ORTHODONTIC PATIENTS VISITING TO KHYBER COLLEGE OF DENTISTRY(KCD) PESHAWAR

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ABSTRACT

Objectives: *The determine the frequency of how common white spot lesions in orthodontic patients .*

Materials and Methods: *A total of 147 patients who visited the Orthodontics department at Khyber College of Dentistry, Peshawar were included in the study. Intraoral pictures were acquired using a DSLR camera before and after therapy (6 months after fixed device insertion) (D600). The development of white spot lesions was evaluated between pre and post-therapy photos. SPSS version 20.0 was used to analyze the data.*

Results: *Eight four were female (57.1%) and sixty-three were males (42.9%). The mean age was 21.45±4.87 years. The overall frequency of WSL in pre-treatment patients was in four patients (2.7%) only. Out of total 147 patients, 68 (46.3%) patients had WSL while 79(53.7%) were WSL free at mid-treatment time. The frequency of WSL in pre-treatment and mid-treatment was statistically significant having p-value of 0.04. The frequency of WSL stratified by gender showed that females had more WSL than males. The frequency of WSL stratified by age showed that maximum number of cases those had WSL were from 13 to 15 years of age, followed by 26 to 30 years. The stratification for frequency of WSL by age was not statistically significant having p-value of 0.602.*

Conclusion: *During the first six months of treatment, the number of WSLs increased dramatically in this clinical investigation. During the first few months of treatment, clinicians should assess patients' dental hygiene and must take further precautions to prevent the occurrence of WSL.*

Key words: *White spot lesions, frequency, fixed appliance, oral hygiene*

INTRODUCTION

In today's world, malocclusion and orthodontic treatment have become a matter of quality of life.[1] Many people seek orthodontic treatment to improve their aesthetic impairment rather than to correct dental anomalies that may lead to physiologic malfunction or avoid tissue deterioration in the oral cavity.[2] Many people seek orthodontic treatment to improve their appearance rather than to fix tooth irregularities that could cause physiologic problems or oral tissue degradation. Fixed appliance therapy has improved the success rate of orthodontic treatment throughout time. However, orthodontic therapy, like any other medical procedure, has dangers and consequences in addition to its benefits. Despite numerous advancements in orthodontics, the growth of WSLs is an unsighty condition and the most frequent side effect of orthodontic therapy with fixed appliances[3]. A WSL is defined as "a sub-surface enamel porosity from carious demineralization that presents itself as a milky-white opacity when located on smooth surfaces ".[4] WSLs can appear one month or four weeks after a fixed orthodontic appliance has been fitted.[5] The white appearance is due to variation in light

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scattering in the demineralized porous enamel. These WSLs rarely proceed to substantial cavitation and are rarely recorded as caries requiring restorative therapy in the DMFT indice,[6] which is a population-based measure for recoding caries by giving the sum of a person's decayed, missing, and filled permanent teeth. WSLs are mostly aesthetic problems that can leave patients, parents, and dental practitioners disappointed.

Incipient lesions and "surface-softened defect," which are other names white spot lesions are the two most common kinds of enamel demineralization[7,8]. It's critical to distinguish between incipient and arrested lesions. Incipient lesions are active lesions that continue to progress even after being attacked by acid, whereas arrested lesions do not. Thylstrup and Fredebo found significant differences between active and arrested lesions in vivo ultrastructural analyses[9]. "On active lesions, "micro-scars" was visible, whereas arrested lesions had micro-cavitation.[10]

WSLs develop substantially more frequently in orthodontic patients than in non-orthodontic patients, and these WSLs can cause cosmetic issues years after treatment.[11] A WSL is the earliest clinical manifestation of this demineralization. WSLs can form in as little as four weeks, which is often the duration between orthodontic treatments.[12] Plaque eradication is more difficult when orthodontic attachments are present in the mouth cavity.[12,13] In addition to the difficulties in removing built-up plaque, orthodontic patients are at risk for WSLs if they do not comply with recommended oral hygiene practices.[14]

A good oral hygiene program, including proper tooth brushing with a fluoride dentifrice, is required to avoid decalcification and the growth of WSLs.[15] During orthodontic treatment, fluoride mouth washes have been proven to considerably diminish WSLs. Unfortunately, patient compliance is required for these preventative measures. Only around 15% of orthodontic patients cleaned their mouths every day as advised, according to research by Geiger et al. The dentistry and medical literature provides ample evidence of poor patient compliance[16]. According to Wilson et al., The maintenance programmes were only adhered to by 16 percent of patients who underwent comprehensive periodontal therapy. It is common knowledge that both patients and doctors must work together to ensure the health and well-being of their patients.[17,18]

In 2% to 96 percent of orthodontic patients, WSLs develop. The maxillary lateral incisors, maxillary canines, and mandibular premolars are especially susceptible to these lesions. Lesions can be found on the buccal surfaces of teeth, around brackets, and especially in the gingival area[19-21]. According to Sandvik et al, in contrast to only 11% of untreated controls, almost 50% of orthodontic patients reportedly developed at least one WSL while undergoing treatment.[22] In a more recent study, Richter et al found that throughout orthodontic treatment, 72.9 percent of patients acquired at least one WSL, with 2.3 percent showing cavitations. According to a prior study by Munizeh Khan, WSLs account for 75% of all.[23]

This study aimed to determine the frequency of WSLs among patients who visited the orthodontic department at the Khyber College of Dentistry in Peshawar, based on the total number of patients afflicted. Due to ethnic, racial, and genetic factors, there are variances in the rate of WSLs. Oral hygiene knowledge among different countries and populations is the second factor that influences the prevalence of white lesions. White spot lesion is more common in underdeveloped populations because they have a lower level of education and are thus less careful about oral hygiene. This study will provide us local proportions of WSLs and the data will be shared with other area orthodontists so that required management guidelines can be changed based on the findings. This will also assist dentists in educating patients about these issues, resulting in improved aesthetics and treatment outcomes at the conclusion of orthodontic therapy.

MATERIALS AND METHODS

The study was carried out on patients who reported to Khyber College of Dentistry.Peshawar. A total of 147 patients who visited the Orthodontics department were included in the study. Consecutive, non-probability sampling technique was used. Our inclusion criteria was those adults

patients ages ranging from 15-35 years and Candidates for fixed orthodontic appliance therapy and we excluded Dental professionals,Person with any formal education in dentistry/dental hygiene/ any dental affiliation,Patients with carious lesions on

labial/buccal surfaces of teeth prior to treatment,Patients with developmental anomalies like amelogenesis Imperfecta,Patients with florosis and Patients with a previous history of orthodontic treatment

Patients meeting the inclusion criteria were selected from Khyber College of Dentistry.Peshawar. Approval of the ethical committee of KCD was sought. Informed consent was obtained. Patients were told that no added risks are there as photographs are harmless.

A structured Performa was used to record the patient's demographic data like name, age and gender etc. the full name which is documented in their NICs were recorded. Ages were recorded in years. Only Pakistani nationals were included in the study assessed on the basis of CNIC.

Patients with fixed orthodontic therapy for at least one month were examined. Before the inspection, the teeth were cleaned with prophylaxis paste and a brush, and then a visual examination was performed in the dentist chair under standard lighting. From the right first molar to the left first molar, the facial surfaces of maxillary and mandibular teeth were evaluated. Teeth were isolated with cotton rollers and air-dried for five seconds before examination. Only the teeth surfaces gingival to the archwire were investigated for the presence of WSLs because this is the area most susceptible to enamel demineralization during orthodontic treatment.

Following the inclusion criteria a list patients were made and photographs were taken before bonding of fixed orthodontics appliances in standard method to ensure the quality. During recording photograph, cheeks were retracted as much possible to ensure good quality intraoral pictures. Occlusal plane was kept parallel to the camera frame. For standardization, pre-treatment and mid-treatment (6 months after placement of fixed appliances) intraoral photographs were taken with Canon EOS 600D DSLR, set at f/22 and ISO 100, with the point of focus at the lateral incisors. All the photographs were cropped to remove unnecessary background. Pictures of pre and mid treatment were compared to look for the development of WSLs. Data collected from all the cases fulfilling the inclusion criteria on structured Performa. Strictly exclusion criteria was followed to control confounders and bias in the study results. Data were entered into SPSS version 20.00 statistical software. White spot lesion was stratified

Table 1: Age distribution of the sample

Age groups (years)	Frequency	Percentage	Cumulative percentage
13-15	15	10.2	10.2
16-20	47	32.0	42.2
21-25	50	34.0	76.2
26-30	35	23.8	100.0
Total	147	100.0	

Table 2: Overall frequency of white spot lesion during mid-treatment

	Frequency	Percentage	Cumulative Percentage
Yes	68	46.3	46.3
No	79	53.7	100.0
Total	147	100.0	

Table 4: Frequency of white spot lesion stratified by genders

Gender	Yes		No	
	N	%	N	%
Male	24	38.1	39	61.9
Female	44	52.4	40	47.6

Table 5: Pearson Chi-Square tests for gender comparison for frequency of WSL in mid treatment

Statistical variable	value
Chi-square	2.955
Df	1
Sig.	.086

Table 3: Comparison of pre and mid treatment white spot lesion in the whole sample

		overall prevalence of white spot mid treatment		Total	Pearson Chi-Square	Df	Sig. (2-sided)
		Yes	No				
overall prevalence of white spot pre- treatment	Yes	0	4	4			.040
	No	68	75	143	3.539	1	
Total		68	79	147			

among age and gender to see effect modified. Post stratification chi-square test was applied keeping the p value ≤ 0.05.All results were presented as tables and graphs.

RESULT

In this study, data (photographs) from pre-treatment and after 6 months of Orthodontics therapy were utilised to estimate the frequency of WSLs in 147 individuals (WSL). There were eighty-four females (57.1%) and sixty-three males (42.9 percent). As a result, there were more females than males. The participants in this study ranged in age from 13 to 30 years old. The average age was 21.45±4.87 years.

The study's age distribution revealed that the majority of patients seeking fixed orthodontic treatment are between the ages of 21 and 25, with 32% coming between the ages of 16 and 20. (34 percent). The age range 13 to 15 years had the smallest number of patients. As a result, the majority of the patients in our study were in their second and third decades. Table 1 contains the specifics. Some individuals have WSLs even before the fixed appliances are bonded. The overall frequency of WSL in pre-treatment patients was just four patients (2.7%) out of a total sample of 147 patients. (Fig 19)

Brushing and mouthwash were recommended for the patients to maintain their dental hygiene. Data on the prevalence of WSL was acquired using a DSL camera after six months of orthodontic treatment with fixed appliances. WSLs appeared in a significant number of patients. Out of a total of 147 patients, 68 (46.3%) developed WSLs, while the remaining 79 (53.7%) were WSL-free. Table 2 provides the specifics.

The difference in the occurrence of WSL in pre-treated and after 6 months with fixed Orthodontics appliances was compared. The number of instances with WSLs has risen from four to sixty-eight. With a p-value of 0.04, this variation in frequency was statistically significant. Table 3 contains the details of the chi square test.

Females had more WSLs than males when the incidence of WSLs was stratified by gender. WSL was found in twenty-four (38.1%) females and 44 (52.4%) males. Table 4 illustrates the specifics.

Although there was a difference in occurrence between males and females, the difference was not statistically significant, with a p-value of 0.086. So, on a clinical level, we may state that females have a higher rate of white spots, but this is not statistically significant. (See Table 5).The incidence of WSLs stratified by age revealed that the age group 13 to 15 years had the highest number of cases with WSL, followed by 26 to 30 years. As a result, the occurrence of white spot lesion has a greater impact on the two extremes of age. The lower age range in this study was 13 to 15 years. Table 6 contains the remaining information.

The occurrence of the white spot was not shown to be affected by age. With a p value of 0.602, the stratification for the incidence of WSLs by age was not statistically significant. This demonstrates that age is not a significant determinant in the occurrence of white lesions. Table 7 contains the specifics.

Table 6: Frequency of WSL stratified by age groups

Age groups	Yes		No	
	N	%	N	%
13-15	9	60.0	6	40.0
16-20	19	40.4	28	59.6
21-25	23	46.0	27	54.0
26-30	17	48.6	18	51.4

Table 7: Pearson Chi-Square Tests for frequency of WSL stratified by age groups

Statistical variable	value
Chi-square	1.859
Df	3
Sig.	0.60

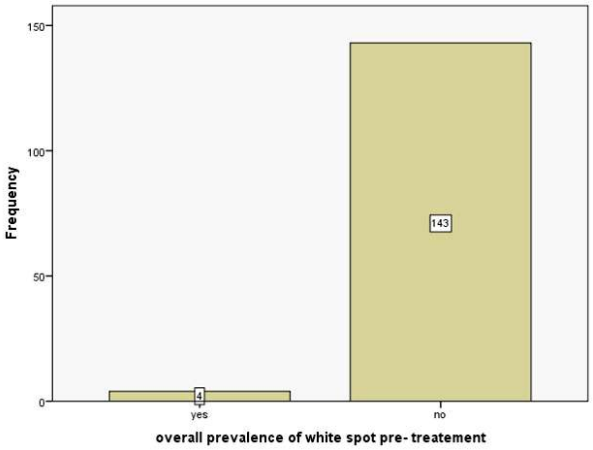

Fig 1: Frequency of white spot lesion in pre-treatment patients

DISCUSSION

Decalcification or the development of WSL on the enamel surface is the most serious iatrogenic effect of fixed orthodontic appliance therapy.[14] Because of the abnormalities in their teeth, people with malocclusions have a lot of retention sites. Furthermore, bonding attachments to teeth creates retention sites on surfaces that aren't typically cariogenic. As a result, oral hygiene is more difficult to maintain in orthodontic patients than in non-orthodontic people, which could explain why there is a significantly greater link between oral hygiene and caries incidence in orthodontic patients than in non-orthodontic people.[6]

Decalcifications are clearly the duty of orthodontists, who must be aware of the risk and take efforts to prevent or limit their development. Fluoride is the most essential agent in preventing decalcification and the progression of lesions. The physician must be conversant with the major components of fluoride action mechanisms and current preventative principles in order to employ current fluoride preparations and treatments optimally.[24]

When plaque is allowed to accumulate for a long time on the tooth's surface, demineralization occurs. White or brown stains on the enamel surrounding the brackets are common signs of demineralization in orthodontic patients, which can lead to cavitation. [25]

The patients included in this study were 18 to 30 years. Patients in this age range are in the permanent dentition stage, and fixed orthodontic therapy is commonly used at this time, according to the literature. During the mixed and late mixed dentition eras, space management is done, and therapeutic treatment is done once all permanent molars have erupted.[26]

We used images obtained with a DSLR camera to detect WSLs in the current investigation. Examining a white spot intra-orally is far more difficult and time-consuming. Munjal et al used a similar methodology in their research.[25] Females were found in greater numbers than males in the current investigation. This could be because females are more concerned with their appearance and present themselves more than males.The photos were analysed before and after 6 months of fixed Orthodontics therapy in the current study.[27]. Previous research has looked at patients after a year to assess if WSL has developed. After six months of fixed appliance treatment, there was a considerable increase in WSLs. There was a statistically significant difference between these two groups. Patients will have a harder time cleaning their teeth with a fixed equipment in place, regardless of the method used. This resulted in the production of initial decalcification in the form of spot lesions and plaque accumulation.[28].

Tufekci E et al investigated the prevalence of WSL in patients for six and twelve months after starting orthodontic therapy. This clinical investigation revealed that the count of WSLs increased significantly during the first six months of treatment and then increased gradually until the final 12 months. During the first few months of treatment, the orthodontist should assess patients' dental hygiene habits and, if necessary, take further precautions to prevent demineralization.[26] These are in line with our findings.

An another study[28] A study was carried out on the Jordanian population, which was published in the Pakistani oral and dental journal. They looked at the occurrence of carious lesions on banded molars, which are generally known as white spots (WSLs), in individuals having orthodontic treatment with fixed equipment. The relationship between prevalence and treatment duration was also investigated. Another goal was to look into the relationship between the severity of discovered WSLs and the length of treatment. The presence of WSLs on banded molars was investigated in a study group of 100 randomly selected individuals having orthodontic treatment with fixed orthodontic appliances The method of detection was a direct visual inspection. In their investigation, they found that 87 percent of WSLs were present. This disparity could be related to racial, genetic, or awareness differences.

Females had more WSLs than males in this study, although the difference was not statistically significant. Other research looked at the relationship between new carious lesions and a variety of other factors. For example, Boersma et al[29] discovered a significant difference in the percentage of caries-affected surfaces in boys (40%) and girls (40%) in their study (22 percent). Haugejordan et al[30] discovered the contrary in terms of gender-specific distribution, with female patients having a higher prevalence than male patients.

The frequency of WSLs was highest in the study's age group of 13 to 15 years. This could be because children of this age are more careless and non-complainant. Lima et al. did a study to learn about family members' experiences with children's dental health care. This was a qualitative study with 12 caregivers done in the Ribeiro Preto health district in 2007. The hermeneutical approach and the vulnerability theoretical framework were applied. As empirical categories, the definitions of oral health care, the investigation of the origins and prevention of oral diseases, and the reality of oral health services were all produced.[31] Overestimating biological causality, providing complex care, and aesthetic dentistry emerged as additional factors that could increase a child's susceptibility to oral diseases, whereas overestimating public knowledge and fusing professional actions with professional knowledge emerged as preventive elements. This study emphasises the need for a review of oral health promotion and prevention strategies, as well as elements to support health care professionals in restructuring paediatric dental care.

To eliminate confounding factors, we used the same appliance in all cases (0.022X0.028" pre-adjusted 3M unitek). Patients treated with pre-adjusted edgewise (0.022x 0.028-in slot) or a Tip-Edge Plus appliance had no different incidence than those treated with full fixed appliance therapy, those combined with surgery or functional appliance treatment, or those treated with pre-adjusted edgewise (0.022x 0.028-in slot) or a Tip-Edge Plus appliance (0.022x 0.028-in slot). Although there is no difference in WSL incidence between self-ligation and traditional pre-adjusted edge wise brackets, self-ligation brackets have been reported to have lower plaque and bacteria counts.[32]

CONCLUSION

During the first six months of treatment, the number of WSLs increased dramatically in this clinical investigation. During the first few months of treatment, clinicians should assess patients' dental hygiene and, if necessary, take extra precautions to prevent demineralization.

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