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Original Article

Efficiency of 5% Sodium Hypochlorite in the Removal of Dental Fluorosis Stains

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ABSTRACT

Dental fluorosis is a specific disturbance in tooth formation, and is defined as a chronic, fluoride-induced condition in which enamel development is disrupted. **Objective:** To test the efficiency of 5% sodium hypochlorite in removing dental fluorosis stains. **Methods:** A 5 percent solution of NaOCl was used in each case. It was administered with a cotton applicator to the whole surface of the teeth, and it was repeated until the NaOCl solution had evaporated. After treatment, a follow-up assessment was conducted by a vita shade guide. **Results:** Patients with dental fluorosis aged 12 to 20 were enrolled in the study. 32 men (59.3%) and 22 women were studied (40.7%). One patient (1.9%) had completed college. There were 23 (42.6%), 23 (42.6%) and 05 (09.3%) cases with inadequate socioeconomic status. One in ten people (or 18.5%) had a family history of fluorosis. 26 (48.1%) brushed once, 23 (42.6%) brushed twice, and just 05 (09.3%) brushed three times. There were 25 mild instances, 15 moderate cases, 10 severe cases, and 4 severe dental cases (DF). 5% sodium hypochlorite was efficacious in 40 (74.1%) and 14 (24.9%) cases of mild to severe dental fluorosis. **Conclusion:** The 5% sodium hypochlorite was found to be an efficient method for eliminating dental fluorosis lesions in this investigation. Non-invasive and safe procedure for these lesions. No additional supplies are needed, and it may be used on children's permanent teeth with ease. To support the efficacy of a bigger sample size, further studies are recommended.

INTRODUCTION

Fluorosis resulting from high groundwater fluoride concentrations is a major public health issue. During the last two decades, tooth decay has decreased in developing countries due to widespread fluoridation. Increased fluorosis rates were found to be linked to a decrease in the incidence of caries [1]. Dental fluorosis is a condition in which the growth of the enamel is slowed down and becomes hypo mineralized because of exposure to fluoride over time. Patients with fluorosis may experience tooth discoloration, which is clinically known as fluorosis. Extrinsic stain absorption, especially from food, is responsible for the dark stains seen in fluorosis of moderate to severe severity. At higher levels of Fluoride, the enamel foundation is pitted, followed by extrinsic stains [2]. Anterior teeth are the most affected and the severity of fluorosis can vary from tooth to tooth.Fluorosis is more common in teeth that begin to develop and mineralize later in life. Fluoride's effect on the growth of men's teeth is cumulative, rather than having a specific threshold dosage. Fluoride intake from a variety of sources has a significant impact on these outcomes [3]. Fluoride is mostly found in drinking water, and some towns' tap water contains high

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levels of naturally occurring fluoride, putting residents at risk of developing fluorosis. In Sindh, Baluchistan, and Punjab, fluorosis is widespread, impacting millions of people, including a high percentage of children. Residents are at risk of developing fluorosis because they live in an area with high levels of naturally occurring fluoride, mostly in the drinking water [4, 5]. Fluorosis, the most prevalent symptom, is characterized by an unappealing yellowing of the teeth. Patients who suffer from tooth discoloration because of fluorosis may benefit from a variety of treatment options including micro abrasion, indirect and direct restorative dentistry techniques such as whitening toothpaste and bleaching with chemicals such as acids and phosphates and sodium hypochlorite [6]. The ability of hypochlorous acid to neutralize amino acids and produce salt and water is what makes it so effective. A decrease in pH results from the removal of hydroxide ions. As a result of the interaction between the amino-protein group and hypochlorite (HOCl), which is found in NaOCl solution, chloramines are formed. Amino acids are oxidized and hydrolyzed by NaOCl and HOCl ions. The chromogenic organic content on enamel surfaces is degraded and destroyed when NaOCl meets hypo-mineralized enamel. Fluorosis patients' stains are caused by an excessive organic part, which is why it's easier to understand how it works [7]. Water irrigation with sodium hypochlorite (NaOCl) has been found to be an effective method for removing dentinal shavings and pulp tissue, as well as antibacterial. The etch/seal/bleach process with NaOCl as a bleaching agent has already been recommended as a careful alternative therapy [8, 9]. To get rid of the fluorotic stains, a solution of 5 percent sodium hypochlorite will do the trick. Fluorosis treatment may be aided if 5 percent sodium hypochlorite is shown to be effective in removing stains caused by dried blood spots. It is a simple, non-invasive, and chair-side treatment option with minimal side effects. We can reduce the financial burden on the community by using this method. The goal of this study was to see if a 5% solution of NaOCl is efficient in removing stains left behind by DF in young patients.

METHODS

The Department of Operative Dentistry at Liaquat University of Medical & Health Sciences, Jamshoro/Hyderabad, Pakistan, after approval fromResearch Ethics Committee, Liaquat University of Medical and Health Sciences, Jamshoro vide letter No. LUMHS/REC/-811, Dated 07 – 10 – 2019 conducted this quasi-experimental study employing non-probability consecutive sampling. The Rao soft software was used to do the sample computation (73 percent were satisfied with their appearance immediately after treatment of 5 percent NaOCl) [10]. Our study used a sample of 54 people, with a 95% confidence level and a 10% margin of error. The study's inclusion criteria were as follows: degrees 1–4 of dental fluorosis (the Dean Criteria), ages 12–20, cases free of caries and restorations, and both sexes as participants. For this study, we did not include patients with any of the following conditions: past bleaching treatment history; sensitivity; periodontal disease; or prior dental trauma. Patients who met the inclusion criteria were included in the trial, which included 54 participants. Informed written consent was obtained after patients or legal guardians were supplied with information on the advantages, hazards, contraindications, and alternatives to bleaching. Brushing procedures, scaling, and polishing were given to all the patients. A 5 percent solution of NaOCl was used in each case. To remove all the plaque, pumice powder was applied to the teeth and water was used to wash them. With a rubber dam in place, a gingival barrier protected each tooth from contact with the bleaching agent. An etching and 15-second soak in 37 percent phosphoric acid were used to penetrate deeper into the enamel surface. It was administered with a cotton applicator to the whole surface of the teeth, and it was repeated until the NaOCl solution had evaporated. At one appointment, the teeth were white within 15 to 20 minutes. After treatment, a follow-up assessment was conducted by a vita shade guide. The proforma had all the necessary information. SPSS 20.0 version was used to enter all data. The quantitative data, such as age, were determined using the mean and standard deviation. Qualitative variables such as gender were estimated using the frequency and percentage method. We performed stratification according to the effect modifiers. The chi-square and t-tests were used, and a p-value of 0.05 was considered significant.

RESULTS

Dental Fluorosis patients ranging in age from as young as 12 years old to as old as 20 years old were studied in total, with a mean age of 15.34 years. Out of a total of 54 patients, 32 (59.3%) were men and 22 (40.7%) were women in this study. In this study, 12 patients (22.2%) were illiterate, 10 patients (22.2 %) had completed elementary school, 25 patients (46.3%) had completed high school, 6 patients (11.1%) had completed secondary school, and only 1 patient (1.9%) had completed college. More than half of the cases had a low socioeconomic status based on their history of socioeconomic level, with 23 (42.6%), 23 (42.6%), and 05 (09.3%) cases having an intermediate socioeconomic position. One in ten patients (or 18.5%) had a family history of fluorosis, as determined by the patient's medical records. Most of the study participants, 26(48.1%), were brushing once, 23(42.6%) were brushing twice, and only 05(09.3%) were brushing trice. There were 25 (46.3%) cases of mild fluorosis; 15 (27.8%) cases had moderate

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fluorosis; 10 (18.5%) had moderately severe fluorosis; and 4 (7.3%) had severe dental fluorosis (DF) (figure 1).

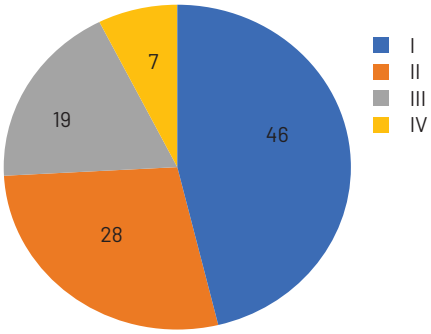

Figure 1: Patients distribution according to degree of Fluorosis

There were 40 (74.1%) and 14 (25.9%) instances in this study in which 5 percent sodium hypochlorite demonstrated good efficacy, and these had moderate and severe dental fluorosis (table 1).

Efficacy	Frequency (%)
Yes	40(74.1%)
No	14(25.9%)
Total	54(100.0%)

Table 1: Efficacy of Sodium Hypochlorite

Male and female participants were found to have similar levels of efficacy in the study (p=0.413). Effectiveness results from this study (p=0.396) were found to be statistically non-significant (table 2 and table 3).

Gender		Efficacy		Total	p-value
		Yes	No		
Males	Frequency	25	7	32	0.413
	Percentage	46.3%	13.0%	59.3%	
Females	Frequency	15	7	22	
	Percentage	27.8%	13.0%	40.7%	
Total	Frequency	40	14	54	
	Percentage	74.1%	25.9%	100.0%	

Table 2: Efficacy of Sodium Hypochlorite according to Gender

Degree of dental fluorosis		Efficacy		Total	p-value
		Yes	No		
I	Frequency	20	5	25	0.396
	Percentage	37.0%	9.3%	46.3%	
II	Frequency	12	3	15	
	Percentage	22.2%	5.6%	27.8%	
III	Frequency	6	4	10	
	Percentage	11.1%	7.4%	18.5%	
IV	Frequency	2	2	4	
	Percentage	3.7%	3.7%	7.4%	
Total	Frequency	40	14	54	
	Percentage	74.1%.	25.9%	100.0%	

Table 3: Efficacy of Sodium Hypochlorite according to Severity of Fluorosis

DISCUSSION

Too much fluoride intake during enamel creation has led to compositional and structural changes in enamel that are referred to as dental fluorosis, even though extensive fluoride treatment has reduced tooth cavities (DF). The average age of participants in this study was 15.34 years old. It was also stated that the mean age was 17.64.0 years by Meireles SS and colleagues. Males accounted for 59% of participants, while females made up the remaining 22%. (40.7 percent) [11]. on the other hand, found that of the total respondents, 48 (68.6%) were women and 22 (31.4%) were men. However, according to Sami E *et al*, 51 percent of 349 children were boys and 49 percent were girls [12]. According to Nevárez-Rascón M *et al*, females and males were both 33 and 34 within a 12- to 16-year age range and an average age of 167 months, respectively [13]. There were 1088 men and 927 females within the Rigo L *et al et al* 2015 study's sample of children (46 percent) [14]. A total of patients, 22.2% were illiterate in this study, 22.2% with primary-level education, 46.3% with matriculation, 11.1% with secondary-level education, and only 1.9% with a university degree. More than half of the cases had a low socioeconomic status based on their history of socioeconomic level. On the other hand, Azevedo MS *et al*. investigated several behavioral, socioeconomic, and demographic characteristics that could be linked to Fluorosis [15]. Writers have suggested that socioeconomic status (SES) and Fluorosis are linked, even though there is no conclusive evidence of this connection in the literature. However, it has been found that children from poorer socioeconomic backgrounds are more likely to be exposed to greater Fluoride levels. Dentifrice may have been given to these children in higher quantities because of their poor socioeconomic level and parental education. As a result of the greater volume of toothpaste used, the risk of fluoride exposure will be greater for all children, not only those from higher socioeconomic backgrounds who prefer to use children's toothpaste over family toothpaste [16]. A higher rate of DF was identified in children who attended private schools, according to Maltz & Silva *et al*. although no link was established between parental education and family income [17]. Similarly, no association between SES and DF was found by other scientists [18]. Dental fluorosis sufferers in the general population have not been studied in terms of their socioeconomic status or educational attainment. In this study, most participants (48.1%) only brush one time, while 42.6% used two time, and just 9.3% brushed thrice. This was supported by Pendrys *et al*. who found that brushing teeth more frequently than once a day using fluoridated toothpaste may eradicate 34% of fluorosis instances [19]. Ozbek CD *et al*. found that 45.2% of youngsters brushed their teeth twice daily, 35.7% brushed their teeth once daily, 8.7% brushed their teeth every day, 8.7% brushed their teeth twice weekly, and 1.6% brushed their teeth more than twice daily [20]. 46.3 percent of

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cases had mild fluorosis, followed by 27.8 percent with moderate fluorosis, 18.5 percent with severe fluorosis, and 7.4 percent with severe fluorosis. Similarly, Ashraf *et al* found that 5.13 percent of patients had DF in mild cases [21]. The next most common condition had an incidence rate of 1.71%. However, research by Rizwan S, *et al*. found that fluorosis was present in 12 percent of the population [22]. Most individuals (58.9%) had fluorosis, with 44.44% having level 2 (very mild) fluorosis, 11.99% had a moderate level of fluorosis, and 0.22% had severe fluorosis, according to Moimaz SA *et al*' findings (level 4)[23]. Studies demonstrate that fluorosis incidence and severity have increased in both areas with fluoridated water sources and those without. Fluoridated toothpaste, fluoridated food, and nutritional supplements all contributed to this increase in Fluoride consumption. During a 2002 study in the same country, 13.8 percent of fluoridated water-source cities were found to have the condition, which was categorized by severity from "very mild" to "moderate" (2.2, 10.9, 0.6, and 0.1 percent respectively). By Rigo L *et al*, 25 percent of the population had fluorosis, with severity levels of 18.3% mild, 5.2% moderate and 1.5% moderate, according to the study results [14]. In this study, 5 percent sodium hypochlorite demonstrated good performance in instances with moderate and severe dental fluorosis, The technique described in this study appears to have advantages over alternative therapies for enhancing fluorotic lesion appearance, according to Flores AC and colleagues [24]. It has been shown previously that the amount of NaOCl needed to dissolve necrotic tissue is directly related to the amount of NaOCl that may be used; a 5.25 percent dilution has been proven to have a significant impact on its capabilities [25]. Gupta A *et al* found that NaOCl was only efficient in removing mild fluorosis stains; moderate to severe stains were lightened to some extent but could not be eliminated [10]. Because of its ability to neutralize amino acids and create salt and water, NaOCl has a high concentration of potency (neutralization reaction). The removal of hydroxyl ions results in a decrease in pH. When hypochlorous acid, a component of NaOCl solution, encounters organic tissue, it releases chlorine as a solvent and forms chloramines when it reacts with the protein amino group (chloramination reaction). After exposure to NaOCl, hypomineralized and discolored enamel lose their chromogenic organic content.

CONCLUSIONS

The 5% sodium hypochlorite was found to be an efficient method for eliminating dental fluorosis lesions in this investigation. Non-invasive and safe procedure for these lesions. No additional supplies are needed, and it may be used on children's permanent teeth with ease. To support the efficacy of a bigger sample size, further studies are recommended.

Conflicts of Interest

The authors declare no conflict of interest

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