

Effect of Oral Hygiene Instruction on Plaque Control and its Association with Sociodemographic and Behavioural Factors

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ABSTRACT

Background: Oral Hygiene Instruction (OHI) is a key preventive strategy in clinical practice, but its effectiveness may vary based on individual characteristics and habits.

Objectives: To assess the effect of OHI on plaque control using the O'Leary Plaque Control Record, and to identify sociodemographic and behavioural factors that may influence plaque reduction.

Materials and Methods: An interventional study carried out in the university of Benin Teaching Hospital. Baseline plaque scores were recorded using the O'Leary Plaque Control Chart. Participants received standardised OHI, followed by a repeat plaque assessment after a week. Data on biodata, oral hygiene practices, and habits were collected using a structured questionnaire.

Results: Baseline O'Leary plaque control scores showed a mean plaque score of $67.9 \pm 17.8\%$. significantly decreased to $50.7 \pm 20.22\%$ ($P < 0.001$). Individuals who reported brushing twice daily did not show significant plaque score improvement ($P = 0.084$). The use of interdental aids was associated with a higher mean reduction in plaque scores ($P=0.606$). Non-consumption of coffee ($P= 0.044$), tobacco ($P= 0.463$), and alcohol ($P=0.800$) showed more pronounced reductions post-intervention.

Conclusion: Oral hygiene instruction significantly improves plaque control. Sociodemographic and behavioural factors influence the effectiveness of OHI, highlighting the need for tailored oral health education strategies.

Keywords: Oral Hygiene Instruction; Plaque Control; Oral Health Education; Patient Compliance

Introduction

The surfaces of teeth and dental prosthesis are perpetually covered by a soft but tenaciously adherent, organised biofilm of microbes, as well as organic and inorganic materials [1]. Although a natural self-cleansing mechanism is provided by the activity of saliva and tongue in the oral cavity, mechanical oral hygiene practices are still required for the removal of these tooth deposits [1,2]. The non-mineralised tooth deposits, known as dental plaque, must be controlled optimally to prevent oral diseases, especially plaque-induced periodontal diseases [3]. A link has been established between plaque accumulation and gingival inflammation, and it is believed that gingival inflammation begins if mechanical plaque control is not instituted

within 48 hours [3]. Optimal plaque control has also been linked to better clinical outcomes of systemic diseases, such as respiratory diseases [4] and Diabetes Mellitus [5].

An optimal individual's plaque control is dependent on many factors, such as motivation, knowledge, oral hygiene instruction, oral hygiene aids available, and manual dexterity [6,7]. It has been reported that individuals are more likely to comply with oral hygiene instructions on proper plaque control if they have serious chronic conditions [8], if their baseline oral hygiene status is good [9], and if they believe that they have some control over their health and can influence treatment outcome [7,10]. Compliance with oral hygiene instructions has also been reported to be better among females [11], among well-in-

formed individuals with high socioeconomic status, and among those who indulge in healthy lifestyle habits such as not smoking, regular exercise, and a healthy diet [12]. Noncompliance is likely to be more common among individuals who are unwilling to perform self-care [13], those who have a poor understanding of the problem [9] and those who are undergoing stressful life events [14]. An objective way of evaluating improvement in an individual's plaque control or compliance with oral hygiene instruction is the use of the plaque control record presented by O'Leary, Drake, and Naylor [15]. This very practical method records the presence of plaque on all the surfaces of the teeth, except the occlusal or incisal surfaces. It is necessary to assess an individual's progress in learning and carrying out the prescribed oral hygiene procedures aimed at achieving optimal plaque control, and not to assume it. The objective of this study is to therefore to determine the level of compliance of the study participants with oral hygiene instruction, by comparing their plaque control records before and after oral hygiene instruction, and also to determine the relationship between the change in plaque control and their oral hygiene practices and status, socio-demographic status and lifestyle habits.

Methodology

This study was carried out among patients who presented at the periodontal clinic of the University of Benin Teaching Hospital, Benin City, for their first oral prophylaxis. Before the commencement of the study, ethical clearance was obtained from the Ethics and Research Committee of the Institution, and Informed consent was obtained from study participants. On the first visit, data on socio-demographic factors, oral hygiene practices, diet, and Dental and Medical histories were recorded. Simplified oral hygiene index (OHI-S) [16] was used to determine the study participants' oral hygiene status. Disclosing tablets were also used to disclose plaque on the teeth. The plaque control record by (O'Leary, et al. [15]) was used to record the presence of plaque on all the surfaces of the teeth (i.e., Mesial, Distal, Buccal, and Lingual), except the occlusal or incisal surfaces. The plaque index is then calculated by dividing the number of plaque-containing surfaces by the total number of available surfaces. The score is then multiplied by 100 to present the plaque score as a percentage. Patients were motivated, and tailored Oral Hygiene Instruction was given. The plaque recording was repeated on the 2nd appointment, i.e., before carrying out oral prophylaxis, and the difference between the baseline plaque index and plaque index calculated at the 2nd appointment was determined [17].

Classification of Occupation by Opeodu, et al. [18] was used:

- Executive managers, Company directors, Professionals (Doctors, Lawyers, Engineers), University Professors, Traditional chiefs.
- Civil servants, Nurses, Professional Teachers, 2444222 including university and polytechnic Teachers, Secretaries, Businessmen*
- Semi-skilled- Tailors, Bricklayers, Carpenters (Joiners), Typists, Sewing mistresses, Clerks. Housewives*
- Unskilled- Messengers, Roadside traders, Cleaners, Night guards, Farmers*
- Students

The data collected were analyzed using the Statistical Package for Social Sciences version 26.0 for Windows (SPSS Inc., Chicago, IL, USA). Data was presented as frequency tables, percentages, and cross tabulations. A paired t-test was used to compare the mean baseline plaque score with the mean plaque scores recorded subsequently. The chi-square test was used to identify significant relationships between the change in plaque control and their oral hygiene practices, status, socio-demography, and lifestyle habits. Statistical significance was based on probability values of less than 0.05 ($P < 0.05$).

Results

A total of 113 patients were recruited for this study. The mean age of participants was 27 ± 10 years, with 47.8 % being females and 52.2 % males. Baseline O'Leary plaque control scores showed a mean plaque score of 67.9 ± 17.8 %. After the oral hygiene instruction intervention, the mean plaque score significantly decreased to 50.7 ± 20.22 % ($P < 0.001$). The reduction in plaque score of $<10\%$ was seen in 36.3% of patients, and 8.8% had a reduction of $>40\%$. There was a greater plaque score improvement among females compared to males (Males (39.0%) and females (33.3%) had $<10\%$ reduction in plaque scores) ($P=0.699$). Individuals who reported brushing twice daily did not show significant plaque score improvement ($P = 0.102$). Use of interdental aids was associated with a higher mean reduction in plaque scores ($P=0.616$). Participants who do not consume coffee ($P= 0.058$), tobacco ($P= 0.575$), and alcohol ($P=0.913$) tended to show more pronounced reductions post intervention (Tables 1-5).

Table 1: Association of Sociodemographic Characteristics with Plaque Reduction After Oral Hygiene Instruction.

Characteristics	Percentage Plaque Reduction				Total	P value
	<10%	10-20%	21-40%	>40%		
	n (%)	n (%)	n (%)	n (%)		
Age (Years)						
<20years	8 (44.4)	3 (16.7)	6 (33.3)	1 (5.6)	18 (100.0)	0.820
20-29	26 (38.8)	22 (32.8)	16 (23.9)	4 (6.0)	68 (100.0)	
30-39	3 (27.3)	4 (36.4)	2 (18.2)	2 (18.2)	11 (100.0)	
40-49	1 (10.0)	2 (20.0)	5 (50.0)	2 (20.0)	10 (100.0)	
50-59	2 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (100.0)	
60-69	1 (33.3)	0 (0.0)	1 (33.3)	1 (33.3)	3 (100.0)	
Sex						
Male	23 (39.0)	18 (30.5)	13 (22.0)	5 (8.5)	59 (100.0)	0.699
Female	18 (33.3)	14 (25.9)	17 (31.5)	5 (9.3)	54 (100.0)	
Occupation *						
Professionals	2 (22.2)	2 (22.2)	3 (33.3)	2 (22.2)	9 (100.0)	0.245
Civil servants	7 (38.8)	4 (22.2)	5 (27.8)	2 (11.1)	18 (100.0)	
Semi-skilled	3 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (100.0)	
Unskilled	6 (33.3)	2 (11.1)	7 (38.9)	3 (16.7)	18 (100.0)	
Students	23(35.4)	24(36.9)	15(23.1)	3(4.6)	65(100.0)	
Marital Status						
Single	35 (36.5)	29 (30.2)	25 (26.0)	7 (7.3)	96 (100.0)	0.440
Married	6 (35.3)	3 (17.6)	5 (29.4)	3 (17.6)	17 (100.0)	
Total	41 (36.3)	32 (28.3)	30 (26.5)	10 (8.9)	113 (100.0)	

Note: *Classification of occupation Opeodu, et al. [18].

Table 2: Association of Oral hygiene status category with Plaque Reduction After Oral Hygiene Instruction.

Characteristics	Percentage Plaque Reduction				Total	P value
	<10%	10-20%	21-40%	>40%		
	n (%)	n (%)	n (%)	n (%)		
Oral Hygiene Status						
Good	3 (50.0)	2 (33.3)	0(0.0)	1 (16.7)	6 (100.0)	0.250
Fair	34 (38.2)	26 (29.2)	21 (23.6)	8 (9.0)	89 (100.0)	
Poor	4 (22.2)	4 (22.2)	9 (50.0)	1 (5.6)	11 (100.0)	
Total	41 (36.3)	32 (28.3)	30 (26.5)	10 (8.8)	113 (100.0)	

Table 3: Association of plaque control strategies with Plaque Reduction After Oral Hygiene Instruction.

Plaque control strategies	Percentage Plaque Reduction				Total	P value
	<10%	10-20%	21-40%	>40%		
	n (%)	n (%)	n (%)	n (%)		
Materials used						
Brush and Paste	41 (36.6)	32 (28.6)	30 (26.8)	9 (8.0)	112(100.0)	0.088
Brush and Herbal paste	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	1 (100.0)	
Interproximal cleaning						
Yes	9 (42.9)	5 (23.8)	4 (19.0)	3 (14.3)	21 (100.0)	0.616
No	32 (34.8)	27 (29.3)	26 (28.3)	7 (7.6)	92 (100.0)	
Brushing Frequency						
Once	34 (37.0)	27 (29.3)	21 (22.8)	10 (10.9)	92 (100.0)	0.102
Twice	7 (33.3)	5 (23.8)	9 (42.9)	0 (0.0)	21 (100.0)	
Strength of Brush						
Soft	3 (18.8)	5 (31.3)	6 (37.5)	2 (12.5)	16 (100.0)	0.356
Medium	33 (39.3)	21 (25.0)	22 (26.2)	8 (9.5)	84 (100.0)	
Hard	5 (38.5)	6 (46.2)	2 (15.4)	0 (0.0)	13 (100.0)	
Total	41 (36.3)	32 (28.3)	30 (26.5)	10 (8.8)	113 (100.0)	

Table 4: Association of Habits with Plaque Reduction After Oral Hygiene Instruction.

Habits	Percentage Plaque Reduction				Total	P value
	<10%	10-20%	21-40%	>40%		
	n (%)	n (%)	n (%)	n (%)		
Refined sugar						
Never	3 (30.0)	4 (40.0)	20 (20.0)	1 (10.0)	10 (100.0)	0.317
occasionally	18 (32.7)	19 (34.5)	16 (29.1)	2 (3.6)	55 (100.0)	
Frequently	20(41.7)	9 (18.8)	12(25.0)	7 (14.6)	48 (100.0)	
Tea/ Coffee						
Never	14 (46.7)	7 (23.3)	5 (16.7)	4 (13.3)	30 (100.0)	0.058
Occasionally	23 (35.4)	23 (35.4)	15 (23.1)	4 (6.1)	65 (100.0)	
Frequently	4 (22.2)	2 (11.1)	10 (55.6)	2 (11.1)	18 (100.0)	
Tobacco						
Never	36 (35.0)	29 (28.2)	28 (27.2)	10 (9.7)	103 (100.0)	0.575
Occasionally	5 (50.0)	3 (30.0)	2 (20.0)	0 (0.0)	10 (100.0)	
Alcohol						
Never	25 (35.7)	19 (27.1)	19 (27.1)	7 (10.0)	70 (100.0)	0.913
Occasionally	14 (35.0)	12 (30.0)	11 (27.5)	3 (7.5)	40 (100.0)	
Frequently	2 (66.7)	1 (33.3)	0 (0.0)	0 (0.0)	3 (100.0)	
Total	41 (36.3)	32 (28.3)	30 (26.5)	10 (8.8)	113 (100.0)	

Table 5: Association of Past dental visits/Reasons for Dental Visits with Plaque Reduction After Oral Hygiene Instruction.

Dental visits	Percentage Plaque Reduction				Total	P value
	<10%	10-20%	21-40%	>40%		
	n (%)	n (%)	n (%)	n (%)		
Past Dental visits						
No	3 (30.0)	4 (40.0)	20 (20.0)	1 (10.0)	10 (100.0)	0.317
Yes	18 (32.7)	19 (34.5)	16 (29.1)	2 (3.6)	55 (100.0)	
Reason for visit						
Apthous ulcer Caries	14 (46.7)	7 (23.3)	5 (16.7)	4 (13.3)	30 (100.0)	0.058
Routine checks	23 (35.4)	23 (35.4)	15 (23.1)	4 (6.1)	65 (100.0)	
Extraction	4 (22.2)	2 (11.1)	10 (55.6)	2 (11.1)	18 (100.0)	
Fillings	36 (35.0)	29 (28.2)	28 (27.2)	10 (9.7)	103 (100.0)	0.575
Not available	5 (50.0)	3 (30.0)	2 (20.0)	0 (0.0)	10 (100.0)	
Not available	25 (35.7)	19 (27.1)	19 (27.1)	7 (10.0)	70 (100.0)	0.913
Root canal fillings	14 (35.0)	12 (30.0)	11 (27.5)	3 (7.5)	40 (100.0)	
Scaling/Polishing	2 (66.7)	1 (33.3)	0 (0.0)	0 (0.0)	3 (100.0)	
Total	41 (36.3)	32 (28.3)	30 (26.5)	10 (8.8)	113 (100.0)	

Discussion

Oral hygiene instruction has played a tremendous role in plaque control [10,17,18]. Plaque control was achieved in this study after oral health education was given to the patients. before their next appointment for oral prophylaxis, as their plaque scores had reduced significantly. ($p < 0.001$). Kusuma recorded similar findings where the plaque values changed to better values after oral education with study models. (Kusuma Ira [19]). There was a significant association between gender and plaque levels in studies by Sandhya et al. Poor plaque levels were observed in 247 (36.9%) males & 77 (13.5%) females ($p = 0.001$), and in Hanomen et al. ($p = 0.008$). Females showed better plaque improvement in our study, with 33.3% of females having less than 10% decrease compared to 39% of males ($p = 0.699$). Individuals who brushed their teeth twice daily, in this study, did not show a significant improvement in plaque score ($P = 0.084$). However, a strong association of toothbrushing frequency and plaque control has been recorded in several studies [20-22]. A relationship exists between lifestyle habits and plaque control in this study. Participants who do not consume coffee ($P = 0.044$), tobacco ($P = 0.463$), and alcohol ($P = 0.800$) tended to show more pronounced reductions post-intervention. This finding corroborates the conclusions made by (Kumar, et al. [23]), on the significant impact of lifestyle factors on oral health. Tobacco is reported to affect bacterial acquisition and colonisation of biofilms, thereby causing increased plaque accumulation and poor plaque control [24]. Coffee (Black) has several compounds known to possess antimicrobial, antiadhesive, and antiplaque activities [25], thus, the reduction of supragingival plaque present in the study subjects ($P = 0.0195$). However, if sugar, milk, or cream is

added to the coffee, it has a negative effect. This finding was similar to subjects who took wine, and they had better plaque control ($P = 0.000594$) [26,27].

Conclusion

Oral hygiene instruction significantly improves plaque control. Sociodemographic and behavioural factors played a significant role in the effectiveness of OHI, highlighting the need for tailored oral health education strategies.

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