Assessment of Patients' Dental Scaling Experience and Their Comparative Perception of The Effectiveness of Manual and Ultrasonic Scaling.

Olagundoye Olufemi Olakunle

Senior Lecturer, Department of Preventive Dentistry, Faculty of Dentistry, Lagos State University College of Medicine, Lagos, Nigeria.

Sorunke Modupeore Ekua

Associate Professor, Department of Preventive Dentistry, Faculty of Dentistry, Lagos State University College of Medicine, Lagos, Nigeria.

Onigbinde Olubunmi

Associate Professor, Department of Preventive Dentistry, Faculty of Dentistry, Lagos State University College of Medicine, Lagos, Nigeria

Kuye Olasunkanmi

Senior Lecturer, Department of Oral and maxillofacial surgery, Lagos State University Teaching Hospital, Lagos, Nigeria.

Olaleye Seun Adekanbi

Dental therapist, Department of Preventive Dentistry, Lagos State University Teaching Hospital Ikeja, Lagos, Nigeria

Corresponding Author - Olagundoye Olufemi Olakunle

Abstract

Introduction: The prevalence of Periodontal diseases is a global epidemic, and several preventive and therapeutic procedures are carried out to curb it. Manual and ultrasonic scaling of teeth to remove supragingival deposits is one of the most executed procedures worldwide, but this is not without some unpleasant experience for the patients.

Objective: This study is to investigate patients' experience during the dental scaling procedure and to determine their perception of effectiveness between manual and ultrasonic scaling methods.

Methodology: The study involved 124 patients who presented at the Periodontology Department of the Dental Centre at the Lagos State University Teaching Hospital (LASUTH), Ikeja, Lagos. Data was collected with a self-administered questionnaire to obtain the sociodemographic parameters. The patients' experience, with both manual and ultrasonic scaling, was assessed, and their preference and recommendation for either was recorded with the questionnaire.
Data analysis was carried out using SPSS version 24. For descriptive variables that are continuous, the mean and measures of variability were determined. Simple frequency and percentages were determined for categorical variables. Bivariate analysis was done using a Pearson's chi-square or Fisher's exact as appropriate for the independent variables and the variables which assess the patients' perception of effectiveness for manual or ultrasonic scaling. Statistical significance was determined at $p \leq 0.05$.

Results The mean age of the subjects is 40.1 ± 16.5 years, with an age range of 14 to 78 years. The mean oral hygiene score was 1.96±0.82. The majority of the subjects were in the 20-29 years age group. The professionals were the most, 48(38.7%), followed by the skilled workers, 36(29%). Ten (8.1%) reported that manual is more effective compared to 114(91.9%) who reported that ultrasonic scaling is more effective. The preference for ultrasonic scaling was consistent and profound in all the determinant parameters assessed, although only the occupation of the subjects was significant (p = 0.02).

Conclusion: It is evident from this study that most of the patients prefer ultrasonic scaling to manual. This emphasises pre-scaling counselling and motivation of the patients while also spelling out the possible unpleasant experience that may accompany the procedure. The provision of ultrasonic scalers by the health authorities will also benefit most dental patients who prefer their use.

Keywords: Dental, Scaling, Manual, Ultrasonic, Experience, Perception

Introduction

Periodontal diseases are inflammatory conditions that affect the periodontal tissues (1, 2, 3). It is one of the most common chronic inflammatory diseases in humans, affecting up to 90% of the global population in one form or the other (2). The World Health Organisation has reported that about 1 billion people suffer from severe periodontal disease globally (2,3). The disease has been increasingly noted for its association with many systemic non-communicable diseases (4). Periodontal disease is not just a known major cause of tooth loss; it is also a proven risk factor for many conditions, such as cardiovascular and respiratory diseases, diabetes mellitus, pregnancy-related and birth outcome complications, obesity, malignancies, and Alzheimer's disease, among many others (4, 5). The primary aetiologic factor is dental plaque/biofilm. Accumulation of dental plaque periodontally in the form of bacterial biofilms is usually followed by localised or generalised gingival inflammation (gingivitis) (2,3,4).

Gingivitis is reversible; common symptoms include halitosis, swollen and hyperemic gingiva that bleeds on brushing, probing, or flossing (2,3,4). It can be reversed by instituting good homecare and, oral health and professional intervention through scaling and polishing, and chemotherapeutics (1, 6). Gingivitis usually presents with about 2 mm loss of clinical attachment and a periodontal probing depth of 4mm or less 2,3,4. When dental biofilm accumulation is long-standing and undisturbed, it progresses to the advanced stage of periodontal disease, at which damage to the components of the periodontium occurs due to bacterial byproducts and enzymes, some of which are proteolytic, while others are hydrolytic (5,6). Major periodontopathic bacteria include Prevotella intermedius, Prevotella gingivalis, Aggregatibacter actinomycetemcomitans, Wollina recta, Eikenella spp, Porphyromonas gingivalis, Tannerella forsythia and Treponema denticola (7). Periodontal ligaments around the teeth get inflamed and destroyed, resulting in alveolar bone resorption (2,3,6). As the lesion deepens apically, the junctional epithelium migrates apically and a periodontal Pocket is formed; this condition is mainly known as periodontitis (1-7).

Periodontitis symptoms may include gingival inflammation, severe bad breath, and bleeding on probing and flossing. Loss of alveolar bone, which is not reversible, may progress to tooth mobility, tooth migration, and eventual tooth loss. Other sequelae include gingival recession and furcation involvement. Peri-implant mucositis is characterised by inflammation of the soft tissue surrounding dental implants, without any loss of bone. Symptoms include hyperemic and painful gingiva around implants and bleeding on brushing. Periimplantitis has accompanying periimplant bone loss and implant mobility in advanced cases (8).

Efforts have been applied to control the formation and the accumulation of dental plaque around the teeth, which include the use of chemotherapeutics in the form of mouth washes, gels and locally delivered agents (9). These are antibiotics, disinfectants, antiplaque/biofilm inhibitors and immunomodulators. Recent attention has been on the use of probiotics (1,9). However, chemotherapeutics are of only minimal effect without combination with mechanical control of dental plaque/biofilm, to which chemotherapeutics are adjuvants (1).

Prevention of periodontal disease is dependent on mechanisms that enhance the removal of the

tenaciously adherent dental plaque and calculus (1,10,11). Scaling and polishing (S&P) is a mechanical periodontal instrumentation and is the most commonly performed dental procedure globally at a huge cost 1. Scaling is the mechanical procedure with the use of hand instruments such as scalers and curettes or ultrasonic scalers directed at the removal of dental plaque, dental calculus, debris and staining from the tooth surfaces (1,9,10). Polishing is a procedure that engages the use of rubber cups or bristle brushes to smoothen the tooth surfaces and remove residual extrinsic stains and deposits with a prophylactic paste. Scaling and polishing is a nonsurgical procedure aimed at supplementing patients' self-care (1,10). Scaling and Polishing have been associated with the improvement in the clinical signs and symptoms of periodontal disease, such as bleeding and inflammation of the gingiva, which ultimately slows or eliminates the progression to periodontitis 10. Depending on the nature and severity of the disease and predisposition of the individual, patients can undergo scaling and polishing quarterly or every 6 months (1).

Ultrasonic scalers are mostly piezoelectric devices that operate at frequencies ranging from 25,000 to 50,000 kHz 11. This forms pulsating bubbles which collapse inwards, releasing energy (cavitation) that breaks bacterial cell walls (11). Ultrasonic scalers also release a stream of water that flushes out the gingival pockets and the periodontal space. This is termed acoustic microstreaming and fluid lavage (11). Scaling with ultrasonic scalers is faster and more comfortable for the operator and the patient than the use of hand instruments (11,12). Extrinsic stains and debris can be removed more easily, and there is better access to narrow, difficult areas. However, ultrasonic scalers can give rise to tooth sensitivity in patients with gingival recession (12). There are also reports of thermal damage to the pulp, damage to platelets by cavitation and acoustic streaming and aerosol generation and dispersal (12). Because of these, hand instruments are still preferred in many instances by some patients and health personnel (11,12). The use of hand instruments and ultrasonic scalers has merits and demerits, and this gives room for preferences for one or the other, and many times, they are combined. Croft et al in a study in Dallas, Texas, involving 463 patients, found out that 74% preferred the use of ultrasonic scalers (12).

This study aims to assess the preference for either manual scaling or ultrasonic scaling among patients attending the dental centre of the Lagos State University Teaching Hospital in Lagos, Nigeria.

Methodology

The study location was the Periodontology Department of the Dental Centre at the Lagos State University Teaching Hospital (LASUTH), Ikeja, Lagos, a metropolitan area with a diverse mix of cultures and ethnicities in Nigeria. LASUTH is a major tertiary and referral hospital in Southwest Nigeria. The Dental Centre has an inflow of more than 500 new patients every month, with a substantial number of them having their teeth scaled and polished as the preliminary or definitive treatment. The study population was 124 patients, 55 of whom were males and 69 females. Inclusion Criteria included patients who were aged 14 years and above who had undergone both manual and ultrasonic scaling within a year before this study. Excluded were patients diagnosed or currently on treatment for dentine hypersensitivity and patients with multiple restorations, implants or on orthodontic treatment. Patients with pain/anxiety disorders and other mental conditions were also excluded.
Ethical approval for this research was obtained from the Health Research and Ethics Committee of Lagos State University Teaching Hospital (LASUTH).

Data collection was carried out with a self-administered questionnaire, which consisted of both open and closed-ended questions to obtain the biodata such as age, sex, occupation, marital status, and educational status. The patients' experience, with both manual and ultrasonic scaling, was assessed, and their preference and recommendation for either was recorded with the questionnaire. Oral hygiene (OH) status of the subjects was assessed using William's periodontal probe. Simplified Oral Hygiene index (OHI-S) of Green and Vermillion, 13 calculated by and summing the debris and calculus indices and scored on a range of 0 to 3. The OH status was graded as good if the score is (0.1–1.2), fair if the score is (1.3–3.0), and poor when the score is (3.1–6.0). Thereafter, patients were informed of the study protocol to avoid exaggerated responses, and written informed consent was obtained from the patients before participating in the study.

Data analysis was carried out using SPSS version 24. For descriptive variables that are continuous, such as age and oral hygiene scores, the mean, minimum, and maximum and measures of variability were determined. While simple frequency and percentages were determined for categorical variables such as age groups, sex, educational status, occupation, etc. Bivariate analysis was done using a Pearson's chi-square or Fisher's exact as appropriate for the independent variables and the variables which assess the patients' preference for manual or ultrasonic scaling to test for a significant difference. Statistical significance was determined at p≤ 0.05.

Results

Figure 1: Distribution of subjects by age group
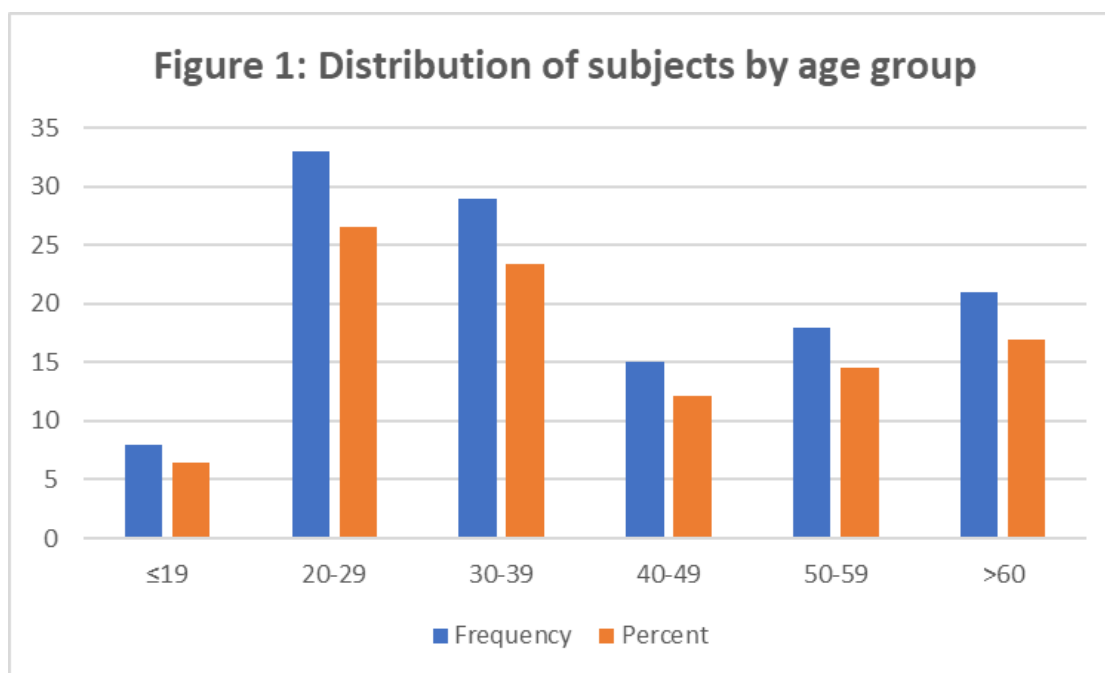
The mean age of the 124 subjects was is 40.1 ± 16.5 years, with an age range of 14 to 78 years. The male-to-female ratio was 1:1.3. The mean oral hygiene score was 1.96±0.82. The majority of the subjects were in the 20-29 years age group, followed by the 30-39 years; the least were the 10-19-year-olds. (Figure 1). Subjects with a tertiary level of education formed the largest population, (95, (76.6%), while the least were those with a primary level of education, (1, (0.8%). The professionals were the most, prevalent (48, (38.7%), when the occupation of the subjects was assessed, followed by the skilled workers, (36, (29%), while the least were the unskilled workers, (6, (4.8%). Only 5(4%) of the subjects reported that they smoke cigarettes. Ninety-six (77.4%) had fair oral hygiene status (1.3-3.0) while 5(4%) had poor. One hundred and eleven (89.5%) of the subjects believe that scaling is effective in removing deposits from the teeth, 7(5.6%) are undecided, and 6(4.8%) believe it is not effective. Sixty-five (52.4%) had a history of pain/discomfort during the scaling procedure, while 59 (47.6%) reported no such history.

Table 1 : Assessment of subjects' experience of manual vs ultrasonic.

Experience	Response	Manual Number(%)	Ultrasonic Number(%)
Stressful	Yes	64(51.6)	32(25.8)
	No	60(48.4)	92(74.2)
Painful	Yes	68(54.8)	56(45.2)
	No	56(45.2)	68(54.8)
Discomforting	Yes	76(61.3)	52(41.9)
	No	48(38.7)	72(58.1)
Time consuming	Yes	55(44.4)	18(14.5)
	No	69(55.6)	106(85.5)

Noisy	Yes	39(31.5)	63(50.82)
	No	85(68.5)	61(49.2)
Teeth sensitivity	Yes	74(59.7)	76(61.3)
	No	50(40.3)	48(38.7)

Ten (8.1%) reported that manual is more effective compared to 114 (91.9%) who reported that ultrasonic scaling is more effective. 55 (44.4%) reported that they will recommend manual scaling to others, while 114 (91.9%) said they will recommend ultrasonic scaling. When different parameters were considered to compare the subjects' experience of manual and ultrasonic scaling, 64(51.6%) of the subjects considered manual scaling to be as stressful, while 32 (25.8%) reported that ultrasonic scaling was stressful. The painful experience was 68 (54.8%) for manual and 56 (45.2%) for ultrasonic scaling. Manual scaling was associated with discomfort in 76 (61.3%), while it was in 52 (41.9%) in for ultrasonic scaling. More of the subjects (55, 44.4%) reported that manual scaling was time-consuming, as compared to 18(14.5%) for ultrasonic. When noise was considered, ultrasonic, scaling was reported to be noisier, (63, (50.2%), than manual, (39, (31.5%). In terms of teeth sensitivity, the results were about the same close with manual 74(59.7%) and ultrasonic 76(61.3%). Table 1

Table 2: Assessment of the determinant variables and subjects' perception of the effectiveness of manual and ultrasonic scaling

Variable		Perception of effectiveness		Total	P-value
		Manual (10) Number (%)	**Ultrasonic (114) Number (%)**		
Age group(years)	10-19	2 (0.2525.0)	6 (0.7575.0)	8	0.14
	20-29	3 (0.099.1)	30 (90.990.1)	33	
	30-39	0	29 (100)	29	
	40-49	0	15 (100)	15	
	50-59	2 (11.1)	16 (88.9)	18	
	≥60	3 (14.3)	18 (85.7)	21	
Sex	Male	4 (7.3)	51 (92.7)	55	0.78
	Female	6 (8.7)	63(91.3)	69	
Educational level	None	0	2 (100)	2	0.13
	Primary	0	1 (100)	1	
	Secondary	5 (19.2)	21 (80.8)	26	
	Tertiary	5 (5.3)	90 (94.7)	95	
Occupation	Unskilled	1 (16.7)	5 (83.3)	6	0.02*
	Skilled	1 (2.79)	35 (97.2)	36	
	Student	5 (20.8)	19 (79.2)	24	
	Professional	1 (2.1)	47 (97.9)	48	
	Retired	2 (20)	8 (80)	10	
Do you smoke	Yes	0	5 (100)	5	0.50
	No	10(8.4)	109(91.6)	119	
Type of toothbrush	Soft	3(10.7)	25(89.3)	28	0.82
	Medium	6(7.6)	73(92.4)	79	
	Hard	1(5.9)	16(94.1)	17	
Oral hygiene status	0.1-1.2 (good)	2(8.7)	21(91.3)	23	0.79
	1.3-3.0 (fair)	8(8.3)	88(91.7)	96	
	3.1-6.0 (poor)	0	5(100)	5	

Significant

The preference for ultrasonic scaling was consistent and profound in all the determinant parameters assessed, although only the occupation of the subjects was significant (p = 0.02).

Discussion

The subjects in this study ranged from the second to the eighth decade of life, representing a fair spread in the expression of their scaling experience across the different age groups. This is similar to another study that assessed the clinical effectiveness of manual and ultrasonic scaling (13). Even though the third and fourth decades formed the largest population of the subjects, this is not far-fetched, as these are the active group of people in any population. There were more females in the study. On average, the subjects had fair oral hygiene. Almost all the subjects studied attained beyond the secondary level of education. When the occupation of the subjects was considered, the professionals and the skilled workers were more than others in this study. The proportion of smokers in this study was very low.

Upon assessing the subjects' scaling experience, almost nine out of every ten subjects in the study believe that scaling is effective in removing deposits from their teeth. At the same time where as, very few are undecided or believe that scaling is not effective at all. A little more than half of the subjects reported a history of pain or /discomfort during the scaling procedure, while about half reported no such history. A previous study in Lagos, Nigeria, (14) reported 88% of the respondents said that they claimed to have experienced moderate pain during scaling, while another study in Pakistan reported 62.8% with pain and discomfort after scaling (15). More than 90% believe that ultrasonic scaling is more clinically effective than manual and that they will recommend it, which is similar to, but more than 74% reported by Croft and coworkers (12). Less than 10% reported that the manual is more effective, but only two-fifths of the subjects will recommend it. Oza et al, in a systematic review and meta-analysis, showed that manual scaling is a bit more clinically effective than ultrasonic from several studies assessed (13).

When different parameters were considered to compare the subjects' experience of manual and ultrasonic scaling, about half of the subjects considered manual scaling as a stressful experience, compared to a quarter of the subjects who reported that ultrasonic scaling was stressful. This difference may be the result of the easier access of ultrasonic tips to sites not easily instrumented manually. (11,12). Painful experience and discomfort were reported more for manual than ultrasonic scaling; this disagrees with another study where almost 70% reported that ultrasonic scaling is more discomforting compared to 60% for manual scaling (16). More of the subjects reported that manual scaling was more time-consuming than ultrasonic; this stands to reason, as the major advantage of machines is that they make processes faster. On the contrary, when noise was considered, ultrasonic, scaling was reported to be noisier than manual.; This is because of the vibration of the tips on the surface of the teeth (17,18,19). In terms of teeth sensitivity resulting from the scaling procedure, subjects' responses were similar for both manual and ultrasonic, this which is in terms with another study that recorded no significant difference in scaling sensitivity (18). Occupation of the respondents was the only variable associated with a significant difference in their perception of the effectiveness of either of the scaling technique. This is because socioeconomic class is a strong predictor of perception of risk, time and injury (20,21), and may be determine the pattern of perception of effectiveness of either of the scaling methods in this study

Conclusion

It is evident from this study that most of the patients prefer ultrasonic scaling to manual because of the perceived comfort and less time consumed in the procedure despite the fact that it is perceived to be noisy as against patients prefer ultrasonic scaling to manual scaling due to the perceived comfort and the shorter time consumed in the procedure, even though it is perceived as noisier than manual scaling. This study also reveals that both methods present with appproximately the similar same level of teeth sensitivity. This emphasizes emphasises the need for pre-scaling counselling and motivation of the patients while also spelling out the possible unsavory experience that may accompany the procedure, be it manual or ultrasonic. It is also important to highlight the health benefits of good oral hygiene and regular scaling and polishing, as may be indicated for the patient. Provision of appropriate

equipment, such as ultrasonic scalers, by the health authorities will also benefit most dental patients that who prefer the use.

Conflict of interest- None

References

1. Tanwar J, Hungund SA, Dodani K. Nonsurgical periodontal therapy: A review. J Oral Res Rev (2016) 8:39-44.

2. Hashim N.T, Babiker R, Padmanabhan V, Ahmed A.T, Chaitanya N.C, Mohammed R, et al. The Global Burden of Periodontal Disease: A Narrative Review on Unveiling Socioeconomic and Health Challenges. Int. J. Environ. Res. Public Health (2025), 22, 624. **Error! Hyperlink reference not valid.**

3. Dubey P, Mittal N. Periodontal diseases- A brief review. Int J Oral Health Dent (2020) ;6

4. Martínez-García M and Hernández-Lemus E Periodontal Inflammation and Systemic Diseases: An Overview. Front. Physiol.(2021) 12:709438. doi: 10.3389/fphys.2021.709438

5. Aizenbud I, Wilensky A. Almoznino G. Periodontal Disease and Its Association with Metabolic Syndrome—A Comprehensive Review. Int. J. Mol. Sci. (2023) 24, 13011. **Error! Hyperlink reference not valid.** ijms241613011

6. Sedghi LM, Bacino M and Kapila Y. Periodontal Disease: The Good, The Bad, and The Unknown. Front. Cell. Infect. Microbiol. (2021) 11:766944. doi: 10.3389/fcimb.2021.766944(3):177-187

7. Abdulkareem A. A, Al-Taweel F. B, Al-Sharqi A. J. B, Gul S. S, Sha A, & Chapple, I. L. C. Current concepts in the pathogenesis of periodontitis: from symbiosis to dysbiosis. Journal of Oral Microbiology, (2023) *15*(1). **Error! Hyperlink reference not valid.**

8. Schwarz F, Derks J, Monje A, Wang HL. Peri-implantitis. J Periodontol. 2018 Jun;89 Suppl 1:S267-S290. doi: 10.1002/JPER.16-0350. PMID: 29926957.

9. Haque M.M, Yerex K, Kelekis-Cholakis A. *et al.* Advances in novel therapeutic approaches for periodontal diseases. BMC Oral Health 22, 492 (2022). **Error! Hyperlink reference not valid.**

10. Clarkson J, Ramsay C, Lamont T, Goulao B, Worthington H, Heasman P, et al. Examining the impact of oral hygiene advice and/or scale and polish on periodontal disease: the IQuaD cluster factorial randomised controlled trial. *British Dental Journal*, (2021) *230*(4), 229-235. **Error! Hyperlink reference not valid.**

11. Chatterjee A , Baiju CS, Bose S , Shetty SS. Clinical Uses and Benefits of Ultrasonic Scalers as Compared to Curets: A Review. J Oral Health Comm Dent, (2013) 7(2)108-113

12. Croft LK, Nunn ME, Crawford LC, Holbrook TE, McGuire MK, Kerger MM, Zacek GA. Patient preference for ultrasonic or hand instruments in periodontal maintenance. Int J Periodontics Restorative Dent. (2003) 23(6):567-73. PMID: 14703760.

13. Oza RR, Sharma V, Multani P, Balsara K, Bajaj P, Dhadse P. Comparing the Effectiveness of Ultrasonic Instruments Over Manual Instruments for Scaling and Root Planing in Patients With Chronic Periodontitis: A Systematic Review and Meta-Analysis. Cureus. (2022) 13;14(11):e31463. doi: 10.7759/cureus.31463. PMID: 36532917; PMCID: PMC9750238.

14. Sorunke M, Olagundoye O, Awotile A, Adenuga-Taiwo. Determinants Of Pain Experienced During Scaling Of Teeth By Patients Attending The Dental Clinic Of The Lagos State University College Of Medicine Ikeja, Lagos Nigeria. International Journal Dental and Medical Sciences Research, (2024) 6(3), 357-365 D:\IJMSDH JOURNAL\IJMSDH JOURNAL DATA 2025\2025 DATA\PUBLISHED ARTICLE\ISSUE 11\GALLEY\www.ijdmsrjournal.com ISSN: 2582-6018 DOI: 10.35629/6018-0603357365

15. Samad A, Ullah S, Zulkaif,Z. Perception of Patients Regarding Dental Scaling Reporting to Periodontology Department of Khyber College of Dentistry: A Descriptive Cross-Sectional Study. JRehmanCollDent (2023) 4(2):6-9.

16. Muhammad N, Nadia I and Tazeen Z. Knowledge, Attitude & Perception of Patients about Manual VS Ultrasonic Scaling and its Polishing Treatment. Medical Forum Monthly, (2024) *31*(8). **Error! Hyperlink reference not valid.**

17. Jack L. Stewart, Richard R. Drisko, A. Dayton H. Comparison of ultrasonic and hand instruments for the removal of calculus. The Journal of the American Dental Association, (1967) 75, 1, 153 - 157

18. Ensieh B, Maryam H. Dentin hypersensitivity after manual and ultrasonic scaling. Journal of Current Oncology and Medical Sciences. (2021) 1(2), 119-123.

19. **Error! Hyperlink reference not valid.**. Patients' Complaints after Scaling and the Self-evaluation of Hand Instrumentation for Scales by Dental Hygienists. **Error! Hyperlink reference not valid.**4(4)DOI:**Error! Hyperlink reference not valid.**.

20. Engstrom HR, Laurin K, Kay NR, Human LJ. Socioeconomic Status and Meta-Perceptions: How Markers of Culture and Rank Predict Beliefs About How Others See Us. Pers Soc Psychol Bull. (2024) 50(9):1386-1407. doi: 10.1177/01461672231171435. Epub 2023 May 22. PMID: 37212389; PMCID: PMC11318217.

21. Tuczyńska M, Staszewski R, Matthews-Kozanecka M, Baum E. Impact of Socioeconomic Status on the Perception of Accessibility to and Quality of Healthcare Services during the COVID-19 Pandemic among Poles—Pilot Study. *Int. J. Environ. Res. Public Health* (2022) *19,* 5734. **Error! Hyperlink reference not valid.**.