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Original Research

Evaluation of Orthodontic Patients' Pain Experience, Perception and Management of Pain from Orthodontics Centres in Lagos, Nigeria.

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Abstract

Background: Pain has been reported as a common unpleasant experience or complication following orthodontic treatment. Despite this, the routine management of the pain remains controversial and inconsistent. This study aimed to evaluate the orthodontic patients' pain experience following orthodontic appliance installation, orthodontic pain assessment, the pain management protocol received, and the perceived possible effect of orthodontic pain on daily activities.

Methodology: This was a 12-month cross-sectional study involving orthodontic patients. A structured questionnaire was used for data collection via Google Forms. Three different sections evaluated participants' sociodemographic variables, the patient's pain experience and management of that pain, orthodontic pain perception, possible effects of orthodontic pain and the need for development of a standardized pain management protocol. Statistical analysis was performed using SPSS Version 26, IBM Corp, with significance set at P-value < 0.05.

Results: A total of 347 orthodontic patients were recruited into the study. Approximately 90% of orthodontic patients experienced pain following orthodontic appliance installation (5.59 ± 2.78), with pain medication prescribed after the onset of pain (25.9%). Pain was mostly described as distressing (47.6%) and lasting for 1 to 6 days (75.8%). There was no significant age or gender variation in pain experience. Paracetamol was the most prescribed pain control option (69%). Difficulty with feeding and brushing was the most affected daily activity. Respondents agreed on the need for a standardised pain control protocol (72.9%).

Conclusion: Orthodontic pain is an established complication following orthodontic treatment, with variation in treatment duration and intensity. It can adversely affect patients' ability to carry out daily activities, consequently affecting treatment outcomes. Efforts should therefore be made to develop a pain management protocol for holistic patient care.

Keywords: Orthodontic Pain; Orthodontics, Fixed Appliances, Orthodontists, Patients, Orthodontic Treatment.

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Introduction

Malocclusion has been shown to have negative physical, social, and psychological effects on an individual's quality of life [1,2]. An increasing awareness of orthodontics in recent times has shown more individuals seeking orthodontic care to improve facial aesthetics and function, amongst other reasons [3]. Pain has been reported as a common unpleasant experience/complication following orthodontic treatment among others [4]. Contemporary orthodontics seeks to provide more comfortable and aesthetic treatment options for the management of malocclusion [5]. Despite these efforts, pain has been reported following almost all types of orthodontic treatment options including removable appliances, aligners, as well as fixed orthodontic appliances [6,8]. The exact mechanism associated with the occurrence of orthodontic pain remains unclear [9]. However, the most accepted theory attributes orthodontic pain to the exertion of orthodontic force with resultant compression of blood vessels within the periodontal ligament space, causing transient ischemia, stimulating an inflammatory response, edema and periodontal pain [9].

The pain experienced following orthodontic treatment may vary from mild discomfort to pain and is usually described by patients as feelings of pressure, tension, soreness of the teeth, or pain [10].It has been reported following different orthodontic procedures ranging from fixed appliance set up or installation, separator placement, band cementation, arch expansion, arch wire change and even removable appliance activation [10,11]. This pain experience usually starts about 4 hours after the procedure and spans as long as one week, possibly affecting the patient's quality of life [6], with approximately 90% of orthodontic patients experiencing pain on the first day of orthodontic treatment [10,11]. The pain experience can be significant enough to negatively influence patient cooperation during the treatment (treatment) period [6,7]. The pain experience has been associated with discontinuation of orthodontic treatment in some cases [12,14].

Various factors have been associated with orthodontic pain. They include but are not limited to the patient's age, gender, type of appliance used, previous pain experience, and amount of orthodontic force applied [12,15,18,19].

Previous literature has investigated the efficacy of several pain management modalities [12-17]. These include the use of pharmacological and non-pharmacological methods [13,15-17]. Some commonly investigated include the use of paracetamol, Non-Steroidal Anti-Inflammatory Drugs (NSAIDs), sugarless chewing gums, bite wafers, behavioural management and more recently vibration and low-level lasers [15,16].

Despite this, the routine management of the pain/discomfort by the orthodontists remains controversial and inconsistent. This may stem from possible underreporting of pain by the patients, orthodontists' underrating the pain experience or lack of scientific evidence supporting a particular pain protocol.

The aim of this study, therefore, is to evaluate the orthodontic patients' pain experience following orthodontic appliance installation, the pain management protocol received, and the possible effect of pain on daily activities.

Methodology

This was an unblinded, cross-sectional descriptive study conducted over a 12-month period at Lagos University Teaching Hospital and a private orthodontic clinic in Lagos, Nigeria. Ethical approval was obtained from the Institutional Review Board of Lagos University Teaching Hospital prior to commencement. The study population comprised patients commencing fixed orthodontic treatment at either of the two sites. A purposive sampling technique was used, with all patients who met the inclusion criteria and provided informed consent during the study period being enrolled.

The study instrument (a structured questionnaire) was developed by the research team and pretested among 40 patients (20 from each centre) to assess clarity and reliability. Data from the pretest were not included in the main study. The questionnaire assessed sociodemographic variables, the patient's pain experience, and the management of the pain. Questionnaires were administered at the orthodontic appointment following appliance installation, no later than six weeks post-installation.

Self-administered, structured multiple-choice questionnaires were used as the data collection tool. They were distributed to consenting participants through an online data collection platform (Google Forms). The questionnaire (Appendix 1) was divided into 3 sections.

Section 1: Participants' socio-demographics and treatment characteristics

Section 2: Participants' pain experience, effect on daily and management of pain during their (removable and fixed) orthodontic appliance installation and follow-up.

The visual analogue scale (0-10 VAS) was used to assess the patient's pain experience. '0' signified no pain, 1-3 rated the pain as mild, 4-6 was categorized as moderate pain, 7 to 9 was termed severe, and 10 was considered worse or unbearable.

Section 3: Participants' pain management.

Statistical analysis

Statistical analysis was carried out using the Statistical Package for Social Sciences, SPSS version 26.0 (IBM SPSS Inc., Chicago Illinois). Data was subjected to simple descriptive statistical analysis (means and standard deviation or median and inter-quartile range), and results were presented in frequency tables and charts. Comparisons between groups were carried out using the chi-square for categorical variables, and the level of significance was set at 0.05.

Results

The questionnaires had good reliability according to Cronbach's Alpha coefficient (0.79). A total of 347 orthodontic patients were recruited into the study. The mean age of the patients was 23.95 years, with a standard deviation of 10.85 years and a range of 7 to 66 years.

Table 1: Socio-demographic Characteristics of Orthodontic Patients

Characteristic	**N = 347**[1]
Age at last birthday (in years) | M±SD (Range)	23.95 ± 10.85 (7 - 66)
Age Category	
Children (< 12)	34.0 (9.8%)
Adolescent (13 - 19)	119.0 (34.3%)
Young Adult (20 - 39)	159.0 (45.8%)
Middle Aged Adult (40 - 59)	33.0 (9.5%)
Old Adult (60+)	2.0 (0.6%)
Sex	
Male	101.0 (29.1%)
Female	246.0 (70.9%)

Characteristic	**N = 347**[1]
Hospital setting	
Government-owned clinic	179.0 (51.6%)
Private clinic	168.0 (48.4%)

[1]Mean ± SD; n (%)

The patient cohort exhibited a diversified age distribution, with young adults being the majority age group (45.8%) and older adults being the minority fraction (0.6%). Gender distribution showed a male-to-female ratio of 1:2.4 with males and females accounting for 29.1% and 70.9% of the study population, respectively [Table 1].

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The assessment of the pain experience following orthodontic appliance installation showed that most of the patients responding in the affirmative. Approximately 90% of them reported pain experience with a Visual analogue scale mean score of 5.59 ± 2.78. The pain description was as follows in descending order: uncomfortable (47.6%), mild (18.4%), distressing (16.7%), very severe (5.2%) and unbearable (2%). The pain duration varied, with a majority (45%) reporting a pain duration of 1 to 3 days. Thirty-eight per cent (30.8%) reported that the pain duration was 4-6 days, and 14.1% reported a pain duration of greater than 6 days [Table 2].

Table 3: Orthodontic Patients' Pain Management Experience

Characteristic	**N = 347**
Informed about the possibility of Pain by the Orthodontist	289.0 (83.3%)
Yes	31.0 (8.9%)
No	27.0 (7.8%)
Not Sure	
Pain Relief Recommendation	245.0 (70.6%)
Pain Relief Recommendation Timing (n = 245)	
After the pain started	90.0 (25.9%)
Before the pain started	145.0 (41.8%)
Pain Relief Option Recommended	
Pain Killers	178 (51.3%)
Warm Saltwater Mouth Rinse	10 (2.8%)
Cold Drinks/Foods	5 (1.4%)
Chewing Gum	6 (1.6%)
Others	15 (4.3%)
Specific Painkiller prescriptions received	
Diclofenac	17 (4.9%)
Ibuprofen	50 (14.4%)
Paracetamol	173 (49.0%)
Action Taken for Pain Relief in the Absence of Orthodontist Recommendation (n = 102)	
Yes	35.0 (10.1%)
No	67.0 (19.3%)
Specific Remedies Used	
Chewed Gum	**2 (0.6%)**
Took Antibiotics	1 (0.3%)
Took a Pain Relief Tablet	28 (8.1%)
Used Sensodyne	1 (0.3%)
Used an Ice Pack for Pain Relief	5 (1.4%)
Used Wax for Pain Relief	1 (0.3%)
Nothing Done for Pain Relief	70 (20%)
Opinion on Orthodontic Pain Management Protocol	
Yes	253.0 (72.9%)
No	31.0 (8.9%)
I don't know	63.0 (18.2%)

An evaluation of the pain management of these patients showed most of the patient respondents (83.3%) affirming that they were pre-informed of possible pain experiences at appliance installation [Table 3]. Pain relief management was recommended to only 70.6% of respondents, with approximately 42% reporting that it was recommended after the onset of pain. Analgesics were the commonest pain relief option prescribed to alleviate post-orthodontic treatment pain (51.3%), with paracetamol being the most frequently prescribed (49%). Other relief options mentioned by the patients included warm water and salt, cold foods and drinks, and chewing gum, amongst others.

Some of the patient respondents who received no form of pain management reported taking pain relief remedies in the absence of an orthodontist's prescription (10.1%), while the remaining 19.3% did nothing. Some of the pain relief options adopted by the patients included the use of ice packs, wax, antibiotics and analgesics. Based on the patient's experiences, most of them reported the need for the development of a pain management protocol following the installation of fixed appliances [Table 3].

Table 4: Perceived effect on orthodontic activities from patients

Effect of Pain on Activities	Not at all	A little bit	Moderately	Quite	Extremely
Activities					
Brushing	61.0 (17.6%)	90.0 (25.9%)	94.0 (27.1%)	61.0 (17.6%)	41.0 (11.8%)
Eating/Chewing	26.0 (7.5%)	63.0 (18.2%)	94.0 (27.1%)	61.0 (17.6%)	103.0 (29.7%)
Mental Efficiency	167.0 (48.1%)	70.0 (20.2%)	61.0 (17.6%)	31.0 (8.9%)	18.0 (5.2%)
Performing Household Chores	162.0 (46.7%)	85.0 (24.5%)	64.0 (18.4%)	25.0 (7.2%)	11.0 (3.2%)
Physical Activities	153.0 (44.1%)	89.0 (25.6%)	55.0 (15.9%)	33.0 (9.5%)	17.0 (4.9%)
Physical Exercise	156.0 (45.0%)	90.0 (25.9%)	53.0 (15.3%)	36.0 (10.4%)	12.0 (3.5%)
Recreation and Hobbies	137.0 (39.5%)	99.0 (28.5%)	64.0 (18.4%)	35.0 (10.1%)	12.0 (3.5%)
Sleep	104.0 (30.0%)	97.0 (28.0%)	78.0 (22.5%)	41.0 (11.8%)	27.0 (7.8%)
Smiling	113.0 (32.6%)	96.0 (27.7%)	74.0 (21.3%)	34.0 (9.8%)	30.0 (8.6%)
Socialising with Friends	106.0 (30.5%)	112.0 (32.3%)	74.0 (21.3%)	35.0 (10.1%)	20.0 (5.8%)
Talking	57.0 (16.4%)	96.0 (27.7%)	99.0 (28.5%)	50.0 (14.4%)	45.0 (13.0%)
Work	150.0 (43.2%)	82.0 (23.6%)	65.0 (18.7%)	36.0 (10.4%)	14.0 (4.0%)
Yard Work or Shopping	189.0 (54.5%)	67.0 (19.3%)	57.0 (16.4%)	22.0 (6.3%)	12.0 (3.5%)

A set of questions which evaluated the perceived effect of orthodontic pain on routine activities showed a positive affectation on patients, with the most frequently affected activity being the ability to eat (92.5%). More than 70% of the respondents reported moderate to extreme effects of their ability to eat. Some of the other activities which were affected by orthodontic pain as reported by the patients included the ability to talk, brush, sleep and mental efficiency [Table 4].

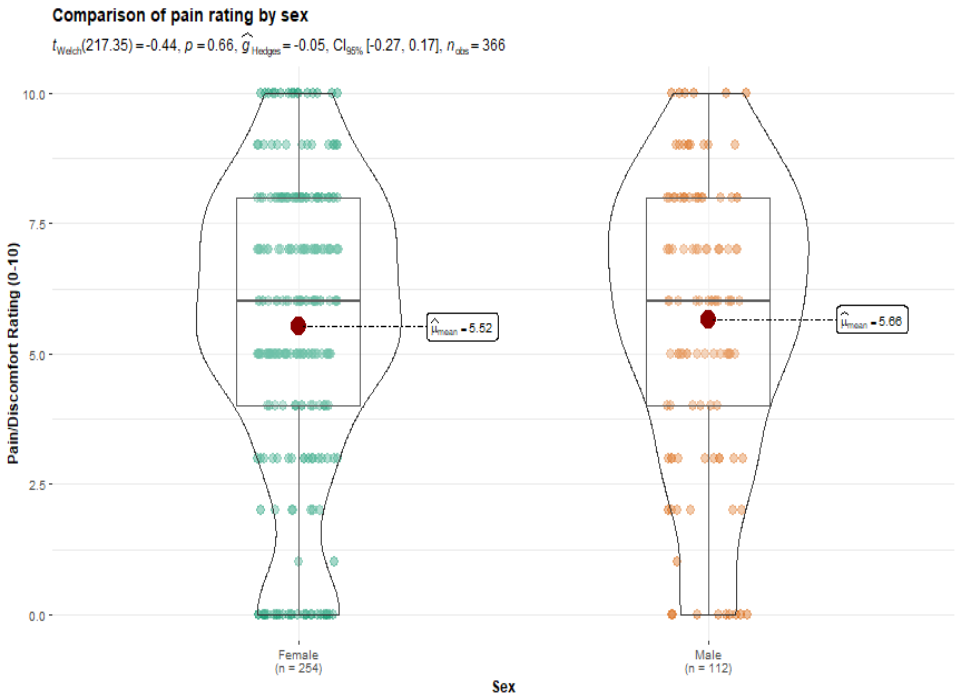

Figure 1: Orthodontic Pain Rating across gender

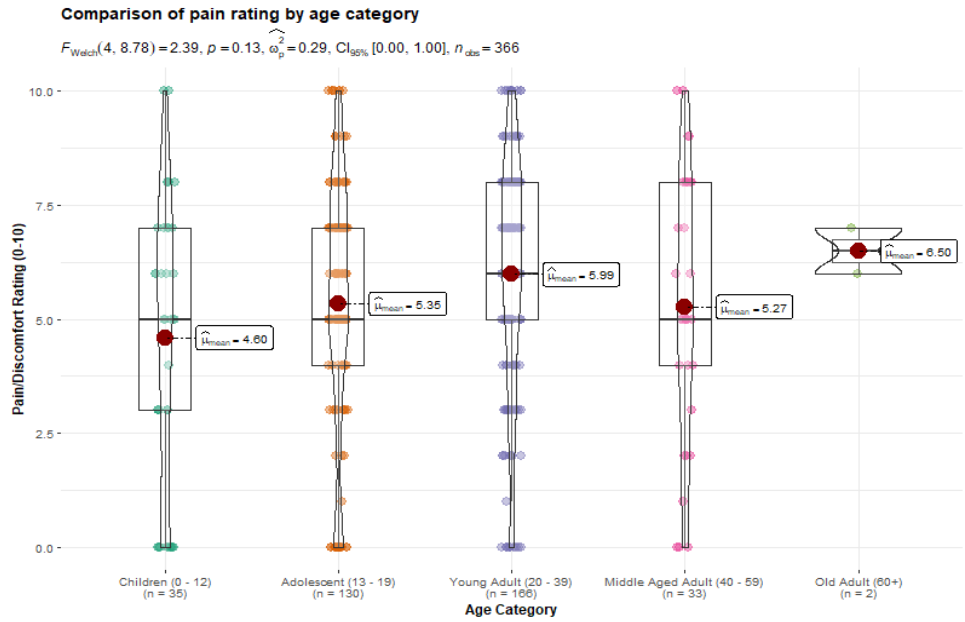

Figure 2: Orthodontic Pain Ratings Across Age Category

Statistical evaluation was carried out to determine the effect of age and gender on reported pain experience [Figures 1 and 2]. Results revealed that there were no notable effects of these variables and reported pain experience.

Discussion

This study evaluated the orthodontic pain experience and management of patients, as well as the perceived effect of orthodontic treatment on their routine activities. This study aimed to give an insight into the pain experience of orthodontic patients following orthodontic appliance installation and how it affects their daily activities. These findings from this study will add to the body of existing knowledge

and help inform clinicians' decisions on orthodontic pain management with emphasis on evidence-based orthodontic practice. Management of orthodontic pain has become important as pain has been reported as a reason why some individuals are hesitant to commence orthodontic treatment and accounts for the discontinuation of treatment by some patients [18].

The orthodontic patients' sociodemographic characteristics in the current study were comparable with previous studies, with a higher female predominance [2,3,17,18]. This may be adduced to the fact that females are more self-aware and willing to take active measures to improve their appearance, hence usually form the majority of the orthodontic population [3].

This study observed an orthodontic pain prevalence of approximately 90% among orthodontic patients with a mean VAS score of 5.59 (moderate pain), with pain lasting between 1 and 6 days. The reported pain experience following orthodontic treatment is consistent with previous studies albeit to different degrees [6,7,11-15], with all studies reporting pain in a majority of patients post-orthodontic appliance installation. A study by Banerjee et al. [11]. reported a higher pain prevalence of 95% among adolescents undergoing fixed orthodontic appliance therapy after the onset of treatment. Although comparable, the slight variation in pain experience obtained in the different studies may be attributed to sociodemographic variation as well as clinical factors [11].

The responses from the orthodontic patients on pain management following appliance installation revealed that most of them affirmed that they were notified of the possibility of experiencing pain following orthodontic treatment. An evaluation of the administration of pain control measures and timing showed that pain management was recommended to approximately 42% of the patients prior to pain onset and to 25.9% only after the onset of pain. (Table 3). A minority of the patients received no form of pain alleviation and resorted to self-care; with the potential risks associated with self-medication. Noteworthy is the fact that orthodontic pain affects the quality of life of patients and treatment cooperation; effective communication is mandatory as part of patient management [19]. Prevention or effective pain management will therefore increase patient quality of life and improve patient cooperation during treatment [19].

Several studies have evaluated pharmacological and non-pharmacological pain management protocols with conflicting results [20-27]. In the current study, most patients reported that the pharmacological method was predominantly used, with paracetamol being the most commonly prescribed analgesic. The use of paracetamol as the preferred medication for orthodontic pain is consistent with previous studies [11,18]. This is at variance with scientific evidence, which recommends non-steroidal anti-inflammatory drugs as the preferred drug of choice for orthodontic pain control due to their mechanism of action by inhibiting the COX enzyme [19,24-26]. The possible side effects of NSAIDS in causing gastric irritation, as well as possibly slowing down tooth movement, may be responsible for the clinicians' reluctance to prescribe it [19].

Most respondents in this study agreed on the negative effect of orthodontic pain on their daily activities, with the effect on eating being most predominant, followed by difficulty with brushing [Tables 4]. This finding is consistent with reports from previous studies [1,5]. A majority of patients who seek orthodontic treatment are adolescents [2]. Any activity which hinders adequate feeding may hinder nutrition, hence affecting adequate growth and development [19]. This is noteworthy as pain has also been reported with wire change and elastic chain activation amongst other orthodontic treatments [4-10]. This means that pain experience may continue to occur during orthodontic treatment, which spans 2-3 years. Due to the prolonged duration of orthodontic treatment and possible pain experiences during this period, there may be a need to consider non-pharmacological pain management options to avoid the possible negative effects of pharmacological pain management. Orthodontic pain affectation on brushing could encourage debris retention, poor oral hygiene, and gingival inflammation and the occurrence of white spot lesions [28]. The high prevalence of orthodontic pain and the adverse effects of daily activities, as observed by

the respondents in the current study, may therefore be responsible for their perceived need for the development of a pain management protocol, thus highlighting the burden of orthodontic pain and the need for its effective management.

The absence of variation in pain experience between genders and age in the current study is at variance with previous reports [29-32], which reported females experiencing more pain, attributing it to the female sex hormones [32,33]and the younger patients due to psychological development occurring at adolescence [34].

The study is limited in part by the fact that pain was assessed only by the patient's subjective opinion, with no concurrent clinical assessment. The fact that some of them were pre-informed of the possibility of pain after appliance installation may affect their responses; however, this was inevitable in the current study, as it also aimed to assess their orthodontists' routine management of orthodontic pain. The current study, however, highlighted the presence of pain as a major complication following orthodontic treatment as reported by patients, its negative effects, the inconsistencies in pain management and the need for a pain management protocol, with possible attention on efficient non-pharmacological options due to the prolonged nature of orthodontic treatment.

Conclusions

Pain is a major complication following orthodontic treatment, with no significant gender or age variation. It is usually moderate in intensity, lasting one to six days, affecting eating and brushing in most respondents. Approximately one-third of the patients didn't receive any pain control medication despite being informed of the post-orthodontic pain. Paracetamol was the most commonly used pain control measure. Respondents, however, agreed that a pain management protocol was necessary in orthodontic patient care.

Recommendations

Pain management should be considered an integral component of orthodontic care and planned from the outset of treatment. Given the prolonged nature of orthodontic therapy, the use of non-pharmacological methods of pain control should also be encouraged. Furthermore, there is a need for the development of a standardised pain control protocol, grounded in evidence-based orthodontic practice.

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