

Socio-Analyzing the Advancement in Pain Management of Dental Procedure

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Abstract

Background: The management of pain is one of the major aspects of dentistry and it directly affects patient adherence, treatment results and patient satisfaction. Although there have been great improvements in the methods of anaesthetics and minimally invasive operations, socio-demographic and psychological factors are still affecting the perception of pain, especially in developing areas.

Methods: The proposed study is an observational study that was planned to be undertaken at Sri Krishna Medical College & Hospital, Muzaffarpur, between July 2023 and August 2025. A total number of 98 patients were included in the study who were undergoing different dental procedures. The perception of pain was assessed with the help of the Visual Analog Scale (VAS), whereas the assessment of anxiety and socio-demographic data was performed with the help of a structured questionnaire. SPSS were used to statistically analyze the data with a p-value of 0.05.

Results: The average score of pain was 3.2 ± 1.4, which showed that the pain was mild to moderate. The pain scores (2.6 ± 1.1) of patients undergoing advanced techniques of pain management were significantly lower than those undergoing conventional ones (4.1 ± 1.5) (p < 0.05). The correlation existing between anxiety levels and pain perception was found to be positive and strong (r = 0.62). Moreover, patients with higher educational achieved lower pain rates and increased acceptance of the modern techniques.

Conclusion: The use of dental pain management has made a substantial difference in improving pain during a particular procedure, yet socio-demographic and psychological variables are still considered to be the most important determinants of pain perception. The combination of modern techniques, patient education and anxiety management can improve clinical outcomes.

Keywords: Dental pain treatment, Visual Analog Scale (VAS), Dental anxiety, Socio-demographic factors, Local anaesthesia.

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Introduction

Management of pain is one of the key elements of good dental practice, which directly determines the level of patient comfort, cooperation, and general outcome of treatment [1]. Dental treatment is considered a cause of fear and anxiety and this has been contributed by the expected pain which may result in late seeking of treatment as well as poor oral health conditions [2].

Proper pain management will not only provide a positive clinical experience, but also increase

patient trust and compliance, thus improving oral healthcare outcomes in the long term [3]. This has made pain control an effective component of the contemporary dental practice. The management of pain in dentistry has greatly evolved over the years [4]. The old techniques largely depended on simple local anaesthetics like lidocaine and simple analgesics, which, although useful, were usually limited concerning the time of onset, duration, and comfort to the patient [5].

Modern techniques have changed using improved methods through the use of computer-controlled local anaesthetic delivery systems, better topical anaesthetics, laser-assisted procedures, and sedation techniques with advancements in technology and pharmacology [6]. The innovations have helped a lot to minimize procedural discomfort and have also helped in a more patient-centered approach to dental care [7]. Nevertheless, the perception of pain is not predetermined by the physiological factors only, but it also depends on different socio-demographic factors. Education level, income status, and awareness of dental procedures are some of the factors that are important in determining patient expectations and reaction to pain [8,9]. The perception of fear and dental anxiety are psychological factors that may enhance the perception of pain, despite the application of modern methods of pain control [10]. Less educated patients with lower socio-economic status tend to have more anxiety and less acceptance towards modern dental procedures [11,12]. There are various gaps in the successful execution of advanced pain management techniques in developing parts of the world, such as in Bihar, India. Poor access to the current dental technologies, patient education, financial factors and cultural beliefs about dental interventions have remained the barriers towards optimal pain management. These difficulties lead to the conclusion that a socio-analytical method of perceiving pain in dentistry is necessary.

Objectives

- To determine the efficiency of current methods of pain management.
- To determine patient perception and anxiety of dental procedures.
- To identify socio-demographic correlates of experience of pain.

Materials and Methods

Study Design: The proposed study was a prospective observational clinical study that was to test the progress in pain management during dental procedures and its correlation with socio-demographic variables. The study was observational, which enabled evaluation of actual clinical practice without intervention bias.

Study Setting: The research was done at Sri Krishna Medical College & Hospital in Muzaffarpur in Bihar which is a tertiary care teaching hospital that serves a large number of patients of both urban and rural origins.

Study Duration: The process was conducted in two years, from July 2023 to August 2025, which is sufficient time to conduct the research, recruit the patients, collect data and analyze it.

Sample Size: The patients used in the study were 98 patients undergoing different routine dental procedures. The study sample was chosen according to the patient availability and eligibility criteria at the time of the study.

Inclusion Criteria: The patients were eligible to take part in the research based on the following criteria: participants either had to be at least 18 years old and had received extractions, fillings, or root canal procedures as part of an ordinary dental treatment, and finally, had to issue an informed consent to participate in the research.

Exclusion Criteria: Patients having severe systemic disease, allergies to local anaesthetic drugs, and psychiatric diseases that might affect the perception and reporting of pain were excluded from the study to ensure the accuracy and reliability of data.

Data Collection: The structured questionnaire was used to collect data through the use of a questionnaire for each of the participants. The intensity of pain was recorded on the Visual Analog Scale (VAS) which gives a subjective measure of pain. The levels of anxiety were measured to measure psychological impact on pain perception. Also, the socio-demographic information (age, gender, educational status, and income level) was recorded to examine how they are correlated with pain experience.

Interventions Studied: The research compared the most commonly used methods of pain management in dental practice, such as local anaesthesia, topical anaesthetic agents and some cases, more sophisticated techniques, which may be an improved delivery system or a minimally invasive one.

Statistical Analysis: Statistical programs were used in data analysis, including SPSS. The data was summarized using descriptive statistics, such as mean and standard deviation. Chi-square test was used as an inferential statistical test to determine relationships between categorical variables, and correlation analysis was also used to determine relationships between anxiety, socio-demographic variables, and the perception of pain. The p-value of below 0.05 was regarded as statistically significant.

Results

The study involved 98 patients who were undergoing different dental procedures. The factors of demographic features, perception of pain, the effectiveness of pain management methods, and the impact of anxiety and socio-demographic factors were analyzed.

Demographic Distribution: The sample of the patients in the study was varied in terms of age,

gender and socio-economic backgrounds. Most of the participants had an age range of between 21-40

years with a slight majority of males than females.

Table 1: Demographic Characteristics of Study Participants

Variable	Category	Frequency (n)	Percentage (%)
Age Group	18–20 years	12	12.2
	21–40 years	46	46.9
	41–60 years	28	28.6
	>60 years	12	12.2
Gender	Male	54	55.1
	Female	44	44.9
Education	Primary	20	20.4
	Secondary	38	38.8
	Graduate & above	40	40.8
Income Level	Low	42	42.9
	Middle	36	36.7
	High	20	20.4

Pain Perception across Procedures: Presence of pain was assessed using the VAS. The vast majority of patients had mild to moderate pain and a smaller number reported severe discomfort.

Table 2: Distribution of Pain Scores (VAS Scale)

Pain Level	VAS Score Range	Frequency (n)	Percentage (%)
Mild	0–3	38	38.8
Moderate	4–6	44	44.9
Severe	7–10	16	16.3

The observers reported the mean pain score of 3.2 ± 1.4 , indicating that the endoscopic procedures.

Effectiveness of Pain Management Techniques: Patients who received advanced pain management techniques experienced lower levels of pain than those who were treated according to conventional methods.

Table 3: Pain Scores by Type of Pain Management Technique

Technique Used	Mean VAS Score	Standard Deviation
Conventional (Local Anesthesia)	4.1	1.5
Topical + Local Anesthesia	3.3	1.2
Advanced Techniques	2.6	1.1

There is a statistically significant difference between the techniques ($p < 0.05$), which displays more efficacy of advanced methods.

Anxiety and Pain Correlation: Patients who reported higher levels of anxiety also experienced pain differently.

Table 4: Correlation between Anxiety Level and Pain Score

Variable	Correlation Coefficient (r)	Significance (p-value)
Anxiety vs Pain Score	0.62	<0.05

Patients with greater levels of anxiety consistently had worse pain scores.

Socio-Demographic Influence on Pain Perception: Pain perception and acceptance of modern dental techniques were all influenced by education and income levels.

Table 5: Pain Perception by Education Level

Education Level	Mean VAS Score	Standard Deviation
Primary	4.5	1.6
Secondary	3.4	1.3
Graduate & Above	2.8	1.1

Patients with higher educational status showed poor pain perception and adaptation to advanced pain management techniques.

Summary of Findings

- More than half of the patients reported mild to moderate pain
- Pain levels dropped dramatically with advanced techniques
- Anxiety strongly influenced pain perception

- Patient experience was driven by socio-demographic factors, and most importantly education and income

Discussion

Effectiveness of Modern Pain Management Techniques:

The results of the current study prove that the improvement of dental pain management methods has helped to decrease the degree of pain that patients feel during the procedure considerably. Patients who were subjected to modern interventions such as better delivery systems of anaesthetics and adjunctive topical agents recorded low scores of pains unlike those who were treated with conventional interventions. This is due to the increased accuracy, speed of action and better effectiveness of more recent anaesthetic methods that reduce tissue damage and maximize delivery of drugs. This has been demonstrated in other reports that show that the use of advanced technology like computer-controlled anaesthesia and minimally invasive surgeries has helped in providing better patient comfort and less pain during the procedure.

Influence of Education and Awareness: The socio-demographic variables especially education and awareness were also important determinants of patient perception of pain. The current research found that patients who had higher educational levels had better pain tolerance and accepted modern dental procedures. The educated people will have a better chance of being aware of what dental treatments involve and this will eliminate doubt and fear. Better knowledge also fosters confidence in dental practitioners and the contemporary methods, and thus, impacts positively on the outcome of treatment. These results are similar to previous studies that indicate that health literacy plays a significant role in influencing the attitude of the patient, compliance, and perceived pain during clinical operations.

Cultural Fear and Dental Anxiety: The cultural beliefs and fear of dental procedures are major obstacles in managing the pain especially in the developing regions. In the present research, more anxious patients experienced more pain perception, irrespective of the method of application. This helps to reinforce the well-known idea that dental phobia can enhance pain using psychological processes. The wrong belief that dental procedures are always painful is still prevalent in most societies like in Bihar region where people will be seeking dental care and instead become fearful. This type of cultural conditioning leads to avoidance and sensitivity to pain in a cycle emphasizing the need for patient education and counselling is necessary.

Psychological vs Physiological Pain: The fact that psychological and physiological elements of pain interact is an important point noted in this study. Although physiological pain is directly connected to tissue damage and nociceptive information, the psychological aspects of anxiety, fear, and previous experiences also play a major role in influencing the perception of pain. The fact that the level of anxiety is positively correlated with the level of pain in this study supports the idea that psychological distress may increase the subjective perception of pain. Thus, efficient management of pain must not be limited to the pharmacological approach but must also include the methods of anxiety reduction in the patient, like behavioural instructions and communication.

Comparison with Existing Literature and Deviations:

Even though the results of this research correlate with most of the available literature, some deviations were noted. Other studies that were carried out in very developed environments show even worse pain scores, which is probably because of more access to advanced technologies and increased patient awareness [13]. On the contrary, the comparatively high pain perception case in this study could be affected by socio-economic limitations, exposure to minimal modern dental care, and cultural conditions that were widespread among the study subjects [14]. Also, differences in personal pain thresholds and subjective reporting can also lead to differences in studies. These inconsistencies highlight the significance of the consideration of regional and socio-cultural contexts in the assessment of the outcomes of pain management [15].

Conclusion

However, in the recent era with the development of many techniques for pain management during dental procedures, patient comfort has been revolutionized. The modern approaches were more effective in relieving pain than the conventional methods. Despite being dominated by socio-demographic variables that correlate with education, awareness and anxiety levels have been shown to play an important role in pain perception.

Patients with better awareness exhibited improved tolerance and acceptance of dental treatments. This highlights the need for technological advances in conjunction with socio-psychological approaches to be integrated into effective pain management strategies aimed at improving clinical outcomes and patient experience.

Recommendations: The dental procedures often cause fear in patients; therefore, important recommendations that are concluded based on the results of this study are strengthening patient educational programs. Broadening the use of

advanced pain management practices, particularly in rural and underserved communities, is essential. Moreover, dentists must be trained in how to deal with the psychological factors of pain, anxiety and fear. They should guarantee the proliferation of modern dental services at different socio-economic levels, making such care available to everyone and consequently enhancing oral health delivery.

Limitations: This study has certain limitations such as a relatively small sample size (98 patients) and being performed in one clinical setting, which may restrict generalizability. Moreover, pain perception was assessed using subjective self-reported scales which can lead to response bias in individual pain assessment and variability in the population.

Future Scope: Future large multi-center studies should be done to increase generalizability of the findings across different populations. Pediatric patients were not included understanding pain perception in younger populations could provide important insights about the age-related nature of this phenomenon. Artificial intelligence can provide novel solutions for pain prediction and management. Additionally, the long-term outcomes of advanced pain management techniques and their sustained impact on patient experience should be evaluated in longitudinal studies.

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