

## Role of Sleep and Pain Control in Endodontic Therapy

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### ABSTRACT

**Aim:** To discover and relate the role of sleep with pain perception in patients undergoing endodontic therapy.

**Study design:** The study was quantitative correlational design in nature.

**Place and duration of study:** Department of Operative Dentistry, Dental section Islam Dental College, Sialkot. Duration of study was two years 2019-2020

**Methods:** Five hundred patients were included in the study, which were scheduled for endodontic therapy.

**Results:** Five hundred patients were included in the study. The correlation between sleep and pain during endodontic therapy was  $-0.039$  which was found non-significant. 250 cases have mild pain (50%), 158 cases (31.6%) have moderate pain, 92 cases (18.4%) have severe pain. Sleep deprived cases in the study were 264 (52.8%), while cases who were practicing good sleeping habits were 236 (47.25%).

**Conclusion:** There exists a statistically significant relationship between perception of pain during endodontic therapy and sleep. In order to improve the outcome of endodontic therapy dental professionals should educate their patients on the importance of good sleep hygiene along with dental hygiene.

**Keywords:** Sleep, pain, endodontic therapy.

### INTRODUCTION

Pain management during endodontic treatment is dependent upon a number of factors. Sleep is one of the factors that influence pain and its perception. When it comes to body homeostasis, both pain and sleep have significant importance<sup>1</sup>. In order to optimize body function and energy pain and sleep are the foundation factors<sup>2</sup>. Studies have proven that pain perception is increased in patients practicing less sleep hours.<sup>3</sup> Anxiety and phobia has direct relationship with painful procedures like endodontic therapy<sup>4,5</sup>.

Single episode of a painful experience becomes a bad experience throughout patient's life. Anxious and stressful patients have tendency to react badly during painful procedures. Therefore attempts should be made to reduce the factors that aggravate pain perception. A key factor responsible for increased pain perception is sleep deprivation among patients<sup>2,4</sup>.

In an attempt to improve the outcome of endodontic treatment identifying their sleep status and correlate possibility of pain during endodontic therapy will improve endodontic treatment outcome. A major determinant of sleep is the breathing style of the patient. Nasal breathers tend to have more undisturbed sleep as compared to the oral breathers who experience repeated arousal due to airway collapse during the sleep<sup>6,7</sup>. Life style modification and behavioral therapy has been proven helpful in positive treatment outcomes in stressful situations and procedures<sup>1,3,6</sup>.

Little evidence is available on the correlation of sleep and endodontic therapy, therefore in this study we will attempt to understand the correlation of pain intensity and patient's pain perception during endodontic therapy.

### MATERIAL AND METHODS

After getting approval from the ethical committee, 500 patients who presented in the department of Operative Dentistry for their endodontic needs were randomly selected. Age range of patients was between 10 to 70 years. Medically compromised, psychiatric patients and those on medication for their systemic diseases were excluded. Each patient was asked about the average sleep hours for the last one month. Inferior alveolar nerve block was administered for achieving pulpal anaesthesia, round bur was used in high speed hand piece with air-water spray, access opening was done, root canal orifices were identified and # 8, # 10, # 15 K-files were used for instrumentation of the root canals. Numeric pain scale was used, where no pain = 0, mild pain = 1-3, moderate pain = 4-6 and severe pain = 7-10, for documentation of patient's pain perception during endodontic treatment. Sleep was categorized as "sleep deprived" and "good sleep" groups, sleep deprived group cases included 4 to 6 hours of average night sleep, while good sleep group cases included 7-9 hours of night sleep.

### RESULTS

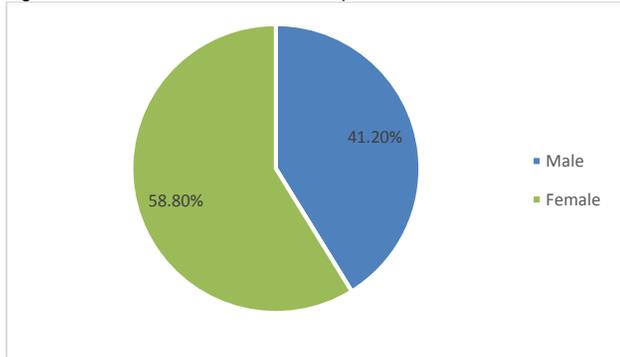
Out of 500 patients, 294 cases were females (58.8%), while 206 were males (41.20%). Sleep deprived cases in the study were 264 (52.8%), while cases who were practicing good sleeping habits were 236 (47.25%). 250

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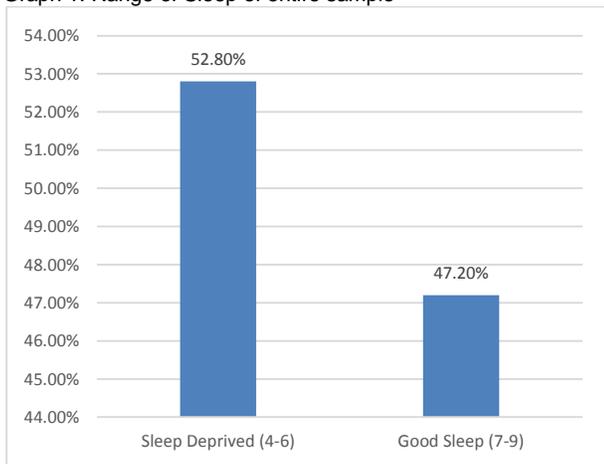
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cases have mild pain (50%), 158 cases (31.6%) have moderate pain, 92 cases (18.4%) have severe pain. The results of Pearson correlation showed non-significant association of level of sleep and pain ( $r=-0.39$ ,  $P=0.95$ ). The negative sign showed that level of sleep is inversely proportion to the pain perception during endodontic therapy.

Figure 1: Gender distribution of sample



Graph 1: Range of Sleep of entire sample



Graph 1: Sample distribution of level of Pain

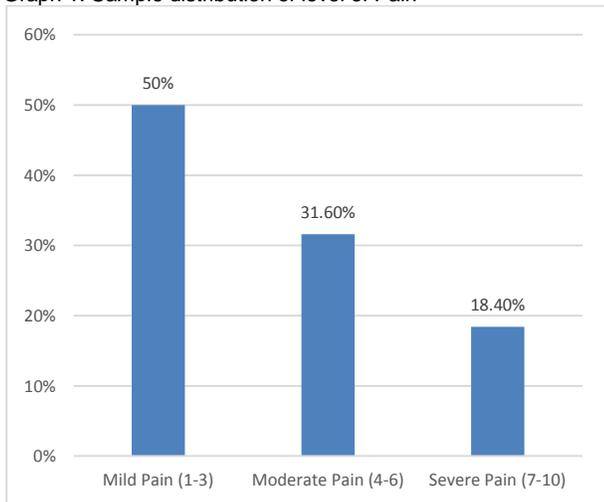


Table 1: Association of level of sleep with pain perception during endodontic therapy

| Variables      | Level of Pain | Level of Sleep |
|----------------|---------------|----------------|
| Level of Pain  | 1             | -.039          |
| Level of Sleep |               | 1              |

## DISCUSSION

Endodontic therapy is a complex and a multifactorial process. A strong correlation exists between pain and sleep. Principally the mechanism for hyperalgesia and distorted sleep is prevention of opioid analgesia<sup>8</sup>. Reduced affinity of M- and D- opioid receptors results in sleep deprivation patterns. Rapid eye movement sleep deprivation reduces the opioidergic analgesia produced by enkephalinase inhibitors and MAO-B substrates<sup>9,10</sup>.

Serotonergic activity plays a very important in the role of sleep and pain regulation that is regulated by MAO-B inhibitor deprenyl. Tryptophan reduction results in reduction of analgesic efficacy of morphine which effects the multiple neural pathways<sup>10,11,12</sup>. Nasal breathing with normal average sleeping hours cases have mild pain perception during painful procedures, like inferior alveolar nerve block<sup>6,7</sup>. Studies have proven that specific brain region plays critical role in sleep regulation as they do in pain regulation. Research has shown that sleep deprivation also contributes to chronic pain development<sup>13,14</sup>.

Sleep disturbances are responsible for up-setting the body metabolism and homeostasis<sup>15</sup>. State of mind and sleep are also interrelated. Emotional and mental health is deeply connected with sleep; it has also demonstrated links between anxiety, depression and other mental conditions. The scientific evidence to date provides bidirectional relationship, as dental pain can impact our sleep pattern and timing; conversely sleep can negatively and positively impact dental procedures like endodontic therapy. Therefore, the relationship of sleep and pain, if disturbed, promotes pain perception in patients in the long term.

There exists a strong correlation that those people who had adequate sleep showed much better state of mind before and during endodontic treatment<sup>17</sup>. It was also revealed that those who were well rested showed better efficacy of dental anesthesia. While those patients who were sleep deprived show more anxiety and pain perceptions when compared to those who were well rested. Both sleep and mental health are interrelated<sup>16</sup>. Hence adequate sleep will help improve pain control in patients<sup>3</sup>.

Therefore, within the limitations of our study we can suggest that improving the sleep and sleep-related factors can positively impact the quality of endodontic treatment outcome. Not just limiting our study to sleep, we would like to go a step further and try to find the correlation between other daily routine factors that may help in improving overall health of our patients. They include role of breathing, exercise and physical fitness and hydration. Small life style changes like nasal breathing, adequate body hydration, adequate sleep, balanced diet and exercise will improve the quality of life of patients directly and will also improve the endodontic treatment outcome of our patients.

## CONCLUSION

In our study the evidence shows that sleep deprivation aggravates pain sensitivity during endodontic treatment. Lack of sleep and repeated arousal triggers complex neurobiological consequences which enhances the effect of pain perception. Therefore pre-operative assessment of patient's life style can have positive impact on the intra-operative and post-operative dental care.

**Conflict of interest:** Nil

## REFERENCES

1. Finan PH, Goodin BR, Smith MT. The association of sleep and pain: an update and a path forward. *J Pain*. 2013;14(12):1539-1552. doi: 10.1016/j.jpain.2013.08.007
2. Cunningham JM, Blake C, Power CK, O'Keeffe D, Kelly V, Horan S, Spencer O, Fullen BM. The impact on sleep of a multidisciplinary cognitive behavioural pain management programme: a pilot study. *BMC Musculoskelet Disord*. 2011 Jan 10;12:5. doi: 10.1186/1471-2474-12-5. PMID: 21219600; PMCID: PMC3024274.
3. Finan PH, Goodin BR & Smith MT 2013 The association of sleep and pain: an update and a path forward. *Journal of Pain* 14 1539–1552. (doi:10.1016/j.jpain.2013.08.007)
4. Appukkuttan DP. Strategies to manage patients with dental anxiety and dental phobia: literature review. *Clin CosmetInvestig Dent*. 2016;8:35-50. Published 2016 Mar 10. doi:10.2147/CCIDE.S63626
5. Fotedar S, Bhardwaj V, Fotedar V. Dental anxiety levels and factors associated with it among patients attending a dental teaching institute in Himachal Pradesh. *SRM J Res Dent Sci* 2016;7:153-7
6. Suzuki M, Tanuma T (2020) The effect of nasal and oral breathing on airway collapsibility in patients with obstructive sleep apnea: Computational fluid dynamics analyses. *PLoS ONE* 15(4): e0231262
7. Russo MA, Santarelli DM, O'Rourke D. The physiological effects of slow breathing in the healthy human. *Breathe (Sheff)*. 2017;13(4):298-309. doi:10.1183/20734735.009817
8. Ukponmwan OE, Ruprecht J, Dzoljic MR. REM sleep deprivation decreases the antinociceptive property of enkephalinase- inhibition, morphine and cold-water-swim. *Gen Pharmacol* 1984;15:255–8.
9. Ukponmwan OE, Ruprecht J, Dzoljic MR. An analgesic effect of enkephalinase inhibition is modulated by monoamine oxidase-B and REM sleep deprivations. *Naunyn Schmiedebergs Arch Pharmacol* 1986;332:376–9.
10. Celada P, Artigas F. Monoamine oxidase inhibitors increase preferentially extracellular 5-hydroxytryptamine in the midbrain raphe nuclei. A brain microdialysis study in the awake rat. *Naunyn Schmiedebergs Arch Pharmacol* 1993;347:583–90.
11. Abbott FV, Etienne P, Franklin KB, Morgan MJ, Sewitch MJ, Young SN. Acute tryptophan depletion blocks morphine analgesia in the cold-pressor test in humans. *Psychopharmacology* 1992;108:60–6.
12. Basbaum AI, Fields HL. Endogenous pain control systems: brainstem spinal pathways and endorphin circuitry. *Annu Rev Neurosci* 1984;7:309–38.
13. Ohayon MM. Relationship between chronic painful condition and insomnia. *J Psychiatri Res* 2005;39:151–9.
14. Smith MT, Haythornthwaite JA. How do sleep disturbance and chronic pain inter-relate? Insights from longitudinal and cognitive-behavioral clinical trials literature. *Sleep Med Rev* 2004;8:119–32.
15. Roizenblatt S, Souza AL, Palombini L, Godoy LM, Tufik S & Bittencourt LR 2015 Musculoskeletal pain as a marker of health quality. Findings from the epidemiological sleep study among the adult population of São Paulo city. *PLoS ONE* 10 e0142726. (doi:10.1371/journal.pone.0142726)
16. Schrimpf M, Liegl G, Boeckle M, Leitner A, Geisler P & Pieh C 2015 The effect of sleep deprivation on pain perception in healthy subjects: a meta-analysis. *Sleep Medicine* 16 1313–1320. (doi:10.1016/j.sleep.2015.07.022)
17. Smith MT, Haythornthwaite JA. How do sleep disturbance and cognitive-behavioral clinical trials literature. *Sleep Med Rev* 2004;8:119–32