Original Article

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The Effect of Orthodontic Treatment with Fixed Appliances on Sleep Quality in the Patients Attended at the Department of Orthodontics BMU Using Pittsburgh Sleep Quality Index

Md. Manjur Alam[1*] Mohammed Kamal Uddin[2] Sumaya Siraj[3]
Ashraful Alam Khan[4] Masud Rana[5] Farzana Akhter Tania[6]

Abstract

Background: This study seeks to investigate the potential relationship between fixed orthodontic appliances and sleep quality using the Pittsburgh Sleep Quality Index (PSQI). By examining the impact of orthodontic appliances on sleep, this research aims to contribute to our understanding of how orthodontic treatment may affect sleep quality. To investigate the effect of fixed orthodontic appliance on sleep quality in the patients attended at the department of Orthodontics using Pittsburgh sleep quality index.

Materials and methods: This comparative cross-sectional study was carried out in the Department of Orthodontics. Patients who were taking fixed orthodontic treatment was enrolled in the study using simple random sampling method. Prior to the commencement of this study, ethical approval by the Institutional Review Board (IRB) of Bangladesh Medical University and Department of Orthodontic was taken. Descriptive statistics were calculated and one-samplet-test was used to compare PSQI global score. The cu-off point we used to determine poor sleep quality was >5. Comparison between males and females for PSQI was done using independent samples t-test. All of the statistical analyses were performed using specialized statistical software SPSS version 26(IBM SPSS Statistics for Mac, Version 26.0. Armonk, NY:IBM Corp.).

Results: One hundred and sixty participants were included in the final analysis (46.25% males and 53.75% females). Both males and females with orthodontic fixed appliances had poor sleep quality with (Mean = 6.80, SD = 1.38) for males and (Mean=7.28, SD=1.40) for females. Comparing males and females, we found that females scored higher than males in both subjective sleep quality and PSQI global score.

Conclusion: Individuals who has received fixed orthodontic appliance experienced decline in sleep quality. And female group showed poor sleep quality than male.

Key words: Fixed appliances; Orthodontic; Pittsburgh sleep quality index; Sleep quality.

1. Lecturer of Conservative Dentistry
Chittagong Medical College, Chattogram.
2. Associate Professor of Dentistry
Chittagong Medical College, Chattogram.
3. Lecturer, Dental Unit
Chittagong Medical College, Chattogram.
4. Dental Surgeon
OSD, DGHS.
5. Post Graduate Student of Orthodontics
Bangladesh Medical University, Dhaka.
6. Dental Surgeon, Madaripur.

***Correspondence: Dr. Md. Manjur Alam**
Cell : 01817 11 10 25
E-mail: manjur11025@gmail.com

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Introduction

One of the key essentials to have a balanced mental health is proper sleep. Lower sleep quality may lead some one tov arious issues, which not only provide an adverse impact on mental health but also become critical to individual's overall health & well-being.[1-2] Risk of premature baby birth, skinaging, declining cognitive performance, diabetes are some of the not able facts that are escalated due to poor sleep quality.[3-5]

Sleep quality and patterns can be obstructed for different vexatious cause like pain. The co-relationship between sleep and pain is reciprocal where one affects another. Orofacial pain is severe and agonizing in nature which has deleterious impacton sleep quality and results sleep disturbance.[6]

Orthodontic treatment is done mostly by fixed orthodontic appliance like orthodontic bracket, archwire, elastic, powerchain. It can produce pain and discomfort which is the common complains during active orthodontic treatment. Activation of fixed orthodontic appliance can cause pain which is worsen in the evening and at night, particularly during the first three days of activation and reaches it's pick at 24 hours o f post activation.[7-9]

Sleep disturbance is characterized by difficulties with sleep onset, sleep maintenance and poor sleep quality. For most adults, the amount of sleep needed for best heal this 7 to 8 hours each night. When one getsless sleep than that, it can eventually lead to many health problems. Reduced sleep duration and poor sleep quality can reduce

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painthres hold in subjects and mental capacity to cope with pain and viceversa.

Fixed orthodontic appliance like braces cause irritation and soreness to cheek, lips and tongue especially during first few days after placement. The bracket and the braces can put pressure on the teeth and gum, causing pain. The presence of bracesin the mouth can make it difficult for individuals to find acomfortable sleeping position.

Pittsburgh Sleep Quality Index (PSQI) is a tool that was evolved in1989.[10] It has seven components; each calculates one aspect of sleep quality with a total score named the global score. It asses the sleep quality of participants during the past month. Several studies have investigated the validity and reliability of PSQI. And showed consistent, reliable and valid with participants suffering from sleep problems having higher PSQI score.[11]

To our best knowledge and searching, no study on the effect of fixed orthodontic appliance on sleep quality has been found yet in Bangladesh. So, it is very important to carryout this study to investigate the association between pain caused by fixed orthodontic appliance and sleep quality using PSQI.

Materials and methods

The comparative cross sectional study comprised a sample of 160 participants who gave consent in written. The participants were selected using exclusion and inclusion criteria who were taking orthodontic treatment in the Department of Orthodontics, BMU from September 2022 to September 2023.

Inclusion criteria were:

- Healthy adults and adolescents.
- Undergoing orthodontic treatment with fixed appliances.

Exclusion criteria were:

- Individuals with chronic conditions that may alter sleep quality.

Sleep Quality Assessment

A Bangla version of PSQI was distributed in the waiting area in Orthodontic Department of BMU. The questionnaire was translated to the Bangla by Google translator and tested in population by a pilot study. The data was collected using a questionnaire that was completed by the patients taking fixed orthodontic treatment. PSQI is scored using seven components. The sum of scores of the seven components was calculated to find the global score. The range of total score is (0–21). As the score grows higher, sleep quality decreases. The cut-off point we used to determine poor sleep quality was >5.

Descriptive statistics were calculated and one-sample t-test was used to compare PSQI global score and the cut-off value of 5 as the value above which, participants are considered to be poor sleepers. Comparison between males and females for PSQI is done using independent samples t-test. p-value of ($p< 0.05$) was used as a cut-off point. The statistical software that was used was IBM SPSS version 26 statistical package (IBM SPSS Statistics for Mac, Version 26.0. Armonk, NY: IBM Corp.).

Results

Data from 160 participants were gathered usinga Bangla version of PSQI questionnaire which included demographic and orthodontic treatment data after applying eligibility criteria and excluding incomplete responses. The sample comprised equal number of male and female. The age distribution of participants was 13–18 year olds 61 (38.1%) and above the age of 18 years old were 99 (61.9%).

One-sample t-test showed that there is a statistically significant difference between PSQI global score and the cut-off value of 5 (Mean = 7.01, SD = 1.44, p = 0.001) (Table I).

The study also found that there is a statistically significant difference in PSQI global score and in subjective sleep quality between males and females (p = 0.049, p = 0.028) respectively, where females had poorer sleep quality group than males (Table II).

Table I Comparison between PSQI Global Score for all participants (n=160) males (n=76) and females (n=84) and the test value (5) using one-sample t-test.

Global PSQI score	n	Mean±SD	p-value	SEM	95% CI of the difference	
					Lower	Upper
All participants	160	7.01±1.44	<0.001*	0.114	6.79	7.23
Male	76	6.91±1.44	<0.001**	0.166	6.58	7.24
Female	84	7.11±1.43	<0.001***	0.157	6.79	7.42

p-value obtained by One-Sample t -test, $p<0.05$ considered as a level of significance***$p<0.001$. PQSI: Pittsburgh sleep quality index

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Table II Comparison of each component of PSQI and the global score between males (n=76) and females (n=84) using independent samples t-test.

Components	Male (n=76) Mean±SD	Female (n=84) Mean±SD	Mean difference	p-value	SEM	95% CI of the difference Lower	Upper
Subjective sleep quality	1.18±0.39	1.46±0.50	-0.280	<0.001*	0.072	-0.421	0.138
Sleep latency	1.46±0.57	1.58±0.64	-0.136	.163	0.097	-0.327	0.055
Sleep duration	1.18±0.65	1.38±0.59	-0.173	.080	0.098	-0.367	0.021
Sleep efficiency	0.93±0.25	1.00±0.16	-0.042	.197	0.032	-0.106	0.022
Step disturbances	0.89±0.31	0.82±0.39	0.073	.189	0.056	-0.036	0.183
Sleep medications	0.12±0.40	0.07±0.30	0.047	.399	0.056	-0.063	0.157
Daytime dysfunction	1.04±0.45	0.96±0.63	0.075	.389	0.087	-0.097	0.247
PSQI global score	6.80±1.38	7.28±1.40	-0.483	.029**	0.220	-0.918	0.049

p-value obtained by Unpaired t-test, $p<0.05$ considered as a level of significance, PQSI: Pittsburgh Sleep Quality Index.

Discussion

The relationship between pain caused by different conditions and sleep quality has been thoroughly investigated in the literature. Chronic pain and pain severity were found to be a predictors of sleep quality.[12-13] In this study, we studied sleep quality of individuals undergoing orthodontic treatment with fixed appliances. Pain caused by the activation of orthodontic appliances can range from mild to severe pain.[14] It is important to note that this phase of pain after the activation of appliance is not chronic rather acute in nature. However, because of the nature of orthodontic treatment that dictates continuous activation every 4–6 weeks; this pain can be significantly troublesome.

Orthodontic treatment is known to cause pain, and pain is associated with sleep disturbance.[15] Pain caused by orthodontic treatment is an evident symptom. It is known to initiate at 2 h after activation of fixed appliances, peaks at 24 h and starts decreasing after the 3rd day. Moreover, elastic separators placement can lead to pain after 1 week.[16] Majority of patients undergoing orthodontic treatment with fixed appliances also reported pain during and after their orthodontic visits.[17] Different components of orthodontic appliances can cause different degrees of pain. Bands were found to cause pain at insertion while activation of fixed appliances peaked at 24 h.[18]

In this study, we compared the sleep quality of participants using PSQI with the cut-off point for poor sleep quality (5). We found that participants undergoing orthodontic treatment have PSQI scores higher than 5. This indicates poor sleep quality. Comparing sleep quality of males to females, we found that females had poorer sleep quality in both the global PSQI score and in the subjective sleep quality component. This is consistent with the findings of several studies that investigated sleep quality among healthy and ill individuals.[19-20]

Limitation

The limitations of this study are there was no comparison group recruited to better understand the differences and the study only utilized subjective measure of sleep quality. Objective measure, such as polysomnography would have provided accurate data on sleep quality.

Conclusion

Individuals who have received fixed orthodontic appliance experienced decline in sleep quality and female showed poor sleep quality than male.

Recommendation

A more comprehensive assessment of sleep quality using validated sleep questionnaires or objective sleep measurement tools (e.g. polysomnography) will provide more accurate and detailed information on sleep disturbances during orthodontic treatment. Future study should take into account other potential confounding factors that may influence sleep quality, such as age, underlying medical conditions and psychological factors.

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Contributions of the authors

MMA-Acquisition of data, data analysis, interpretation of data, drafting & final approval.
MKU-Conception, design, interpretation of data, critical revision & final approval.
SS-Conception, data analysis,, critical revision & final approval.
AAK- Data analysis, drafting & final approval.
MR-Acquisition, interpretation of data, drafting & final approval.
FAT-Data analysis, critical revision & final approval.

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Disclosure

All the authors declared no conflict of interest.

References

1. Baglioni C, Nanovska S, Regen W, Spiegelhalder K, Feige B, Nissen C et al. Sleep and mental disorders: A meta-analysis of polysomnographic research. Psychol Bull. 2016;142:969-990.

2. Milojevich HM, Lukowski AF. Sleep and mental health in undergraduate students with generally healthy sleep habits. PLoS One. 2016;11:e0156372.

3. Okun ML, Schetter CD, Glynn LM. Poor sleep quality is associated with preterm birth. Sleep. 2011;34:1493-1498.

4. Miyata S, Noda A, Iwamoto K, Kawano N, Okuda M, Ozaki N. Poor sleep quality impairs cognitive performance in older adults. J Sleep Res. 2013;22:535-541.

5. Oyetakin-White P, Suggs A, Koo B, Matsui MS, Yarosh D, Cooper KD et al. Does poor sleep quality affect skin ageing? Clin Exp Dermatol. 2015;40:17-22.

6. Svensson L, Hakeberg M, Wide U. Dental pain and oral healthrelated quality of life in individuals with severe dental anxiety. Acta Odontol Scand. 2018;76:401-406.

7. Diddige R, Negi G, Kiran KVS, Chitra P. Comparison of pain levels in patients treated with 3 different orthodontic appliances-a randomized trial. Med Pharm Rep. 2020;93:81-88.

8. Jones M, Chan C. The pain and discomfort experienced during orthodontic treatment: A randomized controlled clinical trial of two initial aligning arch wires. Am J Orthod Dentofacial Orthop 1992;102:373-381.

9. Erdinc AM, Dincer B. Perception of pain during orthodontic treatment with fixed appliances. Eur J Orthod. 2004;26:79-85.

10. Buysse DJ, Reynolds CF 3rd, Monk TH, Berman SR, Kupfer DJ. The pittsburgh sleep quality index: A new instrument for psychiatric practice and research. Psychiatry Res. 1989;28:193-213.

11. Carpenter JS, Andrykowski MA. Psychometric evaluation of the pittsburgh sleep quality index. J Psychosom Res. 1998;45:5-13.

12. Karaman S, Karaman T, Dogru S, Onder Y, Citil R, Bulut YE et al. Prevalence of sleep disturbance in chronic pain. Eur Rev Med Pharmacol Sci. 2014;18:2475-2481.

13. Graham JE, Streitel KL. Streitel, Sleep quality and acute pain severity among young adults with and without chronic pain: The role of biobehavioral factors. J Behav Med. 2010;33:335-45.22.

14. Jones M. An investigation into the initial discomfort caused by placement of an archwire. Eur J Orthod 1984;6:48-54.

15. Brand S, Gerber M, Puhse U, Holsboer-Trachsler E. The relation between sleep and pain among a non-clinical sample of young adults. Eur Arch Psychiatry Clin Neurosci. 2010;260:543-51.

16. Bergius M, Broberg AG, Hakeberg M, Berggren U. Prediction of prolonged pain experiences during orthodontic treatment. Am J Orthod Dentofacial Orthop. 2008;133:339.e1-8.

17. Krukemeyer AM, Arruda AO, Inglehart MR. Pain and orthodontic treatment: Patient experiences and providerassessments. Angle Orthod. 2009;79:1175-1181.

18. Jawaid M, Qadeer TA, Fahim MF. Pain perception of orthodontic treatment-a cross-sectional study. Pak J Med Sci. 2020;36:160.

19. Mystakidou K, Parpa E, Tsilika E, Pathiaki M, Gennatas K, Smyrniotis V et al. The relationship of subjective sleep quality, pain, and quality of life in advanced cancer patients. Sleep. 2007;30:737-742.

20. Tsai LL, Li SP. Sleep patterns in college students: Gender and grade differences. J Psychosom Res. 2004;56:231-237.