OPEN ACCESS

Saudi Journal of Medicine

Abbreviated Key Title: Saudi J Med
ISSN 2518-3389 (Print) |ISSN 2518-3397 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Original Research Article

Impact of the Mouth Breathing Occurred During Childhood with Lordotic Changes; An Analytic Study

Maham Waseem[1], Asmi Shaheen[2], Muhammad Ilyas[3], Waheed Ul Hamid[4], Saba Iqbal[5*], Gul Muhammad Shaikh[6]

[1]Demonstrator, de'Montmorency College of Dentistry Lahore Pakistan
[2]Assistant Professor, de'Montmorency College of Dentistry Lahore Pakistan
[3]Associate Professor, de'Montmorency College of Dentistry Lahore Pakistan
[4]Professor, de'Montmorency College of Dentistry Lahore Pakistan
[5]Assistant Professor Health Professions Education Department, CMH, Lahore Medical College and Institute of Dentistry Lahore Pakistan
[6]Head of Quality Enhancement Cell/Assistant Professor, CMH Lahore Medical College and Institute of Dentistry Lahore Pakistan

DOI: 10.36348/sjm.2022.v07i02.001 | **Received:** 08.12.2021 | **Accepted:** 24.01.2022 | **Published:** 13.02.2022

***Corresponding Author:** Dr. Saba Iqbal
Assistant Professor Health Professions Education Department, CMH, Lahore Medical College and Institute of Dentistry Lahore Pakistan

Abstract

Introduction: Nasopharyngeal passages are the primary passageway for respiratory exchange in humans. But chronic obstruction of the nasal passage encountered in youth causes a physiological shift in normal breathing pattern from nasal to oral breathing. Oral breathing results in craniofacial modification and postural adjustments. This study will be helpful for orthodontists to observe the cervical vertebral column area in growing children to prevent changes in cervical lordosis and associated sequelae from developing by early intervention, when required. ***Material & Methods:*** In this case control study conducted at the 'Montmorency College of Dentistry over 6 month period from 10th July, 2017 till 10th January, 2018, 60 patients fulfilling inclusion and exclusion criteria, were recruited from OPD and divided into two groups. Group "A" patients showing alteration in their cervical lordosis as observed on lateral cephalograms and group "B" patients with normal cervical lordosis on lateral cephalograms. Their breathing pattern, BMI and other demographic information were recorded. All the collected data were analyzed with SPSS version 23.0. ***Results:*** Mean age of the patients in group A (altered cervical lordosis) was 9.13 (+/- 1.68) years and in group B (normal cervical lordosis) was 8.77 (+/-1.91) years). Chi square test was applied for comparison of groups, p-value ≤ 0.05 considered as statistically significant. The alteration in cervical lordosis had a statistically significant association with oral breathing when compared with nasal breathers, chi square value 27.149 (p value 0.000). ***Conclusion:*** Significant association between alteration in cervical lordosis and oral breathing.

Keywords: Oral Breathing, Cervical Lordosis, Craniofacial modification, childhood.

INTRODUCTION

A normal human uses his nasopharyngeal passages as the primary passageway for respiratory exchange. But chronic obstruction of nasal passage which is a relatively common impediment (4.6% prevalence reported in children of India) encountered in youth causes a physiological shift in normal breathing pattern from nasal to oral breathing. Among oral habits, mouth breathing is significant in age group of 7 to 12 years of age [1].

This chronic nasal obstruction may be due to one or more of many causes ranging from mild pharyngitis to tonsillitis or adenoids to anatomic defects in nasopharyngeal development. Also, children with oral breathing due to chronic allergic rhinitis develop skeletal developmental changes [2]. Cervical lordosis is the normal curve in the cervical spine from second cervical vertebra to seventh cervical vertebra. This lordosis is important to maintain stability and efficient functioning of the cervical spine [3]. Lateral cephalograms in oral breathers show increase in extension of head in relation to cervical spine leading to reduction in cervical lordosis as compared to normal physiological breathers [4]. An oral breather uses his oral passages as primary channel for respiratory

exchange because less energy is required in respiration as compared to forced nasal breathing in the same individual. Oral breathing leads to a myriad of adaptations by head and neck musculature, cervical vertebrae, palatal vault and nasomaxillary complex, leading to increased craniocervical anterior extension [5-7].

Head extension provides a functional solution to facilitate oral breathing in order to compensate nasal obstacle by increasing the dimension of the airway. Studies have shown that this postural modification directly affects the cervical vertebral posture (cervical lordosis) and morphology (e.g. fusion of vertebrae) and may contribute to the development of obstructive sleep apnoea [6, 8]. There are mandibular and lingual postural modifications as well as changes in the soft palate, affecting the overall spatial dimension of pharynx [9]. An atypical posture of the cranium fluctuates the load in several joints of craniovertebral region resulting in unfavorable dentofacial and craniocervical growth. Early interception by removing nasal obstruction neutralizes the growth pattern and indirectly helps to relieve cervical vertebral adaptations [10].

As observed in lateral cephalogram, in growing individuals, chronic oral breathing causes functional and morphological alterations and if the cause of this nasal passage obstruction persists, postural adaptations may lead to irreversible growth pattern adjustments [10]. A study conducted in Brazil in this regard found a high correlation of forward head posture with chronic oral breathing (96.7%) and with nasal breathing (48.4%) [8].

Since insufficient data exists in the literature regarding changes in cervical lordosis associated with chronic nasal obstruction in Pakistani population, this study will establish data for this population and emphasize on the orthodontists to observe the cervical vertebral column area on lateral cephalograms when considering diagnosis of malocclusion, especially in growing children to prevent changes in cervical lordosis and associated sequelae from developing by early intervention, when required [11].

OPERATIONAL DEFINITIONS

Cervical lordotic alteration: The average adult cervical lordosis is 34o ± 9o between C2-C7 posterior vertebral body lines. Flattening or reversal of this curve, which manifests as this angular value increased or decreased from this normal range, will be labelled as a cervical lordotic alteration.

Oral breathers: Those who use the oral cavity for respiration, not the nasal passage. Their parents would give a history of open mouth during sleep, with dribbling of saliva on the pillow. There may or may not be a history of snoring and associated sleep disturbances. During clinical evaluation, a mirror would be placed in the nasal voice for at least three minutes, the child sitting casually on the dental chair, it would not show any sign of fogging or water vapors, hence signifying that there is some nasal obstruction.

MATERIALS AND METHODS

Study design

Case control study

Sampling

Non probability consecutive sampling

Setting

Orthodontics Department of de' Montmorency College of Dentistry/Punjab Dental Hospital Lahore

Duration of study

6 months starting from 10th July, 2020 till 10th January, 2021.

Sample size

Sample size of 60 patients (30 patients in each group) was calculated with 95% confidence level, 80% power of the test and expected percentage of oral breathers as 96.7% in cases and nasal breathers as 48.4% in controls.

SELECTION CRITERIA

Inclusion criteria

1. Children visiting OPD of de'Montmorency College of Dentistry, for a dental checkup and giving consent for this study.
2. Children 6 to 12 years of age, irrespective of gender.
3. In case group, children showing altered cervical lordosis on cephalometric radiographs as per operational definitions.
4. In the control group, children showing normal cervical lordosis on cephalometric radiographs.

Exclusion criteria

1. Children diagnosed with syndromes or craniofacial malformations.
2. Previous orthodontic or orthognathic treatment

DATA COLLECTION

After taking ethical approval from the hospital ethics committee, patients fulfilling above criteria were selected from OPD of the orthodontics department of the de'Montmorency college of Dentistry. A detailed history regarding breathing pattern was obtained from the patient and his/her parent/guardian. Informed consent and demographic information like name, age, sex and address were obtained from each patient and a Proforma will be filled.

For obtaining lateral cephalograms, (which are obtained as a routine in orthodontics department, for

diagnosis of the malocclusion type), the subject was first made to assume the natural head position (NHP) while standing comfortably. Ear rods were used for stabilization and the nasal positioner at the notion. The radiographs were taken from a side position where the rays fall perpendicular to the mean sagittal plane of the subject's head with the subject's teeth in occlusion in a conventional manner. Cephalograms of all the subjects were taken by the same radiologist using a single machine for all radiographs and traced by a single examiner. All reference points, landmarks, and measurements were done according to the norms practiced in the de'Montmorency College of Dentistry. The mirror fogging test was performed in patients of both groups by distracting the patient by some conversation, sitting casually in a dental chair and putting mirror under the nostrils for at least three minutes. This test was performed and observed in all subjects by one observer only. Fogging reflected the patent nasal passage. Oral breathing was labelled as defined in operational definition.

DATA ANALYSIS

Data obtained was statistically analyzed using Statistical Package for Social Sciences (SPSS) version 23.0. Quantitative variables like age were analyzed using simple descriptive statistics using mean and standard deviation. Frequency and percentage was calculated for gender.. Both groups were compared by applying chi-square test with p-value ≤ 0.05 as statistically significant and Odds Ratio calculated to measure association between cervical lordotic changes with chronic oral breathing, OR > 1 was considered as statistically significant. Data was stratified for age, gender and BMI for addressing effect modifiers. Post stratification chi square test was applied and OR calculated with OR >1 taken as statistically significant.

RESULTS

In this study a total of 60 patients were taken which were equally divided into two groups i.e. Group A and Group B. Group A contained patients of altered cervical lordosis and Group B contained controls. All the patients fulfilling the inclusion and exclusion criteria were taken from the patients reporting in the orthodontics department of De Montmorency college of Dentistry/ The Punjab Dental Hospital, Lahore.

Table-1: Mean age (years) of both groups

Group	N	Mean Age +/- SD (years)
Cases (A group)	30	9.13+/- (1.68)
Controls (B group)	30	8.77+/- (1.91)
Total	60	8.95 +/- (1.79)

Mean age of the patients in group A was 9.13 (+/- 1.68) years and in group B was 8.77 (+/-1.91) years. (Table 1). There were 15 (50%) males and 15 (50%) females in group A. In group B, there were 13 (43.3%) males and 17 (56.7%) females.

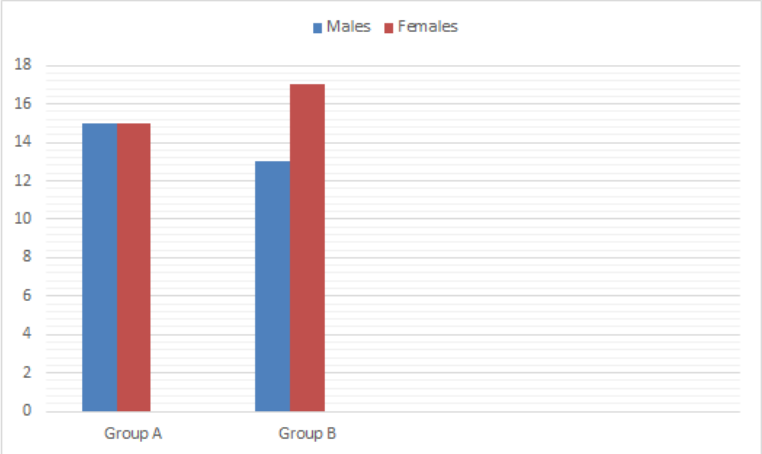

Fig-1: Bar Chart showing males and females in case and control groups

Mean BMI for Group A was 17.20(+/- 2.13) and Group B was 17.46(+/- 2.12). Chi square test was applied for comparison of groups, p-value ≤ 0.05 considered as statistically significant. The alteration in cervical lordosis was statistically significant with oral breathing when compared with nasal breathers, chi square value 27.149 (p value 0.000).

There was statistically significant association between alteration in cervical lordosis and oral breathing, odds ratio value for oral/ nasal breathers 29.57 (OR > 1 statistically significant). Data was stratified with respect to age, gender and BMI to address effect modifiers. Post stratification chi square test was applied with p-value < 0.05 considered as

significant. In the age group of < 9 years, alteration in cervical lordosis was statistically significant for oral breathers as compared to nasal breathers. Chi square value 7.98, p-value 0.009. In the age group of ≥ 9 years, alteration in cervical lordosis was statistically significant for oral breathers as compared to nasal breathers. Chi square value 19.38, p-value 0.000.

Table-2: Stratification of gender and comparison of groups by chi square test

Gender	Groups	Cases	Controls	p-value
Male	Group A	13	3	**0.002**
	Group B	2	10	
Female	Group A	14	4	
	Group B	1	13	**0.000**

Odds ratio for association between oral and nasal breathers was statistically significant in both age groups,(OR>1considered as statistically significant) with odds ratio 20 for age group <9 years and 41.17 for age group ≥ 9 years. After stratification, male group showed statistically significant alteration in cervical lordosis in oral breathers as compared to nasal breathers. Chi square value 11.49, p-value 0.002. (Table 2)

The female group showed statistically significant alteration in cervical lordosis in oral breathers as compared to nasal breathers. Chi square value 15.77, p-value 0.000. (Table 3). Odds ratio for association between oral and nasal breathers was statistically significant in both genders (OR >1 considered as statistically significant). Stratification of BMI had no effect on the alteration in cervical lordosis in comparison to nasal breathers (statistically significant in both categories of BMI, p-value 0.000).

Table-3: Stratification of BMI and comparison of groups

Gender	Groups	Cases	Controls	p-value
Male	Group A	13	3	**0.000**
	Group B	2	10	
Female	Group A	14	4	
	Group B	1	13	**0.000**

DISCUSSION

The mouth breathing leads to craniofacial alterations, including dental malocclusions. A study by M Zakirulla conducted at King Khalid University, Abha, Kingdom of Saudi Arabia author concluded that there The human being normally uses nasal passages for normal breathing. However, in certain chronic conditions of nasal airway obstruction, individual adopts mouth breathing to maintain physiological respiratory function [1]. Few studies have investigated the relationship between alteration in cervical lordosis and oral breathing. The mouth breathing leads to different morphological alterations, including, alterations in cervical vertebral column, craniofacial and facial skeletal changes [12-15].

This was a case control study conducted for comparison between oral breathers and nasal breathers. Chi square test was applied for comparison of groups, p-value ≤ 0.05 considered as statistically significant. The alteration in cervical lordosis was statistically significant with oral breathing when compared with nasal breathers, chi square value 27.149 (p value 0.000). There was statistically significant association between alteration in cervical lordosis and oral breathing, odds ratio value for oral/ nasal breathers 29.57 (OR > 1 statistically significant) is a strong correlation between oral breathers and dental malocclusion[1].

In a Reviewed study by School of Dentistry, university of Milan in November 2020 cephalometric evaluation was done for craniofacial alterations in oral and normal breathers. The difference in craniofacial alteration was statistically significant in oral breathers compared to nasal breathers [12]. Another systematic review concluded with a low evidence for association of mouth breathing and postural changes in children between the ages 5 to 14 years [10].

Another cross sectional study was conducted at Aga Khan University Hospital, Karachi to see the association of skeletal anomalies with dental malocclusions. Among the cervical vertebral column anomalies, a fusion between C2 and C3 was the most frequently observed in all three types of dental malocclusion. The cervical vertebral anomalies were more in malocclusion class III[16]. Isabel Chung Leng Muñoz and Paola Beltri Orta studied cephalometric patterns in mouth breathing and nose breathing children at School of Dentistry, European University of Madrid, Madrid, Spain. This cephalometric comparison revealed a higher tendency of class II malocclusion in mouth breathing children than normal nasal breathers [2].

Antonino Marco Cuccia; Maurizio Lotti; Domenico Caradonna studied lateral cephalograms of 35 children to determine the cephalometric characteristics in oral breathing children. The authors

concluded that oral breathing children have greater extension of the head in relation to the cervical spine and reduced cervical lordosis as compared with nasal breathers [15]. In growing subjects, timely diagnosis of changes in morphological growth patterns is crucial for an orthodontist in choosing an adequate treatment [10]. Owing to multifactoral etiology of oral breathing, and scale of different postures and craniofacial and cervical lordotic alterations it is emphasized to adopt a multidisciplinary approach for mouth-breathing children [8, 17].

CONCLUSION

Chronic oral breathing leads to alteration in cervical lordosis.

Acknowledgements

The authors would like to acknowledge all mothers and interns who participated in the research.

Conflict of Interest

Authors declare no conflict of interest.

REFERENCES

1. Zakirulla, M., Alshehri, A. D., Hudaybi, A. H., Fageeh, S. N., Alghothimi, A. A., Ali, M. G., & Almoammar, S. (2020). Oral Habits: Prevalence and Effects on Occlusion Among 7 to 13 Years Old School Children in Aseer, Saudi Arabia. *Pesquisa Brasileira em Odontopediatria e Clínica Integrada*, *20*.
2. Muñoz, I. C. L., & Orta, P. B. (2014). Comparison of cephalometric patterns in mouth breathing and nose breathing children. *International journal of pediatric otorhinolaryngology*, *78*(7), 1167-1172.
3. Grummons, D. (1994). Orthodontics for the TMJ-TMD patient [Internet]. Scottsdale, Ariz.: Wright & Co. Publishers; 1994. Available from: http://books.google.com/books?id=Y1hqAAAAMAAJ
4. Shrivastava, T., & Thomas, M. (2012). To Determine the Head Posture in Oral Breathing Children: A Cephalometric Study. *Journal of Indian Orthodontic Society*, *46*(4_suppl1), 258-263.
5. Anandarajah, S. (2015). *3-D pharyngeal airway related to facial morphology, upper cervical vertebral column morphology and skeletal maturation in children: a pilot study* (Doctoral dissertation, James Cook University).
6. Sonnesen, L. (2010). Associations between the cervical vertebral column and craniofacial morphology. *International Journal of dentistry*, *2010*.
7. Neiva, P. D., Kirkwood, R. N., Mendes, P. L., Zabjek, K., Becker, H. G., & Mathur, S. (2018). Postural disorders in mouth breathing children: a systematic review. *Brazilian journal of physical therapy*, *22*(1), 7-19.
8. Cid, M. M., Januario, L. B., Zanca, G. G., Mattiello, S. M., & Oliveira, A. B. (2018). Normalization of the trapezius sEMG signal–a reliability study on women with and without neck-shoulder pain. *Brazilian journal of physical therapy*, *22*(2), 110-119.
9. Vaswani, V., & Khajuria, S. (2020). Assessment and Comparison of Cervical Column Morphology and Cranial Base Angle in Three Different Facial Types--A Cephalometric Study. *Journal of Evolution of Medical and Dental Sciences*, *9*(36), 2605-2610.
10. Oliva, G., Zotti, R., Zotti, F., Dalessandri, D., Isola, G., Oliva, B., ... & Bonetti, S. (2020). Integration of Cranial Base and Face in Growing Subject. *Applied Sciences*, *10*(7), 2508.
11. Duarte H, de Araújo MTM. Association between respiratory and postural adaptations and self-perception of school-aged children with mouth breathing in relation to their quality of life.
12. Farronato, M., Lanteri, V., Fama, A., & Maspero, C. (2020). Correlation between Malocclusion and Allergic Rhinitis in Pediatric Patients: A Systematic Review. *Children*, *7*(12), 260.
13. S0165587614002584.
14. Villamil, C. I. (2018). Phenotypic integration of the cervical vertebrae in the Hominoidea (Primates). *Evolution*, *72*(3), 490-517.
15. Chambi-Rocha, A., Cabrera-Domínguez, M. E., & Domínguez-Reyes, A. (2018). Breathing mode influence on craniofacial development and head posture☆. *Jornal de pediatria*, *94*, 123-130.
16. Faruqui, S., Fida, M., & Shaikh, A. (2014). Cervical vertebral anomalies in skeletal malocclusions: A cross-sectional study on orthodontic patients at the Aga Khan University Hospital, Pakistan. *Indian Journal of Dental Research*, *25*(4), 480.
17. Milanesi, J. M., Borin, G., Corrêa, E. C., da Silva, A. M., Bortoluzzi, D. C., & Souza, J. A. (2011). Impact of the mouth breathing occurred during childhood in the adult age: biophotogrammetric postural analysis. *International journal of pediatric otorhinolaryngology*, *75*(8), 999-1004.