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MOUTH BREATHING PATTERN: ITS PREVALENCE AMONG 5 TO 12 YEAR OLD SCHOOL GOING CHILDREN.

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Abstract

Aim:

To determine the prevalence of Mouth breathing among 5 to 12 year old school going children.

Study design:

A cross sectional study.

Methods:

A total of 410 school going children of both genders between the age group 5–12 years, were selected and screened. Data was collected using clinical guidelines for recognition of mouth breathers and additionally 3 performance tests- Graded mirror test, Lip seal test, Water retention test for confirmation of diagnosis were carried out.

Results:

Prevalence of Mouth breathing was observed to be 11.70%.A descriptive statistics was used for the presence of alterations facial characteristics among mouth breathers.Therewas statistically significant difference observed between the facial characteristics and the performance tests parameters among Mouth breathers and nasal breathers ($p<0.05$).

Conclusion:

Prevalence of mouth breathing was around 11.70% among 5 to 12 year old school going children.

Keywords:

Mouth breathing,prevalence, school going children

Introduction:

Breathing is an act of inspiration and expiration and considered as one of vital function of human body.[1]Normally it is occurring through nose but if there is an obstruction which prevents nasal breathing then survival will depends on an adaptation of oral or mouth breathing.[2]However, mouth breathing is an abnormal act of breathing. PersistentMouth breathing pattern can affect oral hygiene, mastication function, reduced humidification of inhaled air and abnormal body posture which may affect quality of life negatively.[3]Prolonged mouth breathing may provoke some structural changes in facial muscles and muscles of posterior chain at cervical region.[4]This muscle imbalance in cervical muscles can be one of the factor causing head and neck postural alterations. In addition, head extension is the functional response to nasal obstruction which can be another contributor[5].According to Lima et al. the changes in the cervical spine are mediated by the superior and middle constrictor muscles of pharynx.[6] The position of hyoid bone it is lower in mouth breathers leads to the alterations in the skull and posterior muscle chain is triggered by styloglossus, stylohyoid and paltoglossus muscle[7].Further, authors demonstrated a shortening of posterior chain muscles particularly sub occipitals along with sternocleidomastoid and scalene. These muscle alteration favors' an increase in thoracic convexity and inspiratory position of the chest wall and medial rotation of shoulders.[6]These predisposing factors causes alteration in posture also leads to respiratory obstruction in an individual. Further narrowing of pharyngeal airways has been associated with anterior displacement and extension of the position of head in order to facilitate air flow during breathing which causes cranio-vertebral angle to increase with anterior displacement of center of gravity[8].This abnormally sustained posture by mouth breather can cause some musculoskeletal related problems in cervical region and it is one of the predisposing factor for developing neck pain.

Some studies observed children with mouth breathing has reduced cervical lordosis and increases in thoracic kyphosis and thus increases in cranio-vertebral angle.[9] Yip et al. observed a positive correlation between the cranio-vertebral angle and neck pain and disability. They also verified a positive correlation between age and these symptoms and negative between age and the cranio-vertebral angle. Thismeans that the lower the angle, more forward is the head. This postural deviation was one of the most observed in the volunteers of this study and it can bring important clinical consequences, once as they will get older this angle decreases and the symptoms increase.[10]The influence of the mouth breathing on the head posture seems to be also due to the overuse of the accessory inspiratory muscles as scalene, sternocleidomastoid and upper trapezius.

In addition to postural alterations in mouth breathers, pulmonary function like inspiratory capacities found to be reduced.[11] So it is deemed necessary to assesschildren for using mouth breathing in their early childhood during school going age itself to prevent them some long term postural abnormalities with or without pain and impaired pulmonary functions which may affect their overall performance in school.

The presence of mouth breathing was confirmed by using clinical recognition of mouth breathing. In this guidelines we were conducted a subjective and objective examination.[12]insubjective examination there were different questions regarding children which were answered by parents and a brief visual assessment done by therapist. In objective examination three tests were included-graded mirror test, lip seal test and water retention test.

As per our knowledge, we did not observed any study reporting the prevalence mouth breathing along with its assessment theseguidelines.The present study aimed to find out the presence of mouth breathing pattern in school going children in our region. By detecting mouth breathing in children and explaining the parents about the consequences of mouth breathing, corrective measures can be

implemented. Also early screening and detection of the condition can be helpful for prevention of postural alterations in long term.

Methodology

The present cross-sectional study observed the prevalence of mouth breathing among 5 to 12 years school going children. A total of 410children of both genders between the age group 5–12 years were selected randomly from urban and rural schools of Aurangabad district, India.

Ethical committee approval was obtained before commencing the study. The screening were conducted with permission from the education authorities and the principals of the respective schools. Informed consent was obtained from child's parents or guardian. Children of both the genders between ages of 5 to 12 years were included in the study. Children having any history of craniofacial malformation, any history of musculoskeletal disorders ,history of orthopaedic trauma, history of any chronic respiratory diseases like asthma ,any history of any neurological disorders, any history of cardiovascular diseases, subject undergone any surgical procedure like adenotonilectomy were excluded from the study. Prevalence was calculated using prevalence rate formula.

$$\text{Point prevalence} = \frac{\text{No of all current cases}}{\text{Estimated population at the same point in time}} \times 100$$

Children were selected and screened using guidelines given for clinical recognition of mouth breathers.[12] the guidelines includes certain questions which covered the domains like visual assessment and breathing tests. In the visual assessment, we most often observed whether the child kept his/her lips sealed and his/her posture. The other items observed were: presence of anterior open

bite, dark eye circles, long face, gingivitis in anterior maxillary teeth, posterior cross bite, and others. Questions asked to parents or children were about the position of the lips, whether he/she sleeps or keeps his/her mouth open. The remaining questions were about snoring, drools on the pillow, allergies whether the child becomes tired easily, had a cold easily and others. In breathing tests we used three tests graded mirror test, water retention test and lip seal test. In graded mirror test a steel mirror was kept below the nose and we asked the child to perform normal breathing and halos of steam measuring less than 30 mm will be considered as abnormal. In water retention test, place water in the patient's mouth (approximately 15 ml) and ask him/her to hold it for 3 minutes. In lip seal test we seal the patient's mouth completely with a tape for 3 minutes and observed if child is not able to retain then consider as mouth breather. In order to consider a child as an oral breather, she/he should have at least 3 facial alteration along with any two test positive.

So we observed children regarding the domains like visual assessment, questions asked to parents or child, and respiratory tests. These questions were asked to parents either on physical basis or on mobile whichever suitable.

After the screening, data were collected and plotted in excel sheet. We obtained absolute and percentage distribution (Descriptive statistics method).Prevalence rate was calculated using prevalence rate formula.The significance level used in the statistical test was of 5% (0.05) and the intervals were obtained considering a 95.0% confidence interval.

Result:

The 410 children (273 boys and 137 girls), with a mean age of 9.13 years were screened. Out Of these, 48(11.70%) were observed as mouth breathers based on the guidelines given for clinical recognition of mouth breathing. Observational findings were carried out by the therapist were presented in tables as follows:

Facial alteration and questions to parents	Nasal breathers	Oral breathers	Total number of children having these alterations

Table 1: Assessment of breathing type with respect to facial alterations seen on observation.

	N = 362	%	N = 48	%	T= 410	%
Lack of lip seal	13	3.5	45	93.75	58	14.14
Postural changes	50	13.81	42	87.5	105	25.54
Dark eye circle	10	2.76	38	79.16	48	11.67
Long face	13	3.59	20	41.66	33	8.02
Anterior open bite	13	3.59	25	52.08	38	9.2
High narrow palate	0	0	18	37.5	18	4.3
Sleep with mouth open	2	0.55	17	35.41	19	4.6
Keep mouth open when distracted	1	0.27	16	33.33	17	4.13
Snoring	1	0.27	13	27.08	14	3.4
Drooling in pillows	3	0.82	11	22.91	14	3.4
Daytime sleepiness	2	0.55	18	37.5	20	4.8
Wake up with headache	7	1.93	15	31.25	22	5.3
Get tired easily	3	0.82	16	33.33	19	4.6
Often have allergies	24	6.62	19	39.58	43	10.46
Stuffy /runny nose	2	0.55	17	35.41	19	4.6
Difficulty in school	0	0	14	29.16	14	3.4
Difficulty in concentration	3	0.82	18	37.5	21	5.1

(N- Number of children with nasal Breathing, n- Number of children with oral breathing, T- total number of children having facial alterations).

Table 1 shows the list of facial alterations by type of breathing and in the whole group. Among types of breathing patterns, it is possible to see that the percentages of facial alterations were correspondently higher among children who were oral breathers when compared to the nasal breathers. It may be established that the percentage differences presented in a descending order were

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recorded for: inadequate lip sealing (93.75% versus 3.5%), anterior open bite (52.08% versus 3.59%) anddark circles underneath the eyes (79.16% versus 2.76%),high palate (37.5% versus 0%).Also postural changes were seen more in mouth breathers as compared with nasal breathers. These percentage distribution was calculated using number of children presented with a particular facial characteristics divided by total number of children having the same facial characteristic.

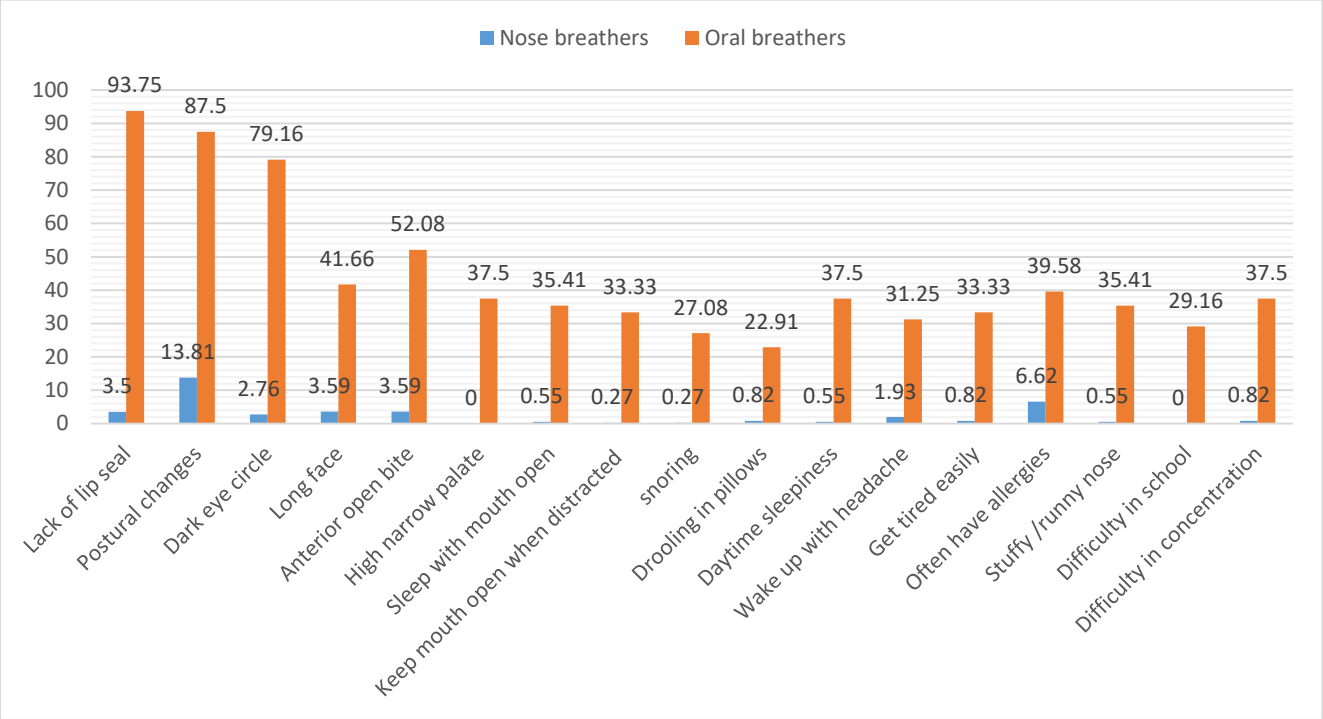
Table 2: Comparison of mean of the tests for different groups

Breathing tests	**Nasal breathers Mean and SD**	**Oral breathers Mean and SD**	**Confidence level**	**Critical t**	**p value**
Graded mirror test in mm	32.88 (7.1)	19.74(7.57)	0.73 to 2.11	2.00	0.00
Water retention test in min	2.97(0.21)	1.87(0.38)	0.02 to 0.11	1.97	0.00
Lip seal test In min	2.98(0.16)	1.97 (0.31)	0.02 to 0.09	1.97	0.00

Table 2 depicts the results of the three breathing tests.

Analysis were performed using unpaired t test's to the test about the time through which the child can hold water in mouth or able to hold lip seal. Also in graded mirror test hallow of steam measuring less than 30 mm will be considered as abnormal. In mouth breather's the mean of the parameters for graded mirror test was less as compared with nose breathers. Also p value is significant for all the three tests

Graph 1: Percentage distribution of facial alteration in between groups



Discussion:

In present study we investigated the prevalence of mouth breathing habit in 5 to 12 year old school going children. It is important to obtain accurate information from the parents/guardians during the interview for the diagnosis of mouth breathing as it is a kind of observational and subjective finding. Questionsabout the child's sleep patterns, if he/she sleeps with the mouth opened, if there is snoring, if the child lacks concentration at school, if the child feels sleepy during the day, if the pillow is wet in the morningrepresent important elements in the diagnosis of oral breathing[12].Moreover, MB children exhibit difficulty in concentration and excessive daytime sleeping, with a negative contribution to quality of life.

In the present study we noticed11.7 %were oral breathers out of 410 screened children. Amongst the very few studies conducted in India, one study conducted in Delhi on assessment of oral habits among 5,554 children aged 5 to 13 years and found a 6.60% prevalence of MB which is comparable to our study findings.[13]However, in Brazil, it was around 53.3% in children aged 8 to 10 years which is quite overstated observation [14].These wide range of percentage differences may be justified by the diagnostic criteria and the different methodologies used in the studies.We assessed children for mouth breathing habit using the guidelines proposal for clinical recognition of mouth breathing children given by Maria Christina Thomé Pacheco et al.[12]

Alterations in facial characteristics were observed more in mouth breathers, as compared with nose breathers. Our observational findings includes -inadequate lip sealing (93.75% in MB versus 3.5% in NB), anterior open bite (52.08% in MB versus 3.59% in NB) and dark circles underneath the eyes (79.16% in MB versus 2.76% in NB), high palate (37.5% in MB versus 0% in NB). Also maximum children around (87.5%) had some of the postural changes in mouth breathers as compared to nasal breathers (13.81%).

In addition, three performance tests to observe the oral functions were conducted and revealed significant differencesin mouth breathers as compared with nose breathers. In mouth breathersgraded mirror testshowedlow nasal flow (19.74± 7.57)compared to nasal breathers (32.88± 7.1).Since the halo mark on the mirror was less than 30mm which considered as low nasal flow.In another method,water retention test, the time duration were significantly lower in mouth breathers as compared with nose breatherssince mouth breathers might feel the task difficult. In addition, during lip sealing test, mouth breathers were not able to close their mouthcompletely for a given period of time(1.97 ±0.31) may be because of hypo-tonicity of facial muscle and overcrowding of teeth however it was more in nose breathers (2.98±0.16).

So it is essential to observe these alterations in school going children because persistent breathing through mouth alters facial structure and thereby craniofacialmorphology, the form and position of the maxilla, mandible, upper airway, and hyoid bone and the muscles contributing in inspiration. According to Moss's functional matrix theory, nasal-breathing allows for the balanced growth ,the development of the craniofacial complex and the interaction with other function mas-tication and swallowing.[15]However mouth breathers presented with the characteristics of increased lower facial height, lack of lip seal , narrow alar base, compressed maxillary dental arch with high palatal vault, posterior cross bite and lower position of hyoid bone.[16] These changes in craniofacial morphology may leads to alteration in mandibular position, occlusion of molar teeth, hypo tonicity of facial muscles and changes in tongue position, as well as the oral and peri-oral muscular balance. These changes trigger head extension to facilitate oral breathing which influences alteration in cranio-cervical region. This could be in correspondence with the known functional relationships between the mandible, pharynx and tongue. The posture of the tongue is an important link between the pharynx and natural head posture (Hellsing, 1989 ; Behlfelt et al. , 1990) a backward rotation of the cervical spine combined with hyperextension of the head could be a mechanism to restore the pharyngeal space at the base of the tongue. Shelton and Bosma (1962) have shown that extension of

the head generally leads to an increase in the antero-posterior diameter of the oropharynx and change in cranio-cervical angulations is accompanied by a positional change in the intra-oral height of the tongue.[17]

Furthermore, muscular imbalance arising due to mouth breathing focusing on the muscles (superior and middle constrictor) of the pharynx leads to alterations in the skull posture mainly head extension which triggered the posterior chains muscles. Along with protraction of the head, shortening of the posterior muscle chain, particularly of the sub occipital muscles, is associated with shortening of the sternocleidomastoid and scalene muscles, which in turn is associated with the cervical thoracic-abdominal-pelvic fascia. These functional muscle alterations favour an increase in thoracic convexity, an inspiratory position of the chest and medial rotation of the shoulders, thus demonstrating postural decompensating resulting from respiratory obstruction in individuals with mouth breathing.[18]

In clinical investigations, MB children exhibit postural alterations such as thoracic kyphosis, protrusion of the shoulders, elevation and abduction of the scapula's and forward head posture[6,17].Thus mouth breathing has been cited as one of the causes of the changes in the head posture which can affect to the whole body posture. These postural compensations arising due to muscular imbalance may perpetuate the chances of getting neck pain and thereby upper back pain along with postural abnormalities. In the present study,it is unlikely to be established a direct effect of the change in posture of the mandible and tongue in children with mouth breathing. It could possibly be due to the postural relationship between the upper cervical spine and the basilar part of the occipital bone, but it remains for future studies to clarify this point.

The present study have some limitations, as the population in this study was below 18 years, we were included parents or guardian in the study. That hampered the parameters for comparison. Lack of

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involvement of parents/ legal guardian who gave inaccurate answers that was not similar with those given by their children.

For early detection and correction of mouth breathing habits it was necessary to conduct screening of mouth breathing in a region. This prevalence was done in view of diagnosing the condition and focused on correcting habit which creates further postural alterations. Postural correction and re-education is suggested for prevention and management of further complications. Further studies are needed to validate a questionnaire for clinical diagnosis of MB at the primary care level. A short postural assessment should be included in the questionnaire.

Conclusion:

Observed prevalence of mouth breathing was 11.70%among 5 to 12 year old school going children. It is recommended to consider breathing pattern assessment during routine health check-ups of school going children.

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