The Development of A Questionnaire, for Early Detection of Upper Respiratory Tract Obstruction, Mouth Breathing and Adenoid Face

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Abstract

Background: Growing children often suffer upper respiratory tract infections which can undergo repeated obstruction of upper respiratory tract or OURT. Prolonged OURT results in the onset of mouth breathing habits, which can disrupt growth and development, thus resulting in morphological dento cranio facial deviation can and even more thorough aberration in physical growth and development. Further impacts include psychic and socialization disorder. Therefore, early detection of Mouth Breathing is needed to prevent the occurrence of undesirable deviations. Purpose: This study is aimed to develop a tool for early detection and diagnosis of OURT, mouth breathing habits and adenoid face. Method: A cross sectional study was done with 189 OURT subjects. All subjects were 9-15 years of age. Data obtained from a questionnaire, physical examination, and analyzed with Cronbach alpha and correlation between items. Result: A valid and reliable questionnaire was developed. The entire questionnaire could be trusted with Cronbach alpha values between 0.7-0.9. The r value was 0.51 to 0.75 and ranged from 0.76 to 1.00 for the correlation between items.

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Introduction

Mouth breathing (MB) is one of the various bad oral habits that may affect dento cranio facial (DCF) morphology. Research conducted by Purwanegara (2007) found that the prevalence of MB in people with Obstruction of the Upper Respiratory Tract (OURT) was 50.0%.[1] It has also been shown that OURT is a risk factor for the occurrence of head posture deviation, which further develops MB.[2]

OURT patients with MB have an *adenoid face* appearance, which includes several features such as protrusion of the upper anterior teeth, a narrow and long face, and lip incompetence. These facial features can cause lower self-esteem, especially in children with protrusion and crowding of the upper anterior

teeth. The presence of OURT during a child's the growth and development periode plays an important role in the occurrence and pathophysiology of snoring and apnea, which can cause MB habit.[1,3-5]

Early detection of the OURT and MBis needed to prevent the occurrence of morphological DCF deviation and other effects.[2,6] It is required expensive tools, such as rhinomanometri, head-out body plethys mograph to determine whether a person is suffering OURT and MB.[7] Not all hospitals, health centers have the facilities of these tools, particularly in rural areas. Thus, there is a need for a simple tool that can detect and diagnose OURT and MB. A questionnaire can acquire information regarding whether a person has experienced OURT and MB for a long time. More over, questionnaire can provide early detection in an easy, cheap and quick manner. This article reports the results of research to construct a questionnaire combined with a physical examination as a tool to conduct early detection of MB.

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Obstruction of the Upper Respiratory Tract (OURT)

The upper airway is also called the upper respiratory tract. It includes the nose, nasal cavity, sinuses and pharynx. Kheirandish-Gozal L, Gozal D (cit. Min *et al*) described the pharynx is typically divided into three anatomic parts: the nasopharynx, oropharynx and laryngopharynx (hypopharynx).[8]

In term of etiology of Obsruction of the Upper Respiratory Tract (OURT) upper respiratory tract infections usually range from mild(e.g., common cold, rhinitis)to conditions that require treatment, such as group A streptococcal pharyngitis, sinusitis, and bacterial lower respiratory tract infections. Upper respiratory tract disease can occur due to an allergic reaction. Clinically common allergic reaction combined with the infection.[9] OURT is also called upper airway obstruction (UAO).

Mouth breathing

The upper respiratory tractinfection eventhough chronic or acute will cause obstruction in this tract. Patient with obstruction in this area will suffere mouth breathing syndrome (MB).[1,2] According to Oliviera & Viera (cit.Bolzan *et al*) mouth breathing is one of the several oral bad habit and it is a common disease in childhood. Clinical manifestation of mouth breathing has a multi factorial etiology.

Whether chronic or acute, an infection in the upper respiratory tract will cause obstruction in this tract. Patients with obstruction of the upper respiratory tract suffer mouth breathing syndrome (MB).[1,2] According to Oliviera and Viera (cit. Bolzan *et al*), mouth breathing is one of the several bad oral habits, and it is a common disease in childhood. The clinical manifestation of mouth breathing has a multi factorial etiology.

Mouth breathing due to OURT has been classified as obstructive mouth breathing. Mouth breathing due to prolonged mouth habits, muscle alterations, transitory swelling of the nasal mucosa, and repaired airways obstruction, among other factors are clasified as unconstructive or habitual mouth breathing.[10] The DCF morphology deviation of OURT subjects with MB in Jakarta and the surrounding population is characterized by hyper divergent facial development, a skeletal Class II Angle pattern, and a convex facial profile. Narrow facial development was only found in the Bijugalare in the age group of 9-11 years[2,11] DCF deviation in sufferers OURT called adenoid face in the picture below. The characteristics are long and narrow face, a convex facial profile, an open jaw, narrow lips, crowding or protrusion of upper teeth.


A   B

C   D   E
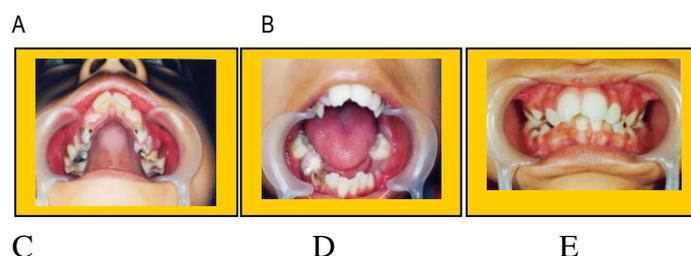
Figure 1. Frontal (A), profile dentocraniofacial appearance (B), and upper dental arch(C), lower dental arch (D) and occlusion of MB patient (E).
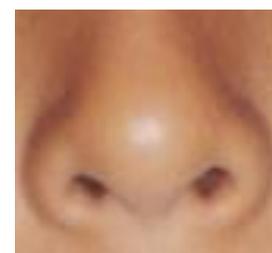
Figure 2   **Figure 3**

Figure 2: The mouth mirror test in front of the nostril. In individuals with nasal breath, the surfaces of glass were not dewy. In the individual with MB the surfaces of glass become dewy during expiration.

Figure 3: Examination of muscle alar. Size and shape. Left: during inspiration and right: expiration. In individuals with nasal breath. There is clear difference between the visible nostrils. Muscle alar becomes wider when inspiration. In individuals with MB, there is no difference between inspiration and expiration.

Figure 4: Examination of MB using a butterfly-shaped cotton. Left: Air does not blow in both nostrils. Right: The air blows in one nostril.

Figure 5: The distance of the edge of the upper lip and the bottom lip.

Methods

The research design was cross sectional. The Committee of The Medical Research Ethics of the Faculty of Medicine, Universitas Indonesia, carefully reviewed and approved this research proposal with regards of the protection of human rights and welfare in medical research, with No: 112/PTO2.FK/ETIK/2002.[1]

Research began with developing the questionnaire to detect OURT and the MB habit.[12] The procedure for developing the questionnaire is described as follows:

1. First, researchers improved their knowledge about OURT including rhinitis and pharyngitis, whether caused by infection or allergy, the disease type, etiology, symptoms and treatment. The researchers also improved the knowledge of the MB habit.

2. The next step was writing some papers in related fields, (e.g., fields of growth and development, MB, OURT and Dental Radiology).

3. The researchers began to create a questionnaire to detect any OURT and MB history. They began by defining the components of OURT, including nasal obstruction, pharynx obstruction, and the components of MB including lip condition and position, head and body posture while sleeping, and intra oral and lip position. Each component had several subcomponents including symptoms, duration and time. The subcomponent were then parsed into more detailed items that could determine the subject's OURT and MB history. Every question had two items to determine the same answer or data so that if one question failed, there would still be another question and thus no information would be lost. There were also two editions of each question: the edition for the child as a subject of research and the edition for the parents of the child. There were initially 49 questions for OURT and 30 questions for MB.

This OURT-MB questionnaire consisted of four parts. The first was the selection part which involved finding respondents who were in accordance with the criteria to become the subject of research. If the respondent met with the criteria then he or she could continue the processof OURT and MB detection by using the questionnaire and physical examination in accordance with the standards determined in this study.

Population of subjects

The population included patient of the Orthodontic and Pediatric Dentistry Universitas Indonesia and the Laryngopharynx Clinic of The ENT Department Faculty of Medicine, Universitas Indonesia. Research subject were determined using a formula based on the proportion of events obtained from the preliminary stages; with P2=0.4, the number of subjects was 134. Thus, the case group had 134 subjects and the control group had 134 subjects, 268 subjets in total.

Inclusion criteria for the subject

Population of the subject were living in Jakarta and its vicinity (i.e.; Bogor, Depok, Tangerang, Bekasi) were of the Deutro-Malay race; were 9 to15 years old; included male and female; and were generally in health. The subject had OURT, had been diagnosed by the ENT specialists, and had adenoid face determined by three orthodontist it meaning the subjects had DCF deformities.

Exclusion criteria for the subject

Subject had oral bad habit other than mouth breathing. The subjects could not be

suffering cough and common cold or influenza; could not have been suffering from any serious disease that interupts growth and development, could not have asthma; and could not have ever received orthodontic treatment.The subject could not have a history of a tonsillectomy or adenoidectomy. Subject with missing, decay, and abnormality teeth and/or jaw could inhibit dentoalveolar and jaw growth and development. Ethical clearance of this study was approved by obtaining informed consent from the subjects.

The questionnaire was guided and directed by the researchers. In order to develop a trusted questionnaire, the questionnaire was tested for reliability and validity.[13] Data was analyzed with Cronbach's Alpha in order to test whether the questionnaire is reliable, and the data was analyzed with a correlation test between items to determine whether the questionnaire was valid.

Results

There were 268 subjects in total. There were 285 subjects on the field who were suitable for the case control study: 189 OURT subjects with adenoid face and 96 OURT subjects without adenoid face. The questionnaires tested on the subject who previously provided informed consent.

Testing questionnaire

The questionnaire test results showed Cronbach alpha values between 0.7 and 0.9. Twelve tests of validity were conducted by looking at the correlation between items, the R value were 0.51 to 0.75 and ranged from 0.76 to 1.00.[13] Thus it can be concluded that as a whole the questionnaire tool can be trusted (OURT-MB questionnaire).

The answer the questionnaire except physical examination combined. Determination of the subject has indications of DCF morphologic deviation can occur, is shown in (Table 1).

Questionnaire for parents: the values ranged between 0-14; if the number of answers were≥ 5, this indicated DCF morphologic deviation.

Questionnaire for children: the values ranged between 0-15; if the number of answers were≥ 6, this indicated DCF morphologic deviation.

The third part of the questionnaire was a part of the physical examination to detect any mouth breathing habit. Three types of conclusions obtained objective data from the questionnaires, from the existence of mouth breathing habit and from physical examination, which determined whether the subject exhibited a mouth breathing habit, taken conclusion there are or are not mouth breathing habit on any subject. A sample retrieval summary is provided in Table 2.

Table 1. Cut off points from the questionnaire total as indicators of the impact of the OURT and MB to DCF (children and parents)

Cut off point	OR		p		ROC		Sensitifity %		Specifisity %	
	Children	Parents	Children	Parents	Children	Parents	Children	Parents	Children	Parents
3	3.92	6.45	0.000	0.000	0.6053	0.6632	80.53	43.16	40.00	89.47
4	2.76	4.12	0.000	0.000	0.6026	0.6553	89.47	79.47	31.58	51.58
5	3.92	**3.92**	0.000	**0.000**	0.6053	**0.6632**	89.47	**70.53**	31.58	**62.11**
6	**2.11**	4.30	**0.003**	0.000	**0.5921**	0.6684	**57.89**	57.89	**60.53**	75.79
7	2.00	4.17	0.008	0.000	0.5842	0.6447	51.58	45.79	65.26	83.16
8	3.34	3.94	0.000	0.000	0.6211	0.6184	42.11	36.32	82.11	87.37

OR   : Odds Ratio
ROC: Receiver Operating Curve
p   : significance 0.05

Table 2. Determination of MB diagnosis

No subject	Subjective		Objective	Conclusion of MB
	Detection (questionnaire) +/-	The time (long lasting MB) +/-	Clinical examination +/-	+/-
1	+	+	+	+
2	+	+	-	-
3	+	-	+	+
4	+	-	-	-
5	-	+	+	+
6	-	+	-	-
7	-	-	+	+
8	-	-	-	-

The patient's diagnosis: Mouth Breathing (+) / No Mouth Breathing (-)

OURT-MB QUESTIONNAIRE:

I. SHEET FOR OBSTRUCTION OF UPPER RESPIRATORY TRACT DETECTION (OURT)

A. Nasal OURT detection

a. Child

Do you :

1. Have any history of sneezing in low temperature condition?
   No = 0   Yes   = 1
2. Have any history of sneezing if you were in the area with a lot of dust?
   No = 0   Yes   = 1
3. Often sneeze after you wake up from sleep?
   No = 0   Yes   = 1
4. Have any history of nasal congestion in low temperature condition?
   No = 0   Yes   = 1

Yes	No	
……	…...	1
……	…...	2
……	…...	3
……	……	4

Total score =

b. Parents

Does your child:

1. Have any history of nasal congestion caused by allergy?
   No = 0   Yes   = 1
2. Have an allergy which corresponds to nasal congestion?
   No = 0   Yes   = 1
3. Often notice her/his voice changes to nasal tone voice?
   No = 0   Yes   = 1

Yes	No	
……	…...	1
……	…...	2
……	…...	3

Total score =

B. Pharyngeal OURT detection

a. Child

Do you:
1. Have any history of pain while swallowing foods?
    No = 0   Yes = 1
2. Often have a sore throat while drinking?
    No = 0   Yes = 1
3. Have any history of sorethroat (itchy throat)?
    No = 0   Yes = 1
4. Have any history of congested throat?
    No = 0   Yes = 1
5. Have any history of difficulty in swallowing foods?
    No = 0   Yes = 1
6. Often experience your voice turning to husky voice?
    No = 0   Yes = 1
7. Often release mucus/slime from your throat?
    No = 0   Yes = 1

Yes	No	
……	…...	1
……	…...	2
……	…...	3
……	…...	4
……	…...	5
……	…...	6
……	…...	7

Total score =

b. Parents

Does your child:
1. Often experience pain while swallowing foods?
    No = 0   Yes = 1
2. Often experience sorethroat while drinking?
    No = 0   Yes = 1
3. Often having a fever caused by sore throat?
    No = 0   Yes = 1
4. Often experience his/her voice turning husky voice?
    No = 0   Yes = 1
5. Often release mucus/slime from his/her throat?
    No = 0   Yes = 1

Yes	No	
……	…...	1
……	…...	2
……	…...	3
……	…...	4
……	…...	5

Total score =

II. MOUTH BREATHING (MB) DETECTION SHEET

A. Mouth Breathing Questionnaire

a. Child

Do you:
1. Notice that your mouth tends to open frequently?
    No = 0   Yes =1
2. Often need to be warned by everyone to close your mouth?
    No = 0   Yes = 1
3. Feel relieved if you breathe while your mouth opens?
    No = 0   Yes = 1
4. Often experience that your mouth turns dry?
    No = 0   Yes = 1

Yes	No	
……	…...	1
……	…...	2
……	…...	3
……	…...	4

Total score =

b. Parents

<u>Does your child:</u>
1. Often to open his/her mouth while in relax condition?
        No = 0   Yes =1
2. Often complaining to have difficulty in breathing with nose?
        No = 0   Yes = 1
3. Often to be warned by everyone to close his/her mouth?
         No = 0   Yes = 1
4. Often opening his/her mouth while sleeping?
        No = 0   Yes = 1
5. Snoring while sleeping?
        No = 0   Yes = 1
6. Often experiencing difficulty in breathing leads to wake up from his/her sleep suddenly?
        No = 0   Yes = 1

Yes	No	
……	…...	1
……	…...	2
……	…...	3
……	…...	4
……	…...	5
……	…...	6

Total score =

B. Physical examination of mouth breathing habit

1. Physiological rest position of upper and lower lip:
    Come into contact mildly   = 0
    Separated   = 1

2. While patient breathes (inspiration), upper and lower lip:
    Come into closed contact   = 0
    Opened/no contact   = 1

3. Deep breath (while doing inhalation/inspiration): lateral nasal dilatation:
    Yes   = 0
    No   = 1

4. Put double-surfaced dental mirror as detector between lip and nose, make sure both surfaces are facing towards nose:
    Both mirror surfaces turn foggy/misty = 0
    No fog/mist on mirror surfaces facing both nostrils/only left nostril/
    only right nostril * = 1

5. If statement number 4 has a"0" score; flip the mirror surface facing towards lip:
    No fog/mist on mirror surfaces   = 0
    Mirror surfaces turn foggy/misty   = 1

6. Put small size butterfly-formed cotton as a detector, in front of the left nostril and consecutively in front of the right nostril. Observeif the cotton will:
    Move/shakein front of both nostrils   = 0
    Not move/shake in front of both nostrils/only
    left nostril/only right nostril *   = 1

7. Distance measurement between upper lip and lower lip, while in physiological rest position = …..mm

8. Period of mouth-tends-to-open habit = …………..(in year)

* Put a streak on statements that do not correspond with physical examination.

Total score =

Discussion

Jefferson concluded that early detection of MB is important to prevent the harm it causes, such as emotional, physical and psychological problems. There is a correlation between the MB and the characteristics of the harms it causes, so the presence of MB can be detected by recognizing the harm it causes.[6]

The questionnaire is a simple tool that can be used to conduct early detection of OURT and MB habits by dentists, orthodontists, pedodontists, general practicians, pediatricians and other medical experts. Thus all can participate in prevention of the harm caused by OURT and MB, so that the health of the next generation can be enchanced.[13]

The questionnaire revealed OURT and MB risk factors that affect the occurrence of DCF growth and development deviation. The questionnaire qualifies as a diagnostically sensitive measurement tool, meaning that it can detect the presence of disease (i.e., DCF morphologic deviation). The questionnaire also has specificity as a measurement tool, meaning that it can determine that the subject is not sick/not suffering from DCF morphologic deviation.

Willis provided a brief overview of methods for developing and testing survey questionnaires of the type commonly used in population-based research at the National Institutes of Health. The principles presented applied to a range of questions and were based on 25 years of experience with surveys involving knowledge, attitudes, risk behaviors, and health status. Questionnaires are a popular way to collect data in health research.[12]

The questionnaire developed in this research followed the right procedure for developing a questionnaire to produce a questionnaire with the necessary characteristics, including simplicity, not giving a double sense, and providing objectives, depth, and detail in the obtained data.

Willis claims that a questionnaire is better accompanied with another examination, as a questionnaire cannot stand on its own.[12] This research accompanied the questionnaire with a physical examination to strengthen the detection of MB. Willis tried to keep face-to-face interviews to around 30 minutes for an average-length interview. He claimed that he does not generally like conducting telephone or web surveys that are longer than 15 minutes on average and explained that 10 minutes would even be better.[12]

In this research, the questionnaire took about 15 minutes to fill out for each respondent.

A good questionnaire can be utilized as an evaluation tool for clinical teaching activities, both by educators as well as students. To obtain a good instrument, a questionnaire must be tested for validity and reliability.[14] This research produced a questionnaire that was tested for validity and reliability.

Conclusions

Early detection of OURT and the MB habit are important, in order to prevent the harms that can occur during the growth and development of DCF. A simple and inexpensive tool to detect the presence of OURT and MB is the questionnaire.

This research produced a valid and reliabile questionnaires to immediately detect the existence of OURT and MB and to predict impending DCF deviations in sufferers.

Acknowledgement

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