# Chapter one
# Introduction

## 1.1 Introduction

The Adenoids or nasopharyngeal tonsil is a group of lymphoid tissues present in the nasopharynx. Adenoids are usually recognised at 1 year of life. It usually increases in size from 3 years of age and decreases by attaining adolescence. It becomes symptomatic when it hypertrophies. Bilateral nasal obstruction, mouth breathing, snoring during sleep, sleepapnea, is difficulty in breathing during sleep are the common symptoms caused by adenoid hypertrophy. (Lawrence, 1995)

Various methods are used in assessing the adenoid hypertrophy such as Trans oral posterior rhinoscopic mirror examination, Transoral digital palpation, endoscopic assessment, acoustic rhinometry, rhinomanometry and radiological investigations. Due to non-cooperation by children for physical examination, often diagnosis is based mainly on radiological investigation. (Kurian, et al. 2005)

Adenoidectomy is one of the common surgical procedures performed on children during this age group. Adenoidectomy indication is based on the symptoms, physical examination and radiological investigation. In the past, mere adenoid hypertrophy had become an indication for removal. But now, adenoid hypertrophy is not itself an indication for adenoidectomy. Symptomatic adenoid with significant adenoid hypertrophy is the criteria used for the indication of adenoidectomy.

In this study, we are attempting to find the significant adenoid hypertrophy by a making an association of clinical symptoms severity score in relation to the size of the nasopharynx.

The symptoms included for clinical severity scoring are bilateral nasal obstruction, mouth breathing, snoring during sleep, sleep apnea (Frequent awakening during sleep) and difficulty in breathing during sleep. Each symptom will be graded based on the number of days affected in a week in to 0-No symptom, 1- Mild symptom, 2- Moderate symptom, 3- Severe symptom.

An individual patient can have a maximum score of 15. Lateral soft tissue neck x-ray investigation which was done as part of the diagnosis will be used to assess the size of the adenoid and the nasopharynx.

The adenoid to nasopharynx ratio will be calculated for each patient. The association between the clinical symptoms severity score to adenoid nasopharynx ratio will be done using the statistical formula and a conclusion will be arrived.

## 1.2 Study problem

The symptoms caused by adenoid hypertrophy are mostly due to where this lymphoid tissue is located; the adenoid is in the midline of the nasopharynx. In order to give a better treatment to the patients, it is important to know the severity of the clinical symptoms of the significant adenoid hypertrophy.

Better understanding of the disease process of adenoid hypertrophy it will be helpful to provide effective treatment to the patients by knowing whether the problem is significant or not.

## 1.3 Study Objectives

- To find the clinical symptoms severity score of adenoid hypertrophy in relation to the age.

- To find the adenoid nasopharynx ratio in relation to the age.
- To find the relation between the clinical symptoms severity score to adenoid- nasopharynx ratio.
- To evaluate the role of lateral neck soft tissue x-ray in the assessment of adenoid hypertrophy.

## 1.4 Aim of the study

Find out the relation between the severity of clinical symptoms of the significant adenoid hypertrophy and the Nasopharynx size be using the radiological investigation as main investigations tool.

## 1.5 Language consideration

All essential documents will be in both English and Arabic Information about the study, and consent forms will be available in both English and Arabic, All data will be recorded in English

# Chapter Two
# Literature Review

## 2.1 Embryology

Over the course of the first 3 weeks of gestation the embryo first exists as a flattened bilayer of cells in between the amniotic sac dorsally and the yolk sac ventrally. At the beginning of the third week the process of gastrulation occurs whereby the germ disk becomes trilaminar.

Towards the end of the first month the foregut comes to lie dorsal to the developing heart tube and developing septum transversum (developing diaphragm). In a human embryo, the stomodeum, a shallow depression lined with ectoderm is separated from the cephalic end of the foregut by the buccopharyngeal membrane. At about 26-27 days the buccopharyngeal membrane ruptures and the stomodeum becomes continuous with the foregut. (Lawrence, 1995)

A portion of the primitive foregut in conjunction with the branchial apparatus is responsible for development of the pharynx. The nasopharynx arises from the developing nose anterior to the eustachian tube and from the primitive pharynx posterior to it. The pharyngeal muscles are derived from the third and fourth pharyngeal arches.

## 2.2 Anatomy of Nasopharynx

Pharynx is situated behind the nasal cavities, mouth and larynx. It is a

musculomembranous tube 12 – 14 cm long extending from cranial base to level of 6th cervical vertebrae.

Nasopharynx is a part of pharynx posterior to nasal cavities and above the level of junction of hard and soft palate. Roof and posterior wall merge and are formed by mucoperiosteum which lies on body of sphenoid, basisphenoid and basiocciput, inferior to pharyngeal tubercle, mucosa covers the pharyngo basilar fascia, upper fibres superior constrictor and arch of atlas Floor is the formed by superior surface of soft palate anteriorly posteriorly floor is deficient where nasopharynx communicates with oropharynx Lateral wall has torus tubarius, an inverted J shaped mucosa covered prominence. Posterior to it is the lateral pharyngeal recess (Fossa of Rosenmuller) pharyngeal opening of eustachian tube is approximately one cm behind the posterior end of inferior turbinate. Levator palati muscle raises a bulge in the floor of Eustachian Tube opening Nasopharynx communicates anteriorly with nasal cavities through choana inferiorly with oropharynx through pharyngeal isthmus and laterally with middle ear through eustachian tube. (King EW, 1952)

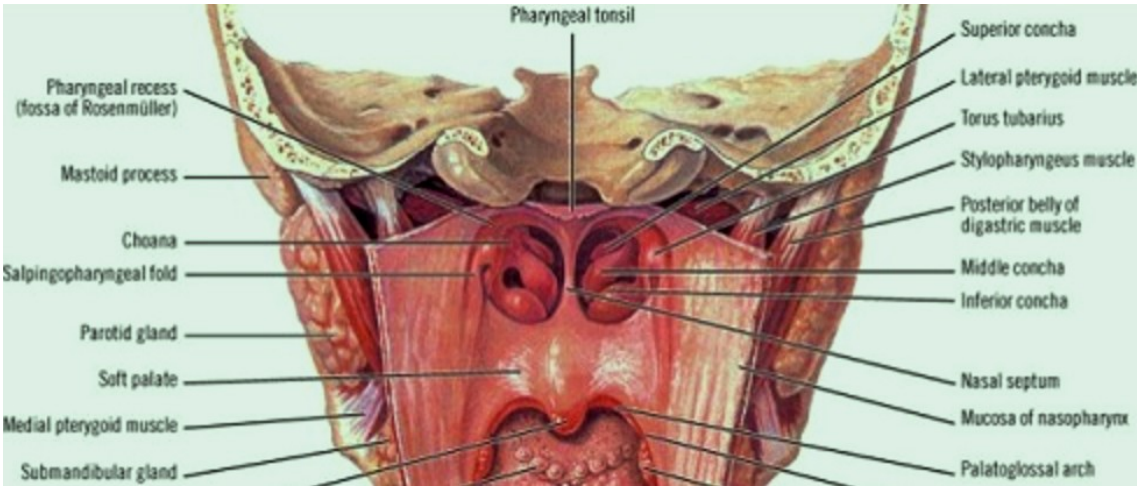


Figure (2-1) Anatomy of Nasopharynx

## 2.3 **Anatomy of Adenoids**

Santorini described nasopharyngeal lymphoid aggregate and Luschka's Tonsil in 1724. Wilhelm Meyer coined the term Adenoid, described as nasopharyngeal vegetations in 1870.

It forms a part of Waldeyer's ring of lymphoid tissue; palatine tonsil, tubal tonsil, lingual tonsil, lateral pharyngeal bands & .nodules of posterior pharyngeal wall. In early childhood this is the first site of immunological contact for inhaled antigens. Nasopharyngeal tonsil is median tonsillar mass situated in roof of nasopharynx. It is shaped like a truncated pyramid hanging from the roof .It consists of a mass of lymphoid tissue embedded in mucosa of nasopharynx, covered by ciliated respiratory epithelium. Superior surface is separated from periosteum of sphenoid & occipital bones by a connective tissue hemicapsule to which fibrous frame work is anchored.

Nasopharyngeal tonsil is subdivided into 4-6 lobes by connective tissue septa, located within this connective tissue are some seromucinous glands with their ducts extending through lymphoid tissue to surface. Epithelium lining the folds of crypts are patches of pseudostratified ciliated, nonkeratinized stratified squamous & occasionally simple cuboidal epithelium. In all these types of epithelial cover there are patches of typical reticulated epithelium of variable size & depth. Internal structure of adenoids closely resembles that of palatine tonsil; follicles with germinal centres & mantle zones containing B lymphocytes , follicular dendritic cells & macrophages, extrafollicular areas with T lymphocytes & interdigitating cells . (Vilella BS, et al. 2006)

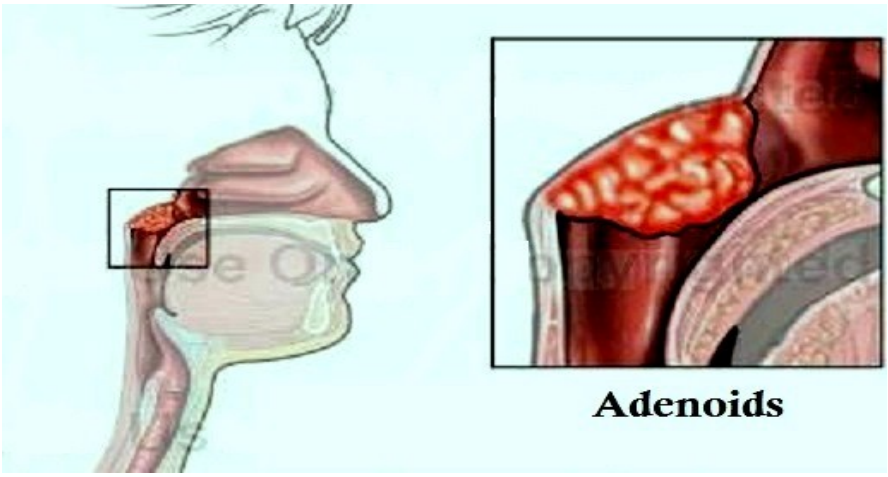


Figure (2-2) Anatomy of Adenoids

## 2.4 Physiology of Adenoids

The adenoid frequently hypertrophies at a rate which exceeds the growth increment of nasopharynx, especially during preschool years. Adenoid growth was at the expense of nasopharyngeal airway occluding almost total nasopharyngeal area. Obstruction of nasopharynx predisposes child to chronic mouth breathing, pathogenic for respiratory obstruction syndrome described by Ricketts. (King EW, 1952).

### 2.4.1 Role of pharyngeal lymphoid

This lymphoid tissue is stationed at gateway of respiratory & alimentary tracts. These regions are areas of high bacterial content & adenoids come in contact with the inspired air streams. The raised parallel ridges on these bodies may help to increase the surface area for sampling the bacteria in the air. Further, ciliary clearance in nasopharynx sweeps nasal mucus, with its contained random sample of bacterial content of air & nose, over adenoids.

### 2.4.2 Functions of Lymphoid tissue

Formation of lymphocytes: Lymphoid tissue is the site of formation of lymphocytes. They are derived from the primitive reticular cells in germinal centres. The first cell in development from reticulum cell to small lymphocyte is lymphoblast,

Lymph filtration: Barrier function – this is one of the methods by which lymphoid tissue serves as a major component in body`s defences against invasion by micro –organisms,

Reaction centres : Toxin clearance from blood – Hellman & his associates postulated that clearance of toxins from blood takes place by cells in so called germ centres, Body`s cellular defence to infection: Lymphocytes, together with their derivative plasma cells, form part of cellular response characteristic of chronic inflammations, They play definite phagocytic role & they are source of cells becoming transformed into plasma cells, fibroblasts & macrophages, Antibody synthesis: Lymphoid tissue has important role in synthesis of antibody & their transport & release into circulation.

## 2.5 Pathological Effects of Adenoids

Adenoids are present at birth and then begin to enlarge. They, along with the tonsils, continue to grow until individuals are aged 5-7 years. The adenoids usually become symptomatic, with snoring, nasal airway obstruction, and obstructed breathing during sleep, when children are aged approximately 18-24 months. By the time children reach school age, the adenoids normally begin to shrink, and, by the time children reach preteen or teenage years, the adenoids are usually small enough for the child to become asymptomatic.

At birth, the nasopharynx and, thus, the adenoids, are accessible to many organisms. The establishment of the upper respiratory tract is initiated at birth. By the time children are aged 6 months, lactobacilli, anaerobic *streptococci*, Actinomycosis, *Fusobacterium* species, and *Nocardia* species are present. Normal flora found in the adenoid consists of alpha-hemolytic streptococci and enterococci, *Corynebacterium*

species, coagulase-negative staphylococci, *Neisseria* species, *Haemophilus* species, *Micrococcus* species and *Stomatococcus* species. The adenoids can become infected and harbour pathogenic bacteria, which may lead to the development of disease of the ears, nose, and sinuses. (Robb, 2007)

Based on the current literature, adenoids can contribute to recurrent sinusitis and chronic persistent or recurrent ear disease because they can harbour a chronic infection. The type and amount of pathogenic bacteria seem to vary based on the disease present and the age of the child.

Overall, the most commonly cultured bacteria have been Haemophilus influenzae, group A beta-hemolytic Streptococcus, Staphylococcus aureus, Moraxella catarrhalis, and Streptococcus pneumoniae, usually in that order. It has been found resistant bacteria of the 3 most common pathogens of otitis media and rhinosinusitis (i.e., H influenzae, M catarrhalis, and S pneumoniae) in children with those diseases. (Robb, 2007)

Adenoids may be implicated in upper respiratory tract disease due to partial or complete obstruction of nasal choana and as a result of sepsis, Otitis media with effusion, Recurrent acute & chronic inflammation of adenoid & increased bacterial load particularly Haemophilus influenza results in squamous metaplasia, fibrosis of interfollicular interconnective tissue & reduced mucociliary clearance, results in development of biofilm infection resulting in middle ear effusion, Chronic gastroesophageal reflux result in inflammation of nasopharynx & adenoid resulting in Otitis media effusion, Upper airway obstruction & Obstructive sleep Apnea, Obstructive sleep apnea in childhood, peak incidence is 3-6 yrs. of age, Airway obstruction due to adenoidal hypertrophy produce depressed arterial PaO2 & PaCO2 levels. (Kemaloglu et

al., in 1999), Rhinosinusitis, Recurrent Acute Otitis Media, Olfactory sensitivity is reduced in adenoidal hypertrophy children's, Neoplasia: Unsuspected neoplasia of adenoid is rare. Non-Hodgkin's lymphoma is encountered. (Robb, 2007)

## 2.6 Theoretical Background

Proposed the adenoidal nasopharyngeal ratio as a convenient method to evaluate adenoid enlargement. In his study, 150 children 4- 10 years of age were divided into 6 subgroups according to clinical assessment & age. According to him ANR presented statistically significant differences between adenoidectomy candidates & control groups. He stated that in control group ANR ranges from 0.48 – 0.56 & in adenoidectomy candidates it ranges from 0.67 – 0.72. He observed that adenoidal depth was significantly larger in adenoidectomy candidates than normal subjects. (Kemaloglu et al., in 1999)

Evaluated the supine & erect lateral neck radiographs of 50 patients with upper airway obstruction due to enlarged adenoids & tonsils. His aim was to find out whether supine & erect views are more useful than a single film. According to him the mean ANR`s were nearly the same for erect & supine positions (0.71 & 0.69 respectively).
He stated that supine radiograph is technically easier to perform, is entirely satisfactory for appraising the size of the adenoids. (Mahboubi et al., in 1985)

The author did a study & tried to determine the correlation between control group & possible adenoidectomy candidates by calculating the ANR`s using lateral radiographs. He reported that he ANR`s of normal children & Possible adenoidectomy

candidates were 0.58 & 0.71 respectively. (Elwany et al., 1987)

A study to evaluate the reliability of x- rays in diagnosis of adenoidal hypertrophy & to validate this with nasopharyngoscopy which is existing gold standard. They studied 26 children from 3 – 12 years age. Lateral neck radiographs & nasopharyngoscope was done to all. Study resulted that 17 of them had complete correlation between x- ray & endoscopy findings. Conclusion was that lateral x- ray of neck besides being a non-invasive procedure, still remains a reliable & valid diagnostic test in evaluation of hypertrophied adenoids. (Kurien et al., in 2005)

A study on 85 children aged 2 – 12 years. Endoscopy was done & obstruction ratio obtained by adenoidal tissue obstructing the choana- 88% is average. Lateral radiograph of nasopharynx taken & ANR was 0.87. There was statistical correlation between ANR & nasal endoscopic findings. They concluded that ANR is easily applicable, non-invasive method that can correctly measure the size of adenoidal tissue. (Caylakli F et al., in 2008)

A study by taking lateral radiographs of nasopharynx. He assessed the adenoid thickness by measuring the distance along a perpendicular line drawn from the pharyngeal tubercle on the base of skull to maximal adenoidal convexity. He found that lateral radiograph is the best diagnostic tool for adenoid assessment. (Johannesson S., 1967)

A study on 95 children in 2010 with upper airway obstruction. Clinical symptoms were assessed. All underwent ENT examination and the tonsil size was graded, digital lateral soft tissue radiographs of nasopharynx were taken. Study did not

find statistically significant correlation between symptom scores and radiologic measurement. Correlations between obstructive sleep apnea score and ANR were weak not significant. But found a statistically correlation between tonsil grade and symptom score. He concluded that radiologic measurement of nasopharynx obstruction does not correlate with clinical symptoms. (Sema et al., 2010)

# Chapter Three
# Material and Methodology

## 3.1 Study Design:

A cross sectional study has been done on 50 adenoid hypertrophy patients aged between 3 years to 12 years visiting the ENT outpatient department and radiology department of Al Gharbia Hospital, Al Silla.

The study sample was consisted of (50) Patients who are clinically diagnosed and radiologically confirmed, the study duration was 3 to 6 month

## 3.2 Study sample selection

Patient between the ages of 3 to 12 years of both sexes has been included.

### 3.2.1 Inclusion criteria

Bilateral nasal obstruction in the last 3 months, Snoring during sleep in the last 3 months, Mouth breathing in the last 3 months, Breathing difficulty during sleep in the last 3 months, Sleep apnea (Frequent awakening during sleep) in the last 3 months

### 3.2.2 Exclusion criteria

Clinical symptoms of allergic rhinitis, Usage of topical nasal decongestants or steroids, Facial abnormality or syndromic condition, previous history of adenoidectomy.

## 3.6 Data collection and analysis

ANR was calculated by dividing adenoidal depth by nasopharyngeal depth. Data will be entered on master data sheet. Data was analyzed using statistical SPSS software. Clinical symptom severity score was compared with adenoid nasopharyngeal ratio and age.

## 3.7 Variables of the study:

Clinical symptoms severity score, adenoid nasopharynx ratio, age, Adenoid size, Nasopharynx size

## 3.8 Example of standard master data sheet will be used in data collection

| Age | Clinical symptoms severity score | adenoid nasopharynx ratio | Adenoid size | Nasopharynx size |
|---|---|---|---|---|

## 3.9 Methodology:

Patients who were clinically diagnosed and radiologically confirmed have been included in the study after the consent from either of the parent as the study group belongs to the children. Symptoms of adenoid hypertrophy such as bilateral nasal block, snoring during sleep, mouth breathing, difficulty in breathing during sleep and sleep apnea (Frequent awakening during sleep) were recorded in a proforma (copy enclosed) and has been graded as: 0-No symptom, 1-Mild (Symptoms 2 days in a week), 2-Moderate (Symptoms 4 days in a week), 3- Severe (Symptoms more than 4 days in a week)

So an individual patient could have a maximum clinical symptoms

severity score of 15. X-ray soft tissue of the nasopharynx investigation which was done as part of the diagnosis and treatment of the patient has been used to calculate the sizes of the adenoid and the nasopharynx.

Adenoid size (A) has been calculated as the distance from the point of maximal convexity of adenoidal shadow to the anterior margin of spheno-occipital synchondrosis.

Nasopharynx size (N) is the distance between posterior borders of hard palate to the anterior margin of spheno-occipital synchondrosis as shown in the following figure. (Fujioka M, Young LW, et al., 1979)

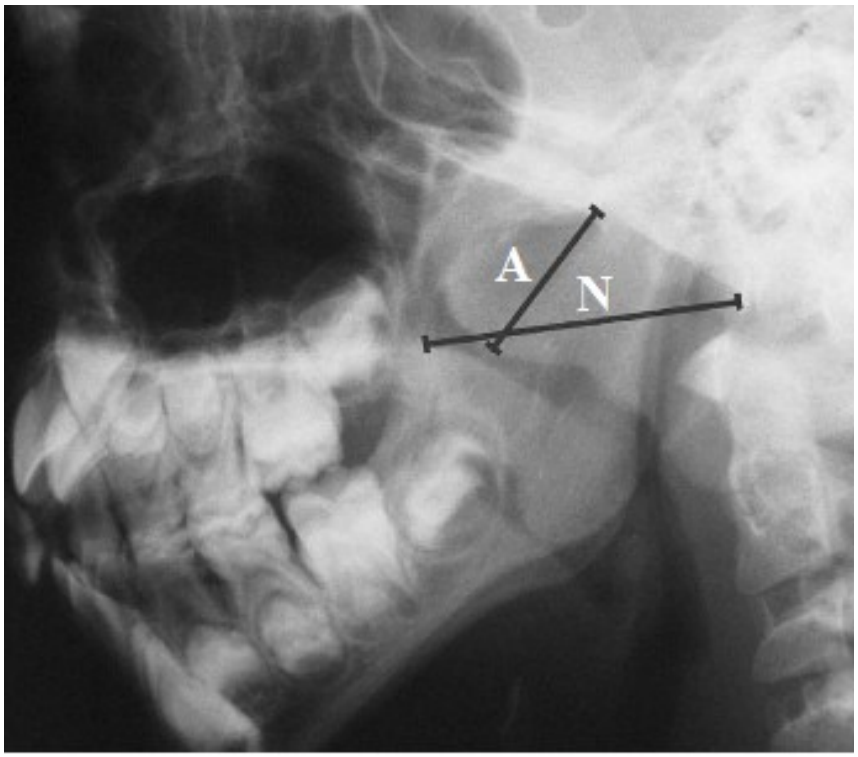


Figure (3-1) Adenoid to Nasopharynx ratio (ANR) is estimated by “A” dividing “N”

# Chapter Four

# Results

35 males and 15 females with age group 0f 4 to 12 years (mean 6.6 years) were included in the study. Clinical symptoms severity score ranged from 3 to 12 (mean 7) and adenoid nasopharynx ratio ranged from 0.4 to 0.9 (mean 0.69) significant correlation was observed between clinical severity score and adenoid nasopharynx ratio.

**Table (4-1) demonstrates Pearson correlation between the Clinical symptoms severity score and adenoid nasopharynx ratio.**

| | | Clinical symptoms severity score | Adenoid-nasopharynx ratio |
|---|---|---|---|
| Clinical symptoms severity score | Pearson Correlation | 1 | .892** |
| | Sig. (1-tailed) | | .000 |
| | N | 50 | 50 |
| Adenoid-nasopharynx ratio | Pearson Correlation | .892** | 1 |
| | Sig. (1-tailed) | .000 | |
| | N | 50 | 50 |

*correlation is significant at the 0.05 level (1- tailed).

**Correlation is significant at the 0.01 level (1- tailed).

**Table (4-2) demonstrates Pearson correlation between Age and adenoid nasopharynx ratio.**

| | | Age | Adenoid-nasopharynx ratio |
|---|---|---|---|
| Age | Pearson Correlation | 1 | -.460** |
| | Sig. (1-tailed) | | .001 |
| | N | 50 | 50 |
| Adenoid-nasopharynx ratio | Pearson Correlation | -.460** | 1 |
| | Sig. (1-tailed) | .001 | |
| | N | 50 | 50 |

*correlation is significant at the 0.05 level (1- tailed).

**Correlation is significant at the 0.01 level (1- tailed).

**Table (4-3) demonstrates Pearson correlation between Age and the Clinical symptoms severity score.**

| | | Age | Clinical symptoms severity score |
|---|---|---|---|
| Age | Pearson Correlation | 1 | -.356* |
| | Sig. (1-tailed) | | .012 |
| | N | 50 | 50 |
| Clinical symptoms severity score | Pearson Correlation | -.356* | 1 |
| | Sig. (1-tailed) | .012 | |
| | N | 50 | 50 |

*correlation is significant at the 0.05 level (1- tailed).

**Correlation is significant at the 0.01 level (1- tailed).

Seen from the table above and the presence of correlation statistically between age and the Clinical symptoms severity score, Adenoid-nasopharynx ratio) according to the moral standards of moral denote statistical sig, all of which were less than (0.05, 0.01). That means there is high correlation between the severity of symptoms, age, and adenoid nasopharynx ratio.

And also is evident from the table above and the presence of statistically significant correlation between the Clinical symptoms severity score and Adenoid-nasopharynx ratio, according to the moral standards of moral significance statistical sig, all of which were less than (0.05).

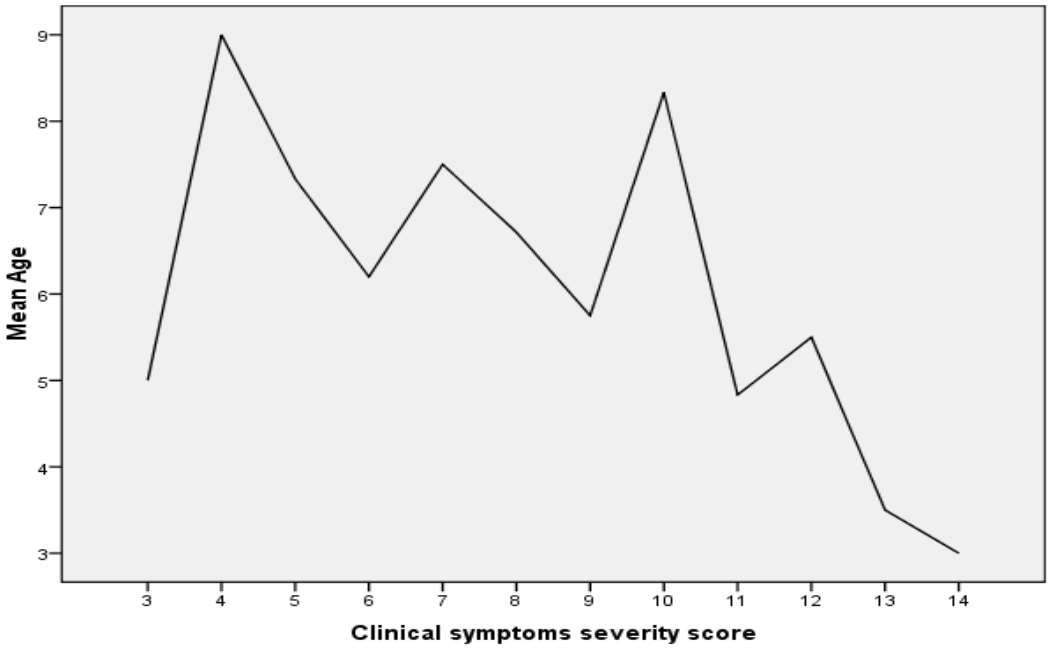


Figure (4-1) graph demonstrating the relation between Mean Age and the clinical symptoms severity.

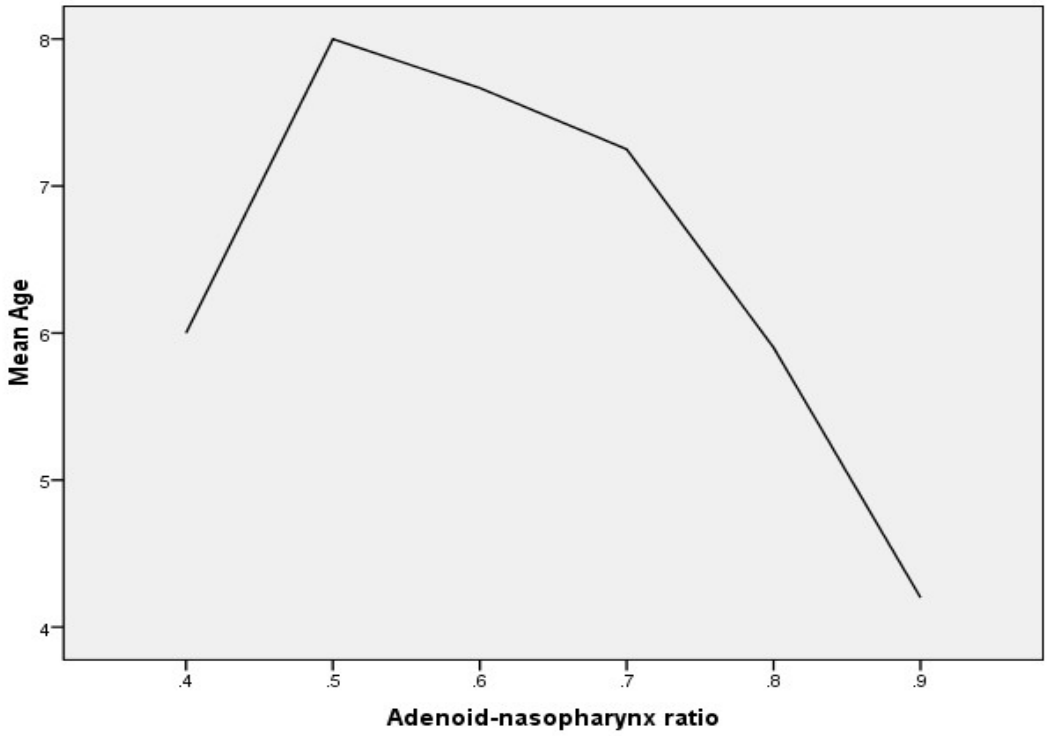


Figure (4-2) Graph demonstrating the relation between mean Age and Adenoids Nasopharynx ratio.

Table (4-4) demonstrate the mean of the age groups in relation to clinical symptoms severity scores.

| Age group | Mean |
|---|---|
| 3-6 | 9.05 |
| 6-9 | 7.88 |
| 9-12 | 7.40 |
| Total | 8.40 |

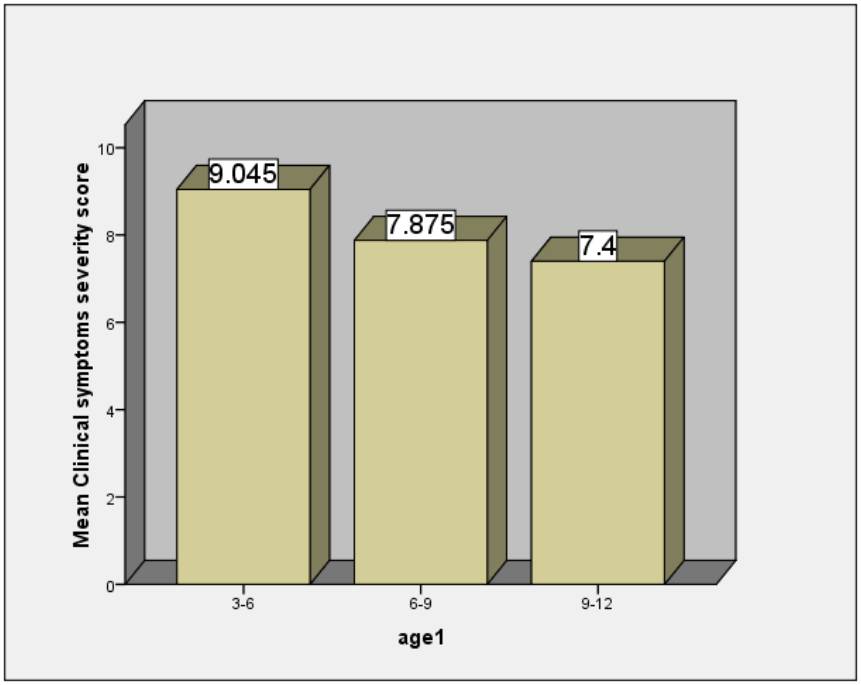


Figure (4-3) demonstrates the mean of the age groups in relation to clinical symptoms severity scores.

Table (4-5) demonstrate the mean of the age groups in relation to adenoid nasopharynx ratio.

| Age group | Mean |
|---|---|
| 3-6 | 0.773 |
| 6-9 | 0.650 |
| 9-12 | 0.630 |
| Total | 0.712 |

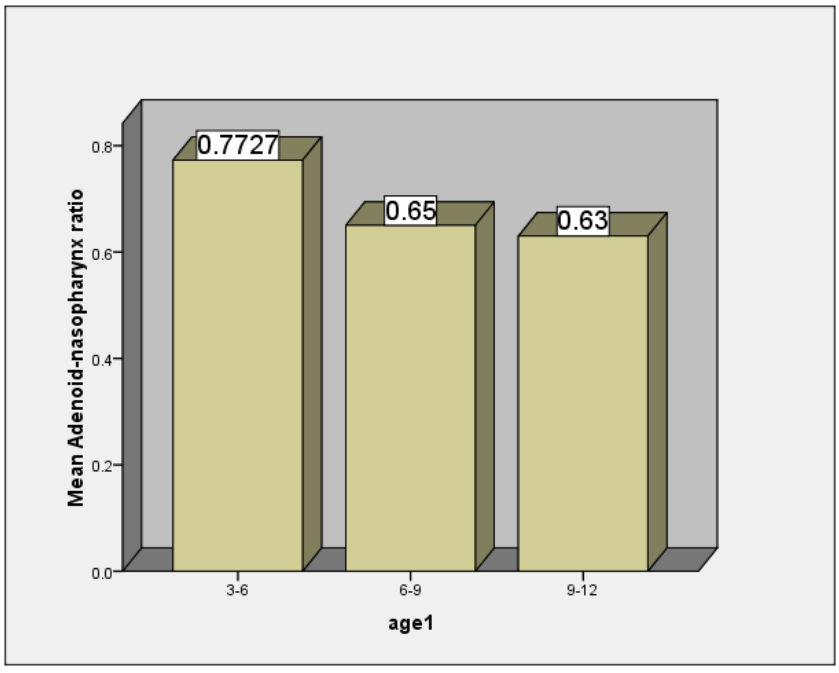


Figure (4-4) demonstrates the mean of the age groups in relation to adenoid nasopharynx ratio.

# Chapter Five

# Discussion, Conclusion and Recommendations

## 5.1 Discussion

In children, adenoids hypertrophy occurs in response to exposure to a variety of conditions such as: viruses, bacteria, allergen, foods and environmental irritants. However, the adenoids in many children regress during puberty and early childhood raising a possibility of a hormonal influence. (Oluwole M, Mills RP., 1995)

There are various methods widely used in the assessment of adenoid hypertrophy such as clinical symptoms severity score, endoscopic assessment, and radiological investigations. Clinical symptoms of bilateral nasal obstruction, mouth breathing, snoring during sleep, sleep apnea (Frequent awakening during sleep) and difficulty in breathing during sleep are considered as primary indicators for the severity of adenoidal enlargement and have been a primary focus of many studies. (Brooks LJ, Stephens BM, et al., 1998)

Soft tissue lateral neck radiographs have been studied in the assessment of adenoid hypertrophy. Many different methods have been described in the evaluation of adenoids on lateral neck radiographs. The most frequently used methods include measuring adenoid size (A), nasopharynx (N) and adenoid to nasopharynx ratio (ANR). (Fujioka M, Young LW, et al., 1979), see Figure (3-1) which has been used in our study.

Some studies show a weak correlation between the adenoid to nasopharynx ratio and adenoid enlargement. (Cohen LM, Koltai PJ, et al., 1992). Whereas others demonstrate a poor correlation between the adenoid to nasopharynx ratio, adenoid enlargement, and clinical symptoms. (Fernbach M, Brouillette RT, et al., 1983)

The main objective of our study was to find relation between the clinical severity score of adenoid hypertrophy with the adenoid nasopharynx ratio (ANR). In addition to evaluate the role of lateral neck soft tissue x-ray in the assessment of adenoid hypertrophy.

The study found that there is high correlation between the clinical severity score of adenoid hypertrophy and the adenoid nasopharynx ratio. Clinical symptom severity score is a valuable tool for the prediction of significant adenoid hypertrophy.

The study also found that the lateral neck X-ray was shown to be effective tool to evaluate and confirm the significant adenoids hypertrophy after taking into consideration the clinical severity score.

## 5.2 Conclusion

Clinical severity symptom score is a valuable tool for diagnosing the significant adenoid hypertrophy patients. Routine X ray nasopharynx investigation can be indicated based on the clinical symptom severity score. A low clinical symptom severity score may avoid the patient for unnecessary routine radiological investigation.

## 5.3 Recommendations

- Using the X-ray is first option for diagnosis the adenoid hypertrophy.
- Uses of other imaging modalities as diagnosis tool of adenoids.
- In case of any symptomatic adenoids early assessment and treatment is recommended to avoid any complications.

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# Appendix

## Appendix (A):

**Patient Proforma**

Serial Number:
Date:

Age:

Sex:

Symptom Grade: 0-No symptom,

1-Mild (Symptoms 2 days in a week

2-Moderate (Symptoms 4 days in a week)

3- Severe (Symptoms more than 4 days in a week)

Nasal obstruction

Snoring during sleep

Mouth breathing

Difficulty in breathing
during sleep

Sleep apnea during sleep

TOTAL SCORE

X ray Nasopharynx investigation findings.

Adenoid size

Nasopharynx size

Adenoid – Nasopharynx Ratio

## Appendix (B):

CONSENT FORM (**استمارة الموافقة**)

Project Title: A Prospective Study on Severity Symptoms of Adenoid hypertrophy in Relation to The Size of the Nasopharynx

**الموضوع : دراسة العلاقه بين مدى شدة الأعراض تضخم اللحميات وحجم البلعوم الأنفي**

Investigators: Dr Mahendra Kumar

Anwar Mohieldeen Mohamed Ahmed Salim

Dear Parent,

A research study is a way to learn more about people. We are doing a research study on adenoids, which is a lymphoid tissue commonly present in the child's back of the nose (nasopharynx). When adenoid increases in size it causes symptoms like nose block, mouth breathing, difficulty in breathing during sleep, snoring during sleep and frequent awakening during sleep. Adenoid enlargement is confirmed by x ray investigation. We will be doing a study to know the sizes of the adenoids and the nasopharynx with respect to the severity of symptoms. The study will help in better understanding of the disease process and selecting an appropriate treatment for the future patients.

**اعزائي الأباء :**

**هي عباره عن دراسة بحثية لمعرفة المزيد عن الناس. نقوم هذه الدراسة البحثية عن دراسة اللحميات التي هي عباره عن الأنسجة لمفاوية الموجوده بشكل شائع في الأطفال في الجزء الخلفي من الأنف. عندما يزيد حجم**

اللحمية فانه يسبب أعراض مثل سد الأنف والتنفس عن طريق الفم ، وصعوبة في التنفس أثناء النوم، الشخير أثناء النوم وتوقف التنفس أثناء النوم. ويتم تشخيص تضخم اللحميات عن طريق فحص بالأشعة السينية. نحن في هده الدراسه سوف نقوم بإجراء دراسة لمعرفة العلاقه بين حجم اللحميات مع البلعوم الأنفي فيما يتعلق بشدة الأعراض. وسوف تساعد هذه الدراسة في فهم أفضل لعملية المرض واختيار العلاج المناسب للمرضى في المستقبل

If you decide that your child wants to be part of this study, you will be asked about the symptoms of adenoid enlargement of your child and confirmation is done by X-ray investigation. We have obtained permission from the hospital ethical research committee to conduct the study.

اذا قررت أن يكون طفلك جزء من هذه الدراسة، سيتم سؤاله عن أعراض تضخم اللحميات ويتم التأكيد عن طريق فحص بالأشعة السينية. لقد حصلنا على إذن من لجنة أخلاقيات البحوث للمستفيات الغربيه لإجراء الدراسة

There are no apparent risks involved for participating in the study. You or your child identity will not be recorded or mentioned anywhere during the process of the study.

لا توجد مخاطر واضحة من المشاركة في الدراسة. لن يتم تسجيل أسم طفلك او اسمك في أي مكان أثناء عملية الدراسة

If you do not want to be in this research study, even then the, method of examination or treatment will not differ, you will not be provided with any monetary benefit for participating in the study, but you will be appreciated for participating in the study which will be beneficial to the mankind

إذا كنت لا تريد أن تكون في هذه الدراسة البحثية، فإن طريقة الفحص أو العلاج لا تختلف، لن يتم تزويدك أي فائدة مالية للمشاركة في الدراسة، ولكن سوف تكون محل تقدير للمشاركة في الدراسة والتي سوف تكون مفيدة للبشرية

When we are finished with this study we will write a report about what was learned. Your child does not have to participate in this study if you do not want to be. If you decide to stop after we begin, that’s okay too. You can withdraw from participating at any stage of the study.

If you decide your child want to be in this study, please sign your name.

عندما يتم الانتهاء من هذه الدراسة سنقوم بكتابة تقرير حول ما تم تعلمه لا يملك طفلك للمشاركة في هذه الدراسة إذا كنت لا تريد أن تكون. إذا قررت أن تتوقف بعد أن نبدأ، هدا حق لكم . يمكنك الانسحاب من المشاركة في أي مرحلة من مراحل الدراسة

إذا قررت ان يشارك طفلك في هده الدراسه ، يرجى تسجيل اسمك

I, انا _____, give my consent on behalf of my

Child (وإعطاء موافقتي نيابة عن ابني) _____, to be in this research study (للمشاركه في هذه الدراسة)

_____

_____

(Sign your name here) التوقيع

(Date) التاريخ

## Appendix (C):

**Samples of study population's X-ray images**


Figure (6-1) Lateral nasopharynx x-ray image showing the measurement of Adenoid size and nasopharynx size of 10 years old male child


Figure (6-2) Lateral nasopharynx x-ray image showing the measurement of Adenoid size and nasopharynx size of 8 years old male child


Figure (6-3) Lateral nasopharynx x-ray image showing the measurement of Adenoid size and nasopharynx size of 11 years old male child

Figure (6-4) Lateral nasopharynx x-ray image showing the measurement of Adenoid size and nasopharynx size of 4 years old male child


Figure (6-5) Lateral nasopharynx x-ray image showing the measurement of Adenoid size and nasopharynx size of 5 years old male child


Figure (6-6) Lateral nasopharynx x-ray image showing the measurement of Adenoid size and nasopharynx size of 4 years old female child


Figure (6-7) Lateral nasopharynx x-ray image showing the measurement of

Adenoid size and nasopharynx of 10 years old male child


Figure (6-8) Lateral nasopharynx x-ray image showing the measurement of Adenoid size and nasopharynx of 6 years old male child


Figure (6-9) Lateral nasopharynx x-ray image showing the measurement of Adenoid size and nasopharynx of 4 years old female child


Figure (6-10) Lateral nasopharynx x-ray image showing the measurement of Adenoid size and nasopharynx of 5 years old female child

## Appendix (D):

Table (6-1): Master data sheet was used in data collection:

| No | Age | Clinical symptoms severity score | Adenoid nasopharynx ratio | Adenoid size | Nasopharynx size |
|---|---|---|---|---|---|
| 1. | 8 | 6 | 0.5 | 12 | 25 |
| 2. | 4 | 6 | 0.6 | 12 | 26 |
| 3. | 6 | 11 | 0.8 | 27 | 35 |
| 4. | 10 | 8 | 0.7 | 18 | 25 |
| 5. | 4 | 11 | 0.8 | 18 | 23 |
| 6. | 10 | 10 | 0.8 | 21 | 27 |
| 7. | 11 | 10 | 0.8 | 24 | 32 |
| 8. | 5 | 3 | 0.4 | 10 | 25 |
| 9. | 5 | 7 | 0.6 | 20 | 31 |
| 10. | 4 | 11 | 0.9 | 22 | 25 |
| 11. | 4 | 10 | 0.9 | 24 | 26 |
| 12. | 6 | 6 | 0.6 | 17 | 26 |
| 13. | 10 | 8 | 0.6 | 23 | 38 |
| 14. | 11 | 7 | 0.6 | 22 | 35 |
| 15. | 7 | 6 | 0.5 | 19 | 35 |
| 16 | 5 | 7 | 0.7 | 20 | 28 |

| | | | | | |
|---|---|---|---|---|---|
| . | | | | | |
| 17. | 9 | 7 | 0.7 | 23 | 31 |
| 18. | 7 | 8 | 0.6 | 22 | 35 |
| 19. | 5 | 8 | 0.8 | 19 | 22 |
| 20. | 4 | 13 | 0.9 | 23 | 24 |
| 21. | 5 | 8 | 0.8 | 19 | 22 |
| 22. | 5 | 8 | 0.7 | 19 | 27 |
| 23. | 3 | 14 | 0.9 | 16 | 17 |
| 24. | 3 | 9 | 0.8 | 12 | 15 |
| 25. | 9 | 5 | 0.5 | 15 | 28 |
| 26. | 5 | 5 | 0.5 | 15 | 27 |
| 27. | 7 | 12 | 0.9 | 21 | 24 |
| 28. | 8 | 5 | 0.6 | 16 | 26 |
| 29. | 11 | 4 | 0.5 | 11 | 22 |
| 30. | 3 | 9 | 0.8 | 12 | 15 |
| 31 | 4 | 11 | 0.9 | 25 | 29 |

| . | | | | | |
|---|---|---|---|---|---|
| 32. | 4 | 12 | 0.9 | 19 | 21 |
| 33. | 6 | 6 | 0.6 | 20 | 30 |
| 34. | 12 | 9 | 0.6 | 16 | 26 |
| 35. | 5 | 8 | 0.9 | 14 | 16 |
| 36. | 7 | 4 | 0.4 | 9 | 20 |
| 37. | 5 | 9 | 0.8 | 21 | 26 |
| 38. | 7 | 11 | 0.8 | 19 | 23 |
| 39. | 4 | 11 | 0.9 | 22 | 25 |
| 40. | 3 | 13 | 0.9 | 22 | 23 |
| 41 | 5 | 8 | 0.7 | 19 | 28 |
| 42 | 4 | 12 | 0.9 | 20 | 26 |
| 43 | 6 | 11 | 0.8 | 26 | 33 |
| 44 | 4 | 11 | 0.8 | 25 | 31 |
| 45 | 11 | 10 | 0.6 | 22 | 35 |
| 46 | 10 | 10 | 0.6 | 21 | 33 |
| 47 | 4 | 11 | 0.8 | 24 | 29 |
| 48 | 10 | 8 | 0.7 | 23 | 32 |
| 49 | 5 | 8 | 0.6 | 21 | 32 |
| 50 | 8 | 6 | 0.6 | 19 | 33 |