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The Correlation Between Tonsil Size and Adenoid Size in School-Aged Children in Kut City, Wasit Province, Iraq

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العلاقة بين حجم اللوزتين وحجم اللحمية لدى الأطفال في سن المدرسة في مدينة الكوت، محافظة واسط، العراق

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Abstract:

Adenoid hypertrophy and tonsillar enlargement are among the most frequent causes of upper airway obstruction in children. This study aimed to assess the correlation between tonsil size and adenoid size and to examine whether tonsillar grading can be used to estimate adenoid size. A prospective observational study was conducted at the ENT clinic of Al-Zahraa Teaching Hospital, Kut City, Wasit, Iraq, from January 2023 to December 2025. Children aged 3–16 years presenting with symptoms suggestive of adenoid and/or tonsillar hypertrophy were enrolled. Tonsil size was graded using the Brodsky scale, and adenoid size was graded endoscopically using the Parikh system. Data were analyzed using cross-tabulation, Fisher's exact test, Cramér's V, and Spearman's rank correlation, with $p < 0.05$ considered significant. A total of 120 children were evaluated (58.3% male). Grade 4 adenoids were found in 53.3% of cases, and grade 2 was the most frequent tonsillar grade (36.7%). Adenoid and tonsil grades were significantly associated (Fisher's exact test, $p < 0.001$; Cramér's $V = 0.379$), whereas the rank correlation was positive but weak ($\rho = 0.230$, $p = 0.011$). Grade 4 tonsils predicted grade 4 adenoids with a specificity of 96.4% and a positive predictive value of 92.6%, but the sensitivity was only 39.1%. Thus, large tonsils are a reliable indicator of severe adenoid hypertrophy, although small tonsils do not exclude it. Tonsillar assessment may help clinicians estimate adenoid size when endoscopic evaluation is not feasible, as in uncooperative children or those with cognitive impairment, and may support family counseling.

Keywords: Adenoid hypertrophy, Tonsil size, Nasoendoscopy, Brodsky grading, Parikh grading, Upper airway obstruction

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الملخص

يُعدّ تضخم اللحمية وتضخم اللوزتين من أكثر أسباب انسداد المجرى الهوائي العلوي شيوعاً لدى الأطفال. هدفت هذه الدراسة إلى تقييم العلاقة بين حجم اللوزتين وحجم اللحمية، ومعرفة إمكانية الاعتماد على تصنيف اللوزتين في تقدير حجم اللحمية. أُجريت دراسة رصدية استباقية في عيادة الأنف والأذن والحنجرة في مستشفى الزهراء التعليمي في مدينة الكوت، محافظة واسط، العراق، للمدة من كانون الثاني 2023 إلى كانون الأول 2025. شملت الدراسة الأطفال بعمر 3–16 سنة ممن راجعوا بأعراض توحي بتضخم اللحمية و/أو اللوزتين. قُيّم حجم اللوزتين باستخدام مقياس برودسكي، وقُيّم حجم اللحمية بالتنظير الأنفي وفق تصنيف باريخ. حُلّلت البيانات باستخدام برنامجي SPSS الإصدار 24 وJamovi الإصدار 2.6، باستعمال الإحصاء الوصفي والجداول التقاطعية واختبار فيشر الدقيق ومعامل كرامر ومعامل ارتباط سبيرمان للرتب، وعُدّت القيمة الاحتمالية أقل من 0.05 ذات دلالة إحصائية. شملت الدراسة 120 طفلاً (58.3% ذكور). وُجدت اللحمية من الدرجة الرابعة لدى 53.3% من الحالات، وكانت الدرجة الثانية هي الأكثر شيوعاً بين درجات اللوزتين (36.7%). أظهرت النتائج ارتباطاً معنوياً بين درجات اللحمية ودرجات اللوزتين (اختبار فيشر الدقيق، $p < 0.001$؛ معامل كرامر = 0.379)، في حين كان ارتباط الرتب موجباً لكنه ضعيف ($p = 0.011$، $\rho = 0.230$). تنبأت اللوزتان من الدرجة الرابعة باللحمية من الدرجة الرابعة بنوعية بلغت 96.4% وقيمة تنبؤية موجبة بلغت 92.6%، إلا أن الحساسية لم تتجاوز 39.1%. وعليه، فإن تضخم اللوزتين الكبير مؤشر موثوق على تضخم اللحمية الشديد، غير أن صغر اللوزتين لا ينفي وجوده. ويمكن أن يساعد تقييم اللوزتين الأطباء في تقدير حجم اللحمية عندما يتعذر التقييم بالتنظير، كما في الأطفال غير المتعاونين أو ذوي الإعاقة الذهنية، فضلاً عن دوره في إرشاد الأسرة.

الكلمات المفتاحية: تضخم اللحمية، حجم اللوزتين، التنظير الأنفي، تصنيف برودسكي، تصنيف باريخ، انسداد المجرى الهوائي العلوي.

Introduction

Adenoid and tonsillar hypertrophy are among the most common causes of upper airway obstruction in children, frequently presenting with nasal obstruction, mouth breathing, snoring, and sleep-disordered breathing. If left untreated, these conditions may considerably impair a child's quality of life, growth, behavior, and academic performance [1, 2]. Accurate and early assessment of adenoid and tonsillar volumes is therefore essential for the diagnosis, treatment planning, and surgical decision-making [3].

The adenoids and palatine tonsils are key components of Waldeyer's ring and contribute to mucosal immunity as a first line of defense against inhaled and ingested pathogens [4, 5]. Despite their shared anatomical locations and immunological roles, the degree of enlargement of these lymphoid tissues varies among individuals.

Assessment of adenoid and tonsil size is one of the central steps in the evaluation of pediatric obstructive sleep apnea, recurrent upper respiratory tract infections, and chronic nasal obstruction [6]. Tonsillar hypertrophy is commonly graded with the Brodsky scale, whereas the grading of adenoid size is done by nasoendoscopic evaluation or lateral nasopharyngeal radiography and may be graded with the Parikh system.

Because both adenoids and tonsils arise from pharyngeal lymphoid tissue and are exposed to similar antigenic stimuli during childhood, enlargement of one may be accompanied by enlargement of the other. This raises a practical question: can tonsillar size serve as a predictor of adenoid enlargement? Clarifying whether this relationship is existent or not may help clinicians anticipate disease severity and guide decisions regarding adenotonsillectomy [1, 7–9], and may allow adenoid status to be estimated when direct evaluation is limited or not possible [10–12]. While the tonsils can be readily examined by simple oral inspection, evaluation of the adenoids is more challenging, particularly in uncooperative children [13].

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Recent studies have reported variable findings. Some authors described a significant positive correlation between adenoid and tonsil size, suggesting a shared response to chronic antigenic stimulation [14], yet the correlation was not strong enough which justifies further research in different populations and clinical settings.

The present study therefore aimed to evaluate the correlation between adenoid size and tonsillar size in pediatric patients in Wasit Province, Iraq, and to determine whether tonsillar grading can reliably predict adenoid hypertrophy.

Material and methods

Study design and setting

This prospective observational study was conducted at the Ear, Nose, and Throat (ENT) clinic of Al-Zahraa Teaching Hospital, Kut City, Wasit, Iraq, between January 2022 and December 2024.

Study population

Pediatric patients aged 3–16 years presenting with symptoms suggestive of adenoid and/or tonsillar hypertrophy, such as nasal obstruction, mouth breathing, snoring, and sleep-disordered breathing, were enrolled. Inclusion criteria were age 3–16 years, symptoms related to upper airway obstruction, no previous adenoidectomy or tonsillectomy, and informed consent from parents or guardians. Children were excluded if they had craniofacial anomalies or congenital syndromes, acute upper respiratory tract infection at the time of examination, previous upper airway surgery, septal deviation, or current use of intranasal steroids.

Assessment of tonsil size

Tonsillar size was assessed by oropharyngeal examination using the Brodsky grading scale [15]: grade 0, tonsils within the tonsillar fossa; grade 1, tonsils occupying less than 25% of the oropharyngeal width; grade 2, 25–50%; grade 3, 50–75%; and grade 4, more than 75% (kissing tonsils).

Assessment of adenoid size

Adenoid hypertrophy was evaluated by nasoendoscopy using the Parikh classification [16]: grade I, adenoid tissue not in contact with adjacent structures; grade II, adenoid tissue in contact with the torus tubarius; grade III, adenoid tissue in contact with the vomer; and grade IV, adenoid tissue in contact with the soft palate.

Data collection

For each participant, age, sex, presenting symptoms (snoring, mouth breathing, nasal obstruction, and others), tonsillar grade according to the Brodsky classification, and adenoid grade according to the Parikh endoscopic classification were recorded.

Statistical analysis

Data were analyzed using SPSS version 24 and Jamovi v2.6. Descriptive statistics (frequency, percentage mean, and standard deviation) were used to describe patient characteristics. The association between adenoid and tonsillar grades was examined by cross-tabulation and Fisher's exact test, and its strength was measured using Cramér's V test. Spearman's rank correlation coefficient (ρ) was used to assess the relationship between the two ordinal grades. A p-value < 0.05 was considered statistically significant.

Ethical considerations

Ethical approval was obtained from the College of Medicine, Wasit University. Written informed consent was obtained from the parents or legal guardians of all participants before enrollment.

Results

The study included 120 children, with a slight male predominance (58.3% males vs. 41.7% females). Age data were available for 114 participants; their demographic characteristics are shown in Table 1.

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Table 1 Demographic characteristics of the study participants

Characteristic	Value
Sex, n (%)	
Male	70 (58.3)
Female	50 (41.7)
Age (years), n = 114*	
Mean ± SD	9.32 ± 2.76
Median	9.00
Range	3–16

Age was missing for 6 participants. SD: standard deviation

Endoscopic evaluation of the adenoids using the Parikh system showed a predominance of advanced hypertrophy, with more than half of the children having grade 4 adenoids. Tonsillar assessment with the Brodsky scale showed that moderate enlargement (grade 2) was the most frequent finding (Table 2).

Table 2 Distribution of adenoid grades (Parikh) and tonsil grades (Brodsky) among the study participants (n = 120)

Grade	Adenoid (Parikh), n (%)	Tonsil (Brodsky), n (%)
Grade 1	14 (11.7)	26 (21.7)
Grade 2	18 (15.0)	44 (36.7)
Grade 3	24 (20.0)	23 (19.2)
Grade 4	64 (53.3)	27 (22.5)
Total	**120 (100)**	**120 (100)**

Cross-tabulation of tonsil and adenoid grades (Table 3) demonstrated a highly significant association between the two variables (Fisher's exact test, $p < 0.001$). The strength of this association, measured by Cramér's V, was 0.379, indicating a moderate categorical relationship.

Table 3 Cross-tabulation of tonsil grade (Brodsky) and adenoid grade (Parikh)

Tonsil grade (Brodsky)	Adenoid grade (Parikh), n (row %)				Total, n (%)
	Grade 1	Grade 2	Grade 3	Grade 4	
Grade 1	6 (23.1)	4 (15.4)	0 (0.0)	16 (61.5)	26 (21.7)
Grade 2	6 (13.6)	10 (22.7)	11 (25.0)	17 (38.6)	44 (36.7)
Grade 3	0 (0.0)	4 (17.4)	13 (56.5)	6 (26.1)	23 (19.2)
Grade 4	2 (7.4)	0 (0.0)	0 (0.0)	25 (92.6)	27 (22.5)
Total	**14 (11.7)**	**18 (15.0)**	**24 (20.0)**	**64 (53.3)**	**120 (100)**

Fisher's exact test, $p < 0.001$; Cramér's $V = 0.379$; Spearman's $\rho = 0.230$, $p = 0.011$.

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Although the categorical association was significant, Spearman's rank correlation coefficient was relatively low ($\rho = 0.230$, $p = 0.011$). This indicates that, while a positive trend exists, the two grades do not increase in a strictly monotonic manner. Grade 4 adenoids were common across all tonsillar grades, as shown in Figure 1.

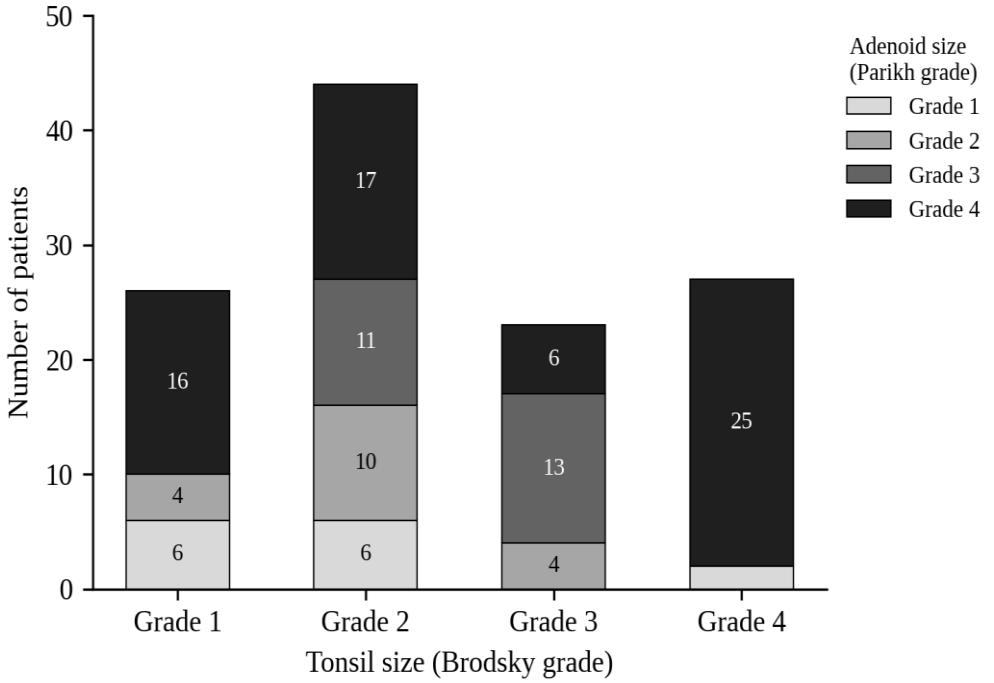


Figure 1: Distribution of adenoid grades (Parikh) within each tonsil grade (Brodsky)

Nevertheless, grade 4 tonsils were a highly specific indicator of grade 4 adenoid hypertrophy (specificity 96.4%; positive predictive value 92.6%). The sensitivity, however, was only 39.1%, indicating that small tonsils do not rule out severe adenoid hypertrophy; indeed, 61.5% of children with grade 1 tonsils had grade 4 adenoids.

Discussion

Adenoid and tonsillar hypertrophy is a common cause of upper airway obstruction in children and can considerably affect their health. Because of recurrent adenotonsillitis and lymphoid hypertrophy, adenotonsillectomy remains one of the most frequently performed procedures in otolaryngology [17].

Assessment of the adenoids and tonsils varies among otolaryngologists. The adenoids cannot be visualized directly during routine examination and mostly require either endoscopy of X-ray, which poses some challenge in uncooperative patient. Although several methods exist to estimate their size and impact on the nasopharyngeal airway, none has been universally accepted as standard practice. Three approaches remain in common use: clinical symptoms, lateral neck radiography, and endoscopic examination. Objective methods are valuable because they inform the need for surgery [18]. But some otolaryngologists assume that large tonsils on oral examination imply large adenoids.

Both adenoids and tonsils respond similarly to infection and other hypertrophic stimuli, yet the reliability of clinical assessment in predicting the severity of nasopharyngeal obstruction has long been debated [19]. Many studies have attempted to find a feasible way to estimate adenoid size, but few have examined its correlation with tonsillar size, and most of these are recent. Of

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the four studies we could identify, all reported a positive correlation between tonsil and adenoid size [14, 20, 21].

In our study, a positive correlation did exist, but it was weaker and less linear than what was shown in previous studies. Advanced adenoid hypertrophy was frequent even among children with small or moderate tonsils, so the overall rank correlation remained modest despite a significant categorical association. Large tonsils (Brodsky grade 4) were a strong predictor of large adenoids (Parikh grade 4), with a positive predictive value of 92.6%, although the low sensitivity means that small tonsils do not exclude large adenoids. These findings alone may not be able to give a confident decision for the indication of adenotonsillectomy; however, they can be helpful when endoscopy is difficult or unavailable, such as in uncooperative children, children with intellectual disability, or centers with limited diagnostic facilities or resources, and they can be helpful in family counseling.

The main limitation of this study is its relatively small sample size, which may limit the precision of the estimates.

Conclusion

In our study we demonstrate a significant positive association between adenoid hypertrophy and tonsillar enlargement in children, with grade 4 tonsils being highly specific to predict grade 4 adenoids. Tonsillar assessment can therefore assist clinicians in estimating adenoid size when direct endoscopic evaluation is not possible or available, as in uncooperative children or those with cognitive impairment, and can support family counseling when planning medical and surgical treatment. Future studies with larger samples and longer follow-up, are recommended to further confirm the relationship and even to develop a scoring system for estimating adenoid size from tonsil size.

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