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# Clinical Impact of Chronic Tonsillitis on Weight and Height Parameters in Kosovo children

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## Abstract

**Objective:** The aim of the study was to determine the association of chronic tonsillitis with physiological parameters, such as the weight and height, before and after the surgical intervention in children.

**Methods:** This is a cross-sectional study involving 85 children diagnosed with chronic tonsillitis and hospitalized in the Department of Otorhinolaryngology, Regional Hospital Center of Gjilan, Kosovo, from January 2011 to February 2015. All children underwent surgical intervention to correct their condition. Height and weight of participating children was measured before treatment and 6 and 12 months after intervention and their values were compared against each-other and standard reference levels.

**Results:** The mean age of the participants was 7.15 years (7.11 years for boys and 7.19 years for girls), with no statistically significant difference between boys and girls. Before treatment, the overwhelming majority of children with chronic tonsillitis were under the weight and height standards for their age (95.3% and 98.8%, respectively). For each age-group, there was a positive association between weight and height with time after intervention, even though the statistical significance was achieved only regarding height. One year after the surgical correction of chronic tonsillitis, the proportion of normal weight and normal height children increased from 4.7% to 8.2% (for weight) and from 1.2% to 4.7% (for height).

**Conclusions:** We propose careful evaluation of young patients with chronic tonsillitis, and monitoring of weight and height for an adequate and timely treatment of it (adenotonsillectomy), as a way to prevent a range of complications including the deteriorating effects on weight and height.

**Keywords:** Kosovo; Chronic tonsillitis; Growth parameters; Weight; Height

## Introduction

Inflammatory changes in the tonsils as a consequence of the local or general disorders in the organism present the clinical entity called Tonsillitis that may be acute or chronic. In addition to local disorders, the inflammatory changes in tonsils, may lead to general disorders in the body. Chronic tonsillitis might be associated with unfavorable changes of weight and weight in patients suffering from this health condition and such clinical changes have been reported in the international literature [1,2]. The tonsils affected by the inflammatory process loose the capability of lymphocytes production causing disorders of T and B-lymphocyte (T-Ly / B-Ly) as well as other effects in the immune-globulins and having direct influence in the cell and hormonal immunity through the hormonal feedback from the hypophysis [3,4]. Some of the local clinical manifestations of chronic tonsillitis include the tonsillogenic, odour (bad smell) from the mouth, difficulty in breathing, continuous coughing, sense of presence of other bodies/entities in the pharynx and irritated angular lymphatic ankle. At the other organs, it is worth mentioning the immunogenic uveitis and general ones like febris rheumatica, systematically skin's disease etc. Chronic tonsillitis, might also have an impact in the patient's weight and height, where the retardation varies about 10% compared to children with normal development [5,6].

In Kosovo there is no information about the influence of chronic tonsillitis on anthropometric parameters of affected children, such as weight and height. Therefore, the aim of this study is to determine the association of chronic tonsillitis with physiological parameters, such as the weight and height, before and after the surgical intervention in a sample of children suffering from this disease in Kosovo.

## Methods

### Study population and sampling

This is a cross-sectional study involving 85 young patients (37 boys and 48 girls), diagnosed with chronic tonsillitis and presented for specialized treatment at the Department of Otorhinolaryngology (ENT) of the Gjilan Regional Hospital in Kosovo, from January 2011 to February 2015. All participating children were diagnosed with some form of chronic tonsillitis that has not been possible to be addressed through conventional treatment and therefore required a more radical type of treatment. We included all children that showed up at Gjilan Regional Hospital during the aforementioned period of time.

## Data collection

We measured the anthropometric parameters of each participating child, such as weight and height, following standard protocols. For the measurement of weight, the children were advised to remove any heavy clothing and shoes whereas for the measurement of height they were instructed to stand in the right position. The measurement of height and weight was performed at the moment the patient showed up at our hospital (that is, before the surgical treatment) and then 6 months and 12 months after the surgical treatment of chronic tonsillitis. The same calibrated weight and height scales were used to measure the weight and height of children in each of the three measurement points of time. Also, we used the standard reference levels of weight and height by age, in order to compare our data against such thresholds.

## Data analysis

For categorical variables absolute numbers and the respective percentages were reported. For continuous variables the mean value and the standard deviation of the parameter was reported. To compare the mean values of weight and height in different points in time the student's t-test, through the one-way ANOVA procedure, was used. For categorical variables, the chi-square test was used. The associations were considered as statistically significant if the P-value ≤0.05.

All the statistical analysis were carried out using the Statistical Package for Social Science (SPSS) software, version 16.

## Results

There were 85 children that participated in the study, of whom 37 were boys (43.5%) and 48 girls (56.5%). The mean age of participants was 7.15 years ± 1.89 years, without significant difference between boys and girls (P=0.849) (Table 1). The age of the participants ranged from 4 years (8 subjects) to 11 years old (1 subject). Around two-thirds of participating children were pupils (65.9%) whereas the remaining 34.1% were still in kindergarten (Table 1). Also, more than half of participating children resided in urban parts of the country, without statistically significant difference between boys and girls (Table 1).

| Variable | Total | Gender | | P- value |
|---|---|---|---|---|
| | | Boys (n=37) | Girls (n=48) | |
| Age (continuous) | 7.15 ± 1.89 * | 7.11 ± 2.01 | 7.19 ± 1.82 | 0.849 |
| Age | | | | |
| 4 years | 8 (9.4) † | 4 (10.8) | 4 (8.3) | |
| 5 years | 11 (12.9) | 5 (13.5) | 6 (12.5) | |
| 6 years | 15 (17.6) | 7 (18.9) | 8 (16.7) | 0.913 |
| 7 years | 13 (15.3) | 5 (13.5) | 8 (16.7) | |
| 8 years | 14 (16.5) | 6 (16.2) | 8 (16.7) | |
| 9 years | 13 (15.3) | 4 (10.8) | 9 (18.8) | |
| 10 years | 10 (11.8) | 5 (13.5) | 5 (10.4) | |
| 11 years | 1 (1.2) | 1 (2.7) | 0 (0.00) | |
| Status | | | | |
| Children | 29 (34.1) | 14 (37.8) | 15 (31.3) | 0.525 |
| Pupil | 56 (65.9) | 23 (62.2) | 33 (68.8) | |
| Residence | | | | |
| Urban | 47 (56.0) | 21 (58.3) | 26 (54.2) | 0.703 |
| Rural | 37 (44.0) | 15 (41.7) | 22 (45.8) | |
| *Mean value ± standard deviation. | | | | |
| †Absolute number and column percentage (in paranthesis). | | | | |
| ‡P - value according to student's t-test (for continuous variables) or chi-square test (for categorical variables). | | | | |

**Table 1:** General characteristics for the patients included in the study.

Table 2 displays the mean values of weight and height before the surgical intervention and 6 months and 12 months after it, for boys and girls. It can be noted that there is a positive association of weight and height with the time after surgical treatment of chronic tonsillitis, even though the statistical significance was not achieved. However, in both boys and girls the mean value of weight and height increased 6 and 12 months after operation compared to the period before the intervention.

| Variable | Total | | Boys (n=37) | | Girls (n=48) | |
|---|---|---|---|---|---|---|
| | Mean value ± SD | P- value | Mean value ± SD | P- value | Mean value ± SD | P- value |
| Weight (in kg) | | | | 0.367 | | 0.538 |
| Before the operation | 23.86 ± 7.33 24.96 ± 7.39 | 0.212* | 24.27 ± 7.03 | | 23.54 ± 7.61 | |
| 6 months after operation | 25.87 ± 7.51 | | 25.53 ± 6.99 | | 24.52 ± 7.73 | |
| 12 months after operation | | | 26.61 ± 7.20 | | 25.29 ± 7.77 | |
| Height (in cm) | | 0.012 | | 0.112 | | 0.105 |
| Before the operation | 119.9 ± 11.2 | | 120.3 ± 10.6 | | 119.8 ± 11.8 | |
| 6 months after operation | 122.6 ± 11.5 | | 123.0 ± 11.0 | | 122.4 ± 12.1 | |
| 12 months after operation | 125.3 ± 11.8 | | 125.8 ± 11.9 | | 125.0 ± 11.9 | |
| *P - value according to one-way ANOVA test. | | | | | | |

**Table 2:** Mean weight and height accordig to time of the measurement, by gender.

Tables 3 and 4 display the mean values of weight and height by age and gender and time of measurement. In general it can be noted that the mean weight and height of participants is lower than the standard reference levels of weight and height for any given age. On the other hand, the time trends observed are clear: for any given age, there is an increase of mean weight and mean height of participants 6 months and 12 months after the surgical intervention compared to the respective values before the treatment and such trends are observed in boys and girls (Tables 3 and 4). However, in general these time-differences in mean values did not reach statistical significance for weight for both boys and girls (Table 3) but they were mostly significant as regards mean values of height in both boys and girls, when mean values of height 12 months after operation are compared against respective values before operation (Table 4).

| Boys | | | | | | |
|---|---|---|---|---|---|---|
| Variable | Standard mean weight | Mean weight before the operation | Mean weight 6 months after the operation | Mean weight 12 months after the operation | P-value for three periods | P- value before the op. 12 month after op. |
| Age | 20.28 | 14.13 | 15.25 | 16.25 | 0.076 * | 0.033 * |
| 4 years | 22.03 | 17.00 | 18.40 | 19.30 | 0.370 | 0.198 |
| 5 years | 23.51 | 21.86 | 22.92 | 23.43 | 0.408 | 0.214 |
| 6 years | 30.90 | 24.40 | 26.10 | 27.20 | 0.494 | 0.261 |
| 7 years | 35.28 | 27.42 | 28.50 | 29.75 | 0.708 | 0.421 |
| 8 years | 40.36 | 31.00 | 32.13 | 33.38 | 0.686 | 0.417 |
| 9 years | 46.16 | 31.20 | 32.20 | 33.80 | 0.746 | 0.464 |
| 10 years | 52.56 | 37.00 | 40.00 | 42.00 | - | - |
| 11 years | | | | | | |
| Total | 31.46 | 24.27 | 25.53 | 26.61 | 0.367 | 0.156 |
| Girls | | | | | | |
| Age | 20.39 | 14.00 | 14.50 | 15.13 | 0.687 * | 0.408 * |
| 4 years | 23.75 | 15.83 | 16.75 | 17.67 | 0.418 | 0.208 |
| 5 years | 27.39 | 16.81 | 17.63 | 18.50 | 0.521 | 0.267 |
| 6 years | 31.47 | 21.31 | 22.63 | 23.38 | 0.329 | 0.152 |
| 7 years | 33.55 | 30.81 | 31.69 | 32.25 | 0.329 | 0.151 |
| 8 years | 41.82 | 28.88 | 29.87 | 30.44 | 0.617 | 0.341 |
| 9 years | 48.18 | 33.50 | 34.80 | 36.10 | 0.831 | 0.559 |
| 10 years | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Total | 32.93 | 23.54 | 24.52 | 25.29 | 0.538 | 0.267 |
| *P - value according to one-way ANOVA test. | | | | | | |

**Table 3:** Mean weight of the subject in the study according to age and gender and time of measurement.

| **Boys** | | | | | | |
|---|---|---|---|---|---|---|
| **Variable** | **Standard mean height** | **Mean height before the operation** | **Mean height 6 months after the operation** | **Mean height 12 months after the operation** | **P-value for three periods** | **P- value before the op. 12 month after op.** |
| Age | 109.5 | 102.0 | 103.9 | 106.4 | 0.164 * | 0.106 * |
| 4 years | 116.8 | 110.6 | 112.9 | 114.7 | 0.020 | 0.018 |
| 5 years | 123.9 | 116.7 | 118.2 | 119.6 | 0.074 | 0.031 |
| 6 years | 131.0 | 119.2 | 123.0 | 125.4 | 0.017 | 0.013 |
| 7 years | 137.8 | 124.2 | 128.2 | 132.5 | 0.005 | 0.002 |
| 8 years | 144.1 | 130.8 | 132.8 | 135.0 | 0.515 | 0.287 |
| 9 years | 149.9 | 134.6 | 137.6 | 141.2 | 0.176 | 0.087 |
| 10 years | 155.5 | 135.0 | 140.0 | 149.0 | - | - |
| 11 years | | | | | | |
| Total | 131.2 | 120.3 | 123.0 | 125.8 | 0.112 | 0.032 |
| Girls | | | | | | |
| Age | 108.4 | 100.5 | 102.5 | 106.8 | 0.013 * | 0.020 * |
| 4 years | 116.1 | 106.8 | 109.5 | 112.2 | 0.017 | 0.010 |
| 5 years | 123.9 | 115.5 | 116.8 | 119.4 | 0.037 | 0.017 |
| 6 years | 131.3 | 116.1 | 118.6 | 121.0 | 0.103 | 0.044 |
| 7 years | 137.7 | 126.4 | 128.9 | 130.1 | 0.086 | 0.051 |
| 8 years | 143.8 | 125.7 | 129.7 | 132.6 | 0.009 | 0.006 |
| 9 years | 149.6 | 142.0 | 145.0 | 148.2 | 0.360 | 0.145 |
| 10 years | | | | | | |
| Total | 131.6 | 119.8 | 122.4 | 125.0 | 0.105 | 0.034 |
| *P - value according to one-way ANOVA test | | | | | | |

**Table 4:** Mean height of the subject in the study according to age and gender and time of measurement.

Tables 5 and 6 show that the overwhelming majority of study participants are under the standards for weight (95.3%) and under the standards for height (98.8%) for their respective age, thus supporting the findings in Tables 3 and 4. The situation is similar in boys and girls regarding these two parameters, with no statistical significant differences (P>0.05).

| **Variable** | **Total** | **Gender** | | **P-value†** |
|---|---|---|---|---|
| | | **Boys (n=37)** | **Girls (n=48)** | |
| Weight before operation | 81 (95.3) * | 34 (91.9) | 47 (97.9) | 0.193 |
| Under the standard | 4 (4.7) | 3 (8.1) | 1 (2.1) | |
| In norm | | | | |
| Weight 6 months after operation | 78 (91.8) | 32 (86.5) | 46 (95.8) | 0.120 |
| Under the standard | 7 (8.2) | 5 (13.5) | 2 (4.2) | |
| In norm | | | | |
| Weight 12 months after operation | 78 (91.8) | 32 (86.5) | 46 (95.8) | 0.120 |
| Under the standard | 7 (8.2) | 5 (13.5) | 2 (4.2) | |
| In norm | | | | |
| *The absolute number and percentage according to columns (in parenthesis). | | | | |
| †P - value according to hi square test | | | | |

**Table 5:** The patients' weight in the study compared to standard reference levels.

| **Variable** | **Total** | **Gender** | | **P-value†** |
|---|---|---|---|---|
| | | **Boys (n=37)** | **Girls (n=48)** | |

| | | | | |
|---|---|---|---|---|
| Height before operation<br>Under the standard<br>In norm | 84 (98.8) *<br>1 (1.2) | 37 (100.0)<br>0 (0.0) | 47 (97.9)<br>1 (2.1) | 0.377 |
| Height 6 months after operation<br>Under the standard<br>In norm | 84 (98.8)<br>1 (1.2) | 37 (100.0)<br>0 (0.0) | 47 (97.9)<br>1 (2.1) | 0.377 |
| Height 12 months after operation<br>Under the standard<br>In norm | 81 (95.3)<br>4 (4.7) | 36 (97.3)<br>1 (2.7) | 45 (93.8)<br>3 (6.3) | 0.444 |
| *The absolute number and percentage according to columns (in parenthesis).<br>†P - value according to hi square test | | | | |

**Table 6:** The patients' height in the study compared to standard reference levels.

## Discussion

This is the first study addressing the association of chronic tonsillitis and anthropometric parameters such as weight and height among young children in Kosovo. We noticed that the mean weight and mean height of chronic tonsillitis children was lower than mean standard reference levels, for each age group and in both boys and girls. Also, we evidenced that the surgical treatment of chronic tonsillitis resulted in an improvement of mean weight and mean height of study participants and the improvement was greater about one year after the intervention, whereas for height these differences were significant in most cases. In addition, despite the lack of statistical significance regarding changes of weight, we spotted a clinical significance: the findings indicate that there is a positive association between time after surgical correction of chronic tonsillitis and weight and height of patients, suggesting the improvement of the latter.

The beneficial effects of adenotonsillectomy on weight and height of young children is documented in the international literature. For example, a review of literature and meta-analysis, including children with sleep disordered breathing due to adenotonsillar hypertrophy, reported that adenotonsillectomy was associated with a significantly increased standardized weight and height [1]. Another study involving 96 children reported a similar improvement of weight and height of children following adenoidectomy [7] and yet similar findings were reported by other surveys [8,9].

Adenotonsillar hypertrophy is often associated with growth retardation, maybe due to reduced appetite and caloric intake, nocturnal hypoxemia and respiratory acidosis, with probably the involvement of impaired growth hormone secretion and action, even though the exact mechanisms of how adenotonsillar hypertrophy leads to growth retardation remain still little understood [8]. This finding is in accordance with the findings from our study which reported that all the children observed had mean weight and height lower than standard reference levels, suggesting a possible negative effect of chronic tonsillitis on growth parameters under study. Moreover, even one year after the intervention, this group of patients could not reach the weight and height of normal children whereas another study reported that after the intervention the height of the patient reached those of their peers [8]. The fact that we did not notice this in our study could suggest a more deep effect of chronic tonsillitis on growth parameters, which cannot be overcome in a one-year period of time. However, such hypothesis has to be confirmed by future studies in Kosovo.

We think that the growth retardation in this group of patients could not be entirely attributed to chronic tonsillitis. The study by Ersoy and colleagues reported that "at the preoperative period, weight of their patients were approximately equivalent to those of their healthy peers", whereas we found that even before the operation the mean weight and height of our patients was much lower compared to standard reference growth levels. This could indicate malnutrition problems in Kosovo children, as suggested by a recent scientific research work [10].

In conclusion, we demonstrated that there is a beneficial effect of adenotonsillectomy on growth parameters of children such as weight and height in Kosovo. Regardless of the cross- sectional nature of the study and the impossibility to establish temporal relationships between events, we think that chronic tonsillitis might play a role in the "slowing down" of these patients regarding to their weight and height. Therefore, the surgical intervention to properly address this disease is very important to improve these parameters. However, the wider picture would require a comprehensive intervention to improve the general conditions and nutrition status of children in order for various interventions to be effective towards normalization of growth parameters of Kosovo children.

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