



# Health-Related Quality of Life Assessed in Children with Chronic Rhinitis and Sinusitis

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## Abstract

**Introduction:** The quality of life can be simply defined as an area of human life that directly affects a person and is important to her/him, where in more detail it can be considered as 'an individual perception of an individual's life position within a cultural context, value system and in relation to their tasks, expectations and standards determined by environmental conditions'. Limitations in well-being will thus also occur in children suffering with sinus diseases.

**Study Aim:** To assess the quality of life in children suffering from chronic rhinitis and sinusitis and comparing with a group of healthy children.

**Materials & Methods:** The study group consisted of children with one of the most common chronic diseases of the upper respiratory tract, i.e. chronic rhinitis and paranasal sinusitis. Admission criteria were ages 5 to 18 years in the presence of a chronic disease such as chronic rhinitis and paranasal sinusitis. The Child Health Questionnaire-Parent Form 50 CHQ-PF-50 (CHQ-PF50) was employed, which is a general purpose research instrument gassed on psychometric tests designed for assessing physical and mental well-being among children aged 5 to 18 years.

**Conclusion:** The greatest impairment to well-being in children with chronic rhinitis and paranasal sinusitis occurs for those areas affecting a child health status on parents' emotions, pain and discomfort and general perception of health. Parents of healthy children were found to attach great importance to the health of their children according to this assessment on the health-related quality of life.

**Keywords:** Health quality of life; CHQ-PF-50; Chronic rhino-sinusitis; Children; Chronic sinusitis; Sinusitis

## Introduction

The issue regarding the quality of life only really started to be dealt with in the second half of the 20<sup>th</sup> century. Initially it was used as a criterion to measure the level of human development in the United States of America and Europe, where only objective parameters had been assessed; such as material goods. Hitherto, subjective ones were introduced, (i.e. non-material parameters), such as health, freedom and happiness. Over time, more and more attention was paid to these subjective parameters in quality of life assessments [1-4]. Moreover, many attempts have been made to define the quality of life more strictly and uniformly, nonetheless, there is no generally accepted definition as yet [5-7].

## Definitions of quality of life

The simplest way of defining the quality of life is as an area of human life that directly concerns a given person and is important to him [8]. In 1990, Schipper introduced the concept of a health-related quality of life, which was defined as 'the functional effects of an illness and its consequent therapy upon a patient, as perceived by the patient' [1,7]. From this perspective, health-related quality of life includes the following four areas: Physical condition and mobility, mental state, social status and social acceptance. Chronic rhinitis and paranasal sinusitis are inflammatory processes of the mucosa and are both regarded as a heterogeneous disease entity in children. This however causes difficulties in classification, therapy and diagnosis. Normal functioning of the paranasal sinuses may

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also be affected by pathologies of the upper respiratory tract such as adenoid hypertrophy or curvature of the nasal septum. Furthermore, during therapy, the strategy adopted will be affected by the coexistence of other pathological factors. The heterogeneous nature of the course of chronic sinusitis poses difficulties that are reflected in the lack of any uniform classification of sinusitis for children. A modified classification by Meltzer [9]; however, appears to be the most useful way during the period of child development as follows:

Acute inflammation; the inflammatory process lasts up to 4 weeks, does not leave permanent traces in the mucosa and is subject to conservative treatment. Recurrent acute sinusitis; episodes of acute sinusitis of at least 5 times a year. Chronic inflammation; an infectious condition of the nasal mucosa and sinuses typical in children, occurring during the cold season and resolving spontaneously in the summer and after the child's immune system reaches maturity. Chronic inflammation; an inflammatory process lasting more than 12 weeks, which after conservative treatment, leaving permanent lesions in the mucosa. The ESPO 2020 classification clinically diagnoses chronic sinusitis, with or without polyps, when at least two symptoms are present, (i.e. the so-called main symptoms), as follows: nasal obstruction, discharge in the nasal cavities or at the back of the throat, facial pain and feeling of fullness and an impairment or loss of smell. These symptoms must last more than 12 weeks. Treatment of chronic rhinitis and paranasal sinusitis in children should be multifaceted (wide ranging) and must include antibacterial, immune-modulating and local-symptomatic treatment. Nevertheless, it must a priori remove the cause of the disease, i.e. any factor impeding the patency of the nose or paranasal sinuses. This usually requires surgery. Studies have been published on HRQL related to chronic sinusitis where the quality of life has been described to be limited to areas such as general health, pain, discomfort, the effect of the child's health status on parents' emotions, fitness physical, limitations in social functioning, limitations on parents' leisure time and mental health [11-14]. It was found however that this disease condition does not limit self-esteem and does not change behavior [15,16]. Patients with chronic rhinitis and paranasal sinusitis have a long-term impaired nasal patency, whilst ENT examination shows discharge in the nasal cavities or on the back of the throat. A child also feels pain and a feeling of fullness in the face and parents report a loss or impairment of smell [17]. A deteriorating nasal patency usually leads to infection of the paranasal sinuses and ears. Parental free time may become limited whilst also reducing the quality of parent-child contact arising from prolonged inflammatory changes as well as related problems in organizing daily family life (e.g. adapting parental time at work to appointments made at pediatric or ENT clinics, or caring for a sick child during working hours). The patient's physical fitness may deteriorate, (being one of the determinants of peer group position), due to abnormal child development which will also probably lower the self-esteem of the sick child. Any given study aim will determine the selection of an appropriate questionnaire. General purpose questionnaires are used when studying large populations with a variety of pathologies. It is thereby possible to compare study outcomes with each other, regardless of whether the examined subjects are healthy or suffering from any medical conditions. Different sized groups can also be compared. As research tools however, general purpose questionnaires are not useful for assessing discrete changes in an individual. Specific HRQL research questionnaires have been designed for specific areas under study. These are more sensitive in detecting deviations occurring over time and are therefore used for investigating the efficacy of treatment

or the progression of lesions. They are however unsuited for studying patients suffering from several diseases (comorbidities). To assess the quality of life in those children with chronic rhinitis and paranasal sinusitis as compared to a group of healthy children.

## Materials and Methods

The study's test groups were children subjects suffering from one of the most common chronic diseases of the upper respiratory tract, namely chronic rhinitis and paranasal sinusitis. Admission criteria were ages 5 to 18 years and the presence of a chronic disease such as chronic rhinitis and paranasal sinusitis. Exclusion criteria were ages under 5 and over 18 years and having acute childhood diseases or an uncompleted questionnaire. The control groups were gathered from amongst children attending nursery school, primary school, middle school and high school in Warsaw and its surrounding regions. School institutions and child subjects were randomly selected. The criteria for admission to the control group were, as before, ages from 5 to 18 years, whilst exclusion criteria were ages under 5 and over 18 years, having acute childhood diseases and chronic childhood diseases or likewise an incompletely filled-in questionnaire. The study was performed using the Child Health Questionnaire - Parent Form 50 CHQ-PF-50 (CHQ-PF50), which is a general purpose research tool based on psychometric testing in order to assess physical and mental well-being amongst children aged 5 to 18 years. This has been used to measure health-related quality of life in both healthy and sick children since 1994, when it was then introduced by Landgraaf JM and Ware JE. The questionnaire was constructed based on the assumption that health status is assessed on physical and mental well-being (including areas related to emotions, behavior and social contacts). The questionnaire consisted of 13 categories each of 50 questions answered by parents/legal guardians. The duration of assessment depended on the group of questions. Areas of general perception regarding health and family cohesion did not have any specific time frame. The current health status was compared to that of one year ago. The last four weeks were however only investigated in the remaining question groups. Each answer is expressed as an appropriate numerical value. Results are calculated based on the following algorithm: The sum of obtained values divided by the number of questions answered, from which the lowest possible value is then subtracted. This obtained value being next divided by the range of possible outcomes. The final scores range between 0 and 100; the higher the score, the better is life functioning and well-being.

## Statistical analysis

This was performed using the STATISTICA package. The level of probability taken as being significant was  $p=0.05$  and choosing two-tailed tests were done at the researcher's discretion. Values of  $p$  (functions of test statistics) of less than 0.05 are denoted in red.

## Variables

These were all described in the questionnaire and were divided into two main groups: Discrete and continuous. Discrete variables were further divided into those variables with two-point distributions and ones with  $n$ -point distributions. For each discrete variable, the counts and structure indices were calculated. Basic summary statistics were calculated for each continuous variable: Count, arithmetic mean, standard deviation, minimum value, maximum value, skewness and kurtosis indices, as well as positional statistics: Median, Q25, Q75. Most of the continuous variables deviated from the normal distribution, which thereby required using the correct method of

**Table 1:** Summary statistics – continuous variables for the control group.

Control	N	Mean	Std. Dev.	Min.	Q25	Median	Q75	Max.	Skewness	Kurtosis
STAND	102	3.78	0.86	1	3.4	4.4	4.4	5	-0.88	0.11
PF	102	97.11	5.17	77.78	94.44	100	100	100	-2.01	3.69
REB	102	96.51	7.49	66.67	100	100	100	100	-2.29	4.85
RP	102	96.24	9.92	50	100	100	100	100	-2.75	7.09
BP	102	85.39	16.75	10	70	90	100	100	-1.37	2.94
BE	102	79.19	11.15	55	71.67	80.83	89.17	100	-0.41	-0.6
MH	102	79.8	13.62	30	70	80	90	100	-0.87	0.52
SE	102	80.19	14.07	37.5	70.83	83.33	91.67	100	-0.91	0.59
GH	102	75.41	13.12	29.17	68.33	76.67	85	100	-1.08	1.52
PE	102	77.21	14.21	41.67	66.67	75	91.67	100	-0.3	-0.47
PT	102	90.41	11.6	66.67	88.89	88.89	100	100	-0.97	-0.3
FA	102	85.29	12.9	50	75	89.59	95.83	100	-0.78	-0.19
FC	102	66.57	18.66	0	60	60	85	100	-0.76	0.77
AGE	102	10.58	3.55	5	8	9	13	18	0.8	-0.41

statistical analysis. Non-parametric methods were therefore mainly used for performing the statistics, however sometimes parametric tests were also employed as part of data mining.

**Continuous variables, median analysis, analysis of averages, correlation:** The non-parametric tests used were the Mann-Whitney test with corrections for associated ranks, the Kruskal-Wallis test using multiple tests to compare mean ranks and the median test. Two parametric tests were used, depending on circumstances: The Student's t-test or one-way analysis of variance. The first was used when the grouping variable had a two-point distribution. Equality of variance was tested by the F-test. If the grouping variable had a different distribution, analysis of variance (ANOVA) was used. Equality of variance was checked by the Brown-Forsythe test. The RIR-Tukey test was used for multiple comparisons. Spearman's rank correlation coefficient and Tukey's correlation coefficient were used to calculate the correlation.

**Discrete variables:** The independence analysis used was based on the chi-square test of independence. A two-tailed exact test was used in the case of 4-field tables whenever numbers were smaller than expected. Appropriate groupings were used for tables with more fields. For the purposes of interpretation, Wanke's surplus values were also calculated in the contingency tables.

## Results

The control group consisted of 50 girls and 52 boys with an average age of 10.58 years; the youngest being 5 years and the eldest 18 years (Table 1). Mean values ranged from 3.78 to 97.11 for continuous variables in the control group, whereas the standard deviation was between 0.86 and 14.21 and the median ranged from 4.40 to 100.00. There were 150 CHQ-PF-50 questionnaires distributed to parents of the test group of children (i.e. those with chronic rhinitis and paranasal sinusitis), out of which 102 (68%) questionnaires met the admission criteria. This group was composed of 51 girls and the same number of boys with a mean age of 10.84 years; the youngest being 5 years the oldest 18 (Table 2). Mean values ranged from 3.34 to 86.06 for continuous variables in the group of children with chronic rhinitis and paranasal sinusitis, whilst standard deviations ranged between 0.84 and 28.46 and medians ranged from 3.40 to 100.00

(Table 3). There were no statistically significant differences found when comparing healthy children and children with chronic rhinitis and paranasal sinusitis using the median test within the area of well-being of (FC) Family Cohesion. However, significant differences in deteriorating well-being were found in sick children in the following areas: Assessment of the current health status of the child (STAND), Physical Fitness (PF), social functioning resulting from behavior or emotional state (REB), the impact of physical health on limitations in social functioning (RP), pain and discomfort (BP), Behavior (BE), Mental Health (MH), Self-Esteem (SE), General Health perception (GH), influence of the child's health condition on Parental Emotions (PE), limitations on parental leisure time due to the child's health (PT) and restrictions on joint Family Activities (FA).

## Discussion

The presented study showed mean values of individual quality of life parameters to range from 53.18 to 86.06 in a group of children suffering from chronic rhinitis and paranasal sinusitis. The greatest reduction (53.18) was found to be perception of General Health (GH) 53.18 whilst the impact of the child's health on Parental Emotions (PE) was equally low at 56.86 and pain and discomfort (BP) was at 57.45; demonstrating a significant impact of the above-mentioned elements on the health-related quality of life. In contrast, social functioning resulting from behavior or emotional state (REB) was rated the best at 86.06 and Physical Fitness (PF), also scored highly at 83.88. Parental replies received from subjects diagnosed with chronic rhinitis and paranasal sinusitis showed a statistically significant deterioration in wellbeing when compared to healthy children from the control group in the following areas: Current general health status (STAND), Physical Fitness (PF), social functioning resulting from behavior or emotional state (REB), the impact of physical health on limitations in social functioning (RP), the occurrence of pain and discomfort (BP), behavior (BE), Mental Health (MH), Self-Esteem (SE), General Health perception (GH), the impact of children's health on Parental Emotions (PE), limitations in parental leisure time due to children's health (PT) and limitations in joint Family Activities (FA). There were however no significant differences in Family Cohesion (FC). To the best of our knowledge, there are no studies in the Polish literature dealing with the quality of life in children with chronic rhinitis and paranasal sinusitis,

**Table 2:** Summary statistics - continuous variables for the test group (chronic rhinitis and paranasal sinusitis).

Control	N	Mean	Std. Dev.	Min.	Q25	Median	Q75	Max.	Skewness	Kurtosis
STAND	102	3.34	0.84	1	3.4	3.4	3.4	5	-0.68	0.96
PF	102	83.88	18.02	27.78	72.22	88.89	100	100	-1.25	0.99
REB	102	86.06	23.38	0	77.78	100	100	100	-1.92	3.28
RP	102	76.63	28.46	0	66.67	83.33	100	100	-1.28	0.82
BP	102	57.45	25.51	0	40	50	70	100	0.14	-0.57
BE	102	70.57	15.88	25.83	58.33	72.5	80.83	100	-0.18	-0.29
MH	102	66.37	17.45	20	55	65	80	100	-0.21	-0.24
SE	102	73.41	16.65	12.5	66.67	75	87.5	100	-0.76	0.88
GH	102	53.18	16.56	5	43.33	51.67	64.17	91.67	-0.11	-0.04
PE	102	56.86	22.08	0	41.67	58.33	75	100	-0.01	-0.39
PT	102	73.75	23.91	11.11	55.56	77.78	100	100	-0.61	-0.68
FA	102	73.37	19.96	16.67	58.33	75	87.5	100	-0.72	0.01
FC	102	63.58	22.84	0,00	60	60	85	100	-0.58	0.3
AGE	102	10.84	3.28	5,00	8	11	14	18	-0.03	-1.13

**Table 3:** A comparison of children suffering from chronic rhinitis and paranasal sinusitis (test group) with controls.

	Control means	Test means	Control medians	Test medians	P t. medians
STAND	3.78	3.34	4.4	3.4	0
PF	97.11	83.88	100	88.89	0
REB	96.51	86.06	100	100	0.0093
RP	96.24	76.63	100	83.33	0
BP	85.39	57.45	90	50	0
BE	79.19	70.57	80.83	72.5	0
MH	79.8	66.37	80	65	0
SE	80.19	73.41	83.33	75	0.0007
GH	75.41	53.18	76.67	51.67	0
PE	77.21	56.86	75	58.33	0
PT	90.41	73.75	88.89	77.78	0.0015
FA	85.29	73.37	89.59	75	0.0004
FC	66.57	63.58	60	60	0.4678

whilst we found only one reference in this area from the world literature that assessed HRQL in a small group of children with this diagnosis in a study by Cunningham et al. This used a general purpose questionnaire, on 21 children in the USA treated by endoscopic surgery of the paranasal sinuses for CRS. The questionnaires were CHQ PF-50 and CHQ CF-87; taking into account the self-esteem of the patients and the assessment made by the parents of their children. The study demonstrated significant limitations in the quality of life profile in children with CP compared to children with other chronic diseases such as: Asthma, epilepsy, rheumatoid arthritis and mental disorders. HRQL was particularly low in the following areas: The impact of physical health on limitations in social functioning (RP) and pain and discomfort (BP). They also found that children with CP gave a more favourable self-assessment of their individual quality of life indicators than those of their parents. Nevertheless, decreases were observed in both children's and parents' responses concerning the perception of General Health (GH), pain and discomfort (BP), Physical Fitness (PF), limitations in social functioning (REB/RP), limitations in parental leisure time due to children's health (PT) and Mental Health (MH). However, there was no constraint observed

in Self-Esteem (SE) or Behavior (BE). Such outcomes are mostly consistent with those found in the presented study; differences being in an unchanged Family Cohesion (FC) compared to controls in the presented study (as opposed to a deterioration in the quoted work), as well as in a decreased Self-Esteem (SE) and Behavior (BE) in our study. It should however be remembered that assessing the quality of life of both a healthy child and a sick child, according to the individual health-related elements, will also depend on those socio-economic and cultural conditions prevailing in individual countries. Another factor is that the sizes of the study groups were different in both studies. It is also impossible to compare changes in the quality of life in health or ill children when using specific questionnaires intended solely for assessing any given disease. Current studies in the literature have assessed the quality of life using specific testing for laryngological diseases and have shown a worse quality of life in children with CP in terms of their life activity, emotional disorders, allergy symptoms, nasal blockage and symptoms of sinus infections. Such outcomes essentially agree with the presented study although drawing conclusions from any comparison is precluded because of the significant differences in methodologies employed. The quality of



life for adults is assessed in the EPOS2020 classification. An overall assessment of symptom severity can obviously be high depending on the population studied. Those CRS patients identified from the general population had achieved mean scores of 8.2 and 7.8 for respectively CRSwNP and CRSsNP (on the VAS scale ranging from 0 to 10), when asked how bothersome their symptoms were in general. Moderate to severe average symptom scores were reported by hospital patients awaiting surgery; with a mean SNOT-22 score of 42.0 [13] compared with controls at 9.3. A median score of 7.0 has been proposed as a threshold for normal scores [14], where patients with CRSsNP had higher pre-operative baseline scores 44.2 compared to CRSwNP 41.0. CRS has been shown to affect patients' health-related quality of life. There are significant differences in all domains of the SF-36 when compared to healthy controls [15]. A landmark paper by Gliklich and Metson demonstrated for first time the impact of CRS on global quality of life, where it was stated that CRS has a greater impact on social functioning than angina or chronic heart failure [18,19]. They have also recently shown that health utility values, as measured by the EQ-5D, were lower than in the general population and indeed comparable to other chronic diseases such as asthma. The severity of symptoms is influenced by gender, with greater severities seen in women that impact on their quality of life, as measured by disease-specific tools or by global measures such as SF-36 or Eq-5D [15]. Coexisting depressive disease is associated with a poorer quality of life specific to CRS. The severity of symptoms may depend in part on the severity of the disease, but is further affected by the patient's self-characteristics (e.g. gender, ethnicity, religious and cultural beliefs) as well as comorbidities and external characteristics such as socioeconomic factors and support systems. This likely explains the mismatch commonly found between objective and patient-assessed disease severity scales, such as those assessing radiological severity and symptoms.

## Conclusions

- Children suffering from chronic rhinitis and paranasal sinusitis demonstrate that the greatest limitations/constraints to their well-being occurs in areas where the child's health status affects their parents' emotions, pain and discomfort and general perception of health.

- The health related quality of life assessment for healthy children demonstrates that parents attach great importance to the health of their children.

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