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The Assessment of Quality of Life among Early Aged Children with Bronchiolitis and Community-Acquired Pneumonia Using Qualin and PCQ Questionnaires

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Abstract

Background: The aim of this observational study was to evaluate the quality of life 3 years or younger children with bronchiolitis and community-acquired pneumonia using the validated Armenian version of the QUALIN and PCQ questionnaire.

Methods: The subjects of the research were children 3 years or younger. Children who were hospitalized with a diagnosis of severe bronchiolitis and community-acquired pneumonia in the "Mouratsan" University Complex formed case group. Healthy children receiving care from the Preventative Polyclinic department in same hospital were formed control group. QL were measured by QUALIN and PCQ questionnaires. Depending on the severity of community-acquired pneumonia, we have formed the 2 subgroups in case group.

Results: QUALIN scores of children with bronchiolitis and community-acquired pneumonia were lower compared with control. Were registered a dependency between the severity of community-acquired pneumonia and QL scores. In case of severe pneumonia scores of QUALIN and PCQ were more affected.

Conclusion: A significant decrease in all subscales of the QUALIN and PCQ questionnaires indicated impact of community-acquired pneumonia and bronchiolitis on QL of the early aged children. Most affected subscale in QUALIN was ARA and in PCQ Q1. All scores in case group were significantly lower than it in control group.

Keywords: Quality of life • Children • Bronchiolitis • Community-acquired pneumonia • QUALIN questionnaire • PCQ questionnaire

Abbreviations: • QUALIN: Qualite´ de vie du Nourisson • QL: Quality of life • BC: Behavior and communication • ARA: Ability to remain alone • FE: Family environment • PSWB: Psychological and somatic well-being • TS: Total score • Q1: Cover cough frequency • Q2 : Sleep disturbance of the child • Q3: Sleep disturbance of the parent • Q4: Cough severity • Q5: The degree of bothersomeness to the child

Introduction

For those under 18 years of age acute bronchitis and upper respiratory infections ranked highest in terms of direct medical spending in 2011 [1]. Pneumonia is a common cause of death in young children worldwide. An estimated 900000 children less than 5 years of age died because of pneumonia in 2015, with more than 90% of these deaths occurring in low-income and middle-income countries [2]. Community-acquired pneumonia is a common and potentially serious infection that afflicts children throughout the world; it is fundamentally different in children and in adults. The annual incidence of pneumonia in children younger than 5 years of age is 34 to 40 cases per 1000 in Europe and North America, higher than at any other time of life, except perhaps in adults older than 75 or 80 years of age [3]. Bronchiolitis causes significant morbidity and mortality in infants and young children worldwide and is one of the most common clinical conditions treated by practicing pediatricians. Severe bronchiolitis is the most common reason for hospitalization of pediatric patients. This condition causes acute inflammation, edema, and necrosis of epithelial cells; increased mucus production; and inadequate oxygenation of tissues, which can permanently damage the respiratory structures. In high-income countries, such as the United States, the number of hospitalizations for severe bronchiolitis have been estimated at 120,000 cases per year among infants, and the proportion of hospitalizations have tripled between 1980 and 1996, from 5% to 16% [4,5]. In Spain, the incidence of bronchiolitis is estimated at 7%, and hospital admissions is estimated at 1.79% annually in children younger than 2 years [6]. However, in low/middle-income countries, the data on admissions of children with severe bronchiolitis and their outcomes are seldom up to date [7]. The Simplified Chinese version of the ITQOL performed well in a community-based sample of Chinese infants, with evidence supporting the instrument's feasibility, reliability, and validity. These data support the ITQOL as a valuable tool to assess HRQOL in Chinese infants [8].

Acute bronchiolitis increases the risk of asthma, and reduced quality of life (QoL) is reported in children with asthma and allergy. However, the impact

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of asthma risk factors on QoL is unclear. This study investigated whether bronchiolitis and common asthma risk factors in infancy had an influence on later QoL [9].

The relationship between early infections due to respiratory syncytial virus (RSV), particularly bronchiolitis in infancy, and the subsequent development of asthma, bronchial hyper-responsiveness, and/or other allergic manifestations, seems increasingly certain, even if the mechanisms involved are not yet quite clear [10,11].

Wheezing illness [12] and asthma-like symptoms [2] have been associated with reduced QoL in infants and young children.

Using the 97 question version of the Infant/Toddler Quality of Life Questionnaire (ITQOL-97) [13], we have shown that hospitalisation for acute bronchiolitis as well as asthma risk factors, including atopic eczema in infancy, were associated with reduced general QoL nine months later [9].

Acute bronchiolitis increases the risk of asthma, and reduced quality of life (QoL) is reported in children with asthma and allergy. However, the impact of asthma risk factors on QoL is unclear. This study investigated whether bronchiolitis and common asthma risk factors in infancy had an influence on later QoL. Having acute bronchiolitis, atopic eczema and three asthma risk factors were negatively associated with later QoL in early childhood [1].

The general health Infant Toddler Quality of Life Questionnaire™ (ITQOL) was recently validated and applied to infants with obstructive airways disease [14] and other diseases [15]. When the ITQOL was applied to 5000 infants in the Generation R study, QoL was reduced for the majority of domains and particularly for the general health, bodily pain and family activities domains in infants with asthma-like symptoms. Similar reductions of QoL were reported 2–6 months after acute bronchiolitis [16,17].

The aim of this observational study was to evaluate the quality of life 3 years or younger children with bronchiolitis and community-acquired pneumonia using the validated Armenian version of the QUALIN and PCQ questionnaire.

Research Methodology

Study design, population, and setting

This retrospective, case-controlled study included all children 3 years or younger who were hospitalized with a diagnosis of severe bronchiolitis and community-acquired pneumonia in the "Mouratsan" children clinic of Yerevan State medical University from September 2015 to January 2017. Severe bronchiolitis was defined as rhinorrhea, cough, tachypnea, wheezing, rales, and increased respiratory effort (e.g., grunting, nasal flaring, and intercostal and/or subcostal retraction), with symptoms of severity (e.g., increased respiratory rate, retractions, and oxygen saturation at 90% or lower) [18]. For making the diagnosis of pneumonia was used clinical criteria, which has defined by The World Health Organization [4].

All these children diagnosed with severe bronchiolitis, community-acquired pneumonia were hospitalized.

Inclusion criteria included diagnosis of severe bronchiolitis and age 3 years or younger, date of birth during the study period and respiratory virus detected in nasopharyngeal aspirate. Exclusion criteria included previous hospitalization for bronchiolitis, previous use of bronchodilators or corticosteroids, the lack of clinical symptoms of respiratory infections and/or demographic data and absence of respiratory virus isolated in nasopharynx aspirate.

In addition, clinical information about healthy age-matched children, which received care for healthy children control, from the same period of time was used as the control group. Healthy children 3 years or younger, with no history of respiratory symptoms or previous hospitalizations during the past 6 months, who were born in the catchment area and received care from the Preventative Polyclinic department in same hospital were included as a healthy control group. Depending on the severity of community-acquired pneumonia, we have formed the following subgroups using British Thoracic Society guidelines, which classify children as having mild or severe pneumonia [18]:

Group case I: Mild.

Group case II: Severe.

Informed consent was obtained from the children's parents at the time of clinical evaluation. The Ethical Committee of Yerevan State Medical University approved the study in accordance with the Declaration of Helsinki 1975, as revised in 1983.

"Mouratsan" University Complex

It serves as the regional referral hospital for children. Mouratsan University Complex is a tertiary-level hospital that provides medical care to children from rural towns and urban cities of Armenia. Hospital has 12 clinics with 141 pediatricians and 181 nurses attend to pediatric patients that arrive at this Hospital.

Quality of life assessment

Quality of life assessment was performed using the general and specific questionnaires.

- As a general questionnaire were used QUALIN performed by Manificat et al. for early aged children (up to 3 years). The questionnaire includes 34 items. Each of items was scored on a 6-point Likert scale, scored from 0 (quite false) to +5 (entirely true) (Ralston SL). Thus, the mean score ranges from 0 (poor QOL) to +5 (excellent QOL). Four topics are addressed: behavior and communication (BC), ability to remain alone (ARA), family environment (FE), psychological and somatic well-being (PSWB). The total score (TS) of all 34 questions was calculated finally. Questionnaire completed by parents and pediatricians.
- As a specific HRQL questionnaire were used the pediatric cough questionnaire (PCQ). PCQ includes five questions, which are answered by the child's parent or caregiver, cover cough frequency (Q1), sleep disturbance of the child (Q2), sleep disturbance of the parent (Q3), cough severity (Q4), and the degree of bothersomeness to the child (Q5). Each of the five items was scored on a 6-point Likert scale.

Statistical analysis

The continuous variable data are reported as the mean and standard deviation (SD). The demographic data and risk factors are given as simple frequencies and proportions. Statistical associations were determined by Student t test, Chi-square test, or Fisher exact test, when appropriate. P value <.05 was considered statistically significant, and the confidence interval was set at 95%. Agreement between QUALIN and PCQ scores in the different study groups was analyzed by correlations. All analyses were performed using IBM_ 22.0.0 SPSS statistical package.

Results

A certificate of hospital care for children up to 7 years invested in Republic of Armenia since January 2011. The certificate allowed receiving services within the framework of the state order. The number of children receiving hospital care in the "Muratsan" University Complex increased during 2011-2017 due to the availability of medical care. The prevalence of bronchiolitis and community-acquired pneumonia increased among hospitalized children (Figure 1).

A total of 1117 children 3 years or younger with bronchiolitis and community-acquired pneumonia (case group) and 1005 healthy age matched children 3 years or younger (control group) underwent study. The studied case group was represented by the boys, which made up 55.5% and the girls, which made up 44.5%. The studied control group was represented by the boys, which made up 52.0% and the girls, which made up 48.0% (Table 1).

The QL measures with QUALIN showed that case group has significantly lower scores compared with controls for all subscales of QUALIN (Table 2).

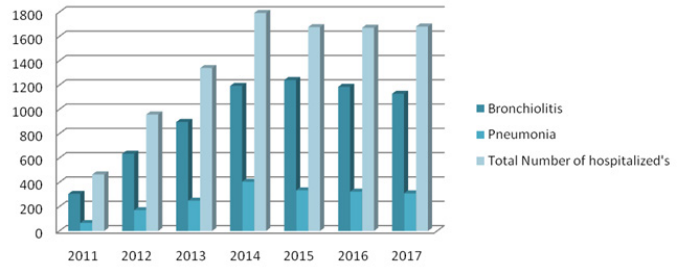

Figure 1. Children with bronchiolitis and community-acquired pneumoniahospitalizated in the "Muratsan" University Complex during 2011-2017.

Table 1. Characteristics of participants.

Groups	Case group n= 1117	Control group n= 1005
Boys (n, %)	620 (55.5)	523 (52.0)
Girls (n, %)	497 (44.5)	482 (48.0)
Birth weight (Mean, SD)	3120 (237)	3185 (245)
Gestation age (weeks) (Mean, SE)	37.5 (0.42)	38.7 (0.26)
Maternal age at birth (Mean, SE)	30.1 (2.7)	28.9 (2.6)

Table 2. The QL scores of participants (QUALIN).

QL subscales	Case group	Control group	P value (case vs control)
	Mean(SE)	Mean(SE)	
BC	3.6±0.07	4.5±0.07	<0.001
ARA	3.2±0.07	3.5±0.03	<0.05
FE	3.4±0.07	4.4±0.08	<0.001
PSWB	3.1 ±0.07	3.9±0.03	<0.001
TS	3.4±0.07	4.1±0.6	<0.001

The results of the study have shown that there is a dependency between the severity of community-acquired pneumonia and the quality of life. The impact of pneumonia on children's QoL depending on the severity has been compared. As can be seen from the results of the study the difference between groups is more pronounced for "Psychological and somatic well-being" and "Ability to remain alone" subscales (Table 3).

According to PCQ results were registered significant differences between scores of PCQ among case subgroups, except Q3 subscale (Table 4).

The Pearson's correlation coefficient between PCQ and QUALIN questionnaires in case group was -0.575 (p<0.001) suggesting a robust correlation between scores.

Discussion

Results of the study are of importance as they show that quality of life is affected in case of community-acquired pneumonia and bronchiolitis in early childhood. The study is important since it enriches the literature data referred to the early aged children's community-acquired pneumonia and bronchiolitis (British Thoracic Society, Manificat S, Hartnick CJ, Ma H, Eg KP) [19-22].

Strength of this study is to be one of the first studies to explore the impact of community-acquired pneumonia and bronchiolitis on QoL scores in early childhood. The results of study are important, because the findings can be generalized to other Armenian urban populations. A limitation is the observational nature of the study, which means a temporal relationship between studed diseases and quality of life cannot be explored.

Reduced QoL in four domains was associated with increased length of stay and need for ventilatory support. Physical abilities and general health were associated with both severity markers, whereas bodily pain and discomfort and change in health were associated with length of stay. Ventilatory support was more negatively associated with QoL than atopic eczema and also associated with reduced parental emotions and parental time [1].

Table 3. The scores of qualities of life of children due to pneumonia severity criteria (Me, Q25-Q75, M ± SE).

Subscales of QL(QUALIN)	Non parametric Statistics (Me, Q25-Q75)			Parametric Statistics			
	Group case I	Group case II	P-value	Group case I		Group case II	
				M±SE	M/5* 100%	M±SE	M/5* 100%
BC	3,9 (3,0-4,1)	3,2(2,2-4,4)	<0,001	3,7±0,04	74%	3,2±0,03	64%
ARA	3,4 (2,9-4,3)	2,9(2,5-3,0)	<0,001	3,1±0,04	62%	2,8±0,02	56%
FE	3,5(3,2-4,7)	3,3(2,9-3,5)	<0,001	3.,5±0,04	70%	3,1±0,03	62%
PSWB	3,2 (3,1-4,3)	3,0(2,9-3,4)	<0,001	3,0±0,05	60%	2,9±0,02	58%
TS	3,6(3,1-4,4)	3,2 (2,8-3,2)	<0,001	3,4±0,04	68%	3,0±0,04	60%

Table 4. The QL scores of participants (PCQ).

QL subscales (Mean)	Group case I	Group case II	P value (case vs control)
Q1	3.9	4.6	<0.001
Q2	2.9	3.4	<0.001
Q3	3.5	3.6	>0.05
Q4	3.6	4.4	<0.001
Q5	3.9	4.1	<0.05

Reductions in the QoL scores in four domains – physical abilities, general health, parental emotions and parental time – in infants receiving ventilatory support have, to our knowledge, not previously been demonstrated. Our results are in contrast to the study by [10,19], who did not find associations between mechanical ventilation and QoL two years later in 28 of 128 infants hospitalized with RSV infection.

The present study may be limited by the relatively low rate of QoL answers from the original bronchiolitis group of the randomized controlled trial (52%), leading to an overrepresentation of parents with higher education and Caucasian ethnicity. On the other hand, we found no significant interaction or confounding by maternal education or ethnicity [1,8,22]. The ITQOL is carefully validated in general infants and child populations [23], as well as for young children with diseases [24] relevant for the present study.

Disease-specific and general health QoL instruments are not directly comparable, possibly explaining some of the discrepancy in magnitude of associations. The presently observed negative impact on QoL by atopic eczema of up to 11 percentage points or score points is less than the 33% reduction in QoL observed in 5 to 16-year-old Scottish children with generalized atopic eczema, but more in line with the 19% reduction in QoL with localizedeczema . In comparison, Beattie et al. [25] reported a mean reduction of QoL for asthma of 28%.

The severity of acute bronchiolitis, assessed by length of stay in hospital, the need for supportive treatment and the disease severity at hospital admission were all associated with reduced quality of life nine months later. Infants receiving ventilatory support had the poorest QoL almost a year after the acute disease [26,27].

Conclusion

A significant decrease in all subscales of the QUALIN and PCQ questionnaires were indicative for an impact of community-acquired pneumonia and bronchiolitis on QL of the early aged children. Most affected subscale in QUALIN was ARA and in PCQ Q1. All scores in case group were significantly lower than it in control group. The severity of community-acquired pneumonia also has impact on QL scores. Thus, the results of the study substantiate that the impact of pneumonia and bronchiolitis on children's QoL scores of early childhood has its own peculiarities.

Ethics Approval and Consent to Participate

The study was approved by the Ethics Committee of the Yerevan State

Medical University. The study was performed following the Declaration of Helsinki Principles and the written informed consent was given by all participants before enrolment.

Consent for Publication

- Not applicable in this section since no personally identifiable information is present in our manuscript.
- Availability of data and materials.
- The datasets used in the current study may be available from the corresponding author on reasonable request.
- The datasets generated and/or analysed during the current study are not publicly available due [Reason Why Data Are Not Public] but are available from the corresponding author on reasonable request.

Competing Interests

The authors declare that they have no competing interests.

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