ОРИГІНАЛЬНІ ДОСЛІДЖЕННЯ

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Recurrent respiratory infections in young school-age children and psychological maternal predictors

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Recurrent respiratory infections (RRIs) in children remain a pertinent issue in modern medicine. According to literary data, the prevalence of this phenomenon can reach up to a quarter of the child population. RRIs adversely affect a child's physical development, social adaptation, and give rise to intra-family conflicts.

Purpose — to investigate the contribution of psychological predictors from the mother's perspective in the development of recurrent courses of respiratory infections in their young school-age children.

Materials and methods. The study included surveys of mothers (Spielberger–Hanin State-Trait Anxiety Inventory, the Varga—Stolin Parenting Attitudes Test) and their children (R. Temple, M. Dorki, E. Amen «Choose a face» projective test). The main group comprised children aged 5–7 years with RRIs according to the criteria of the 2021 Inter-Society Consensus. The control group consisted of children aged 5–7 years who experienced occasional acute respiratory infections.

Results. In our study, 40 families (mothers and children) participated. We found that mothers of children with RRIs had significantly higher levels of state and trait anxiety, as well as a higher score in the «Cooperation» parenting attitude model compared to the control group. In the structure of the anxiety phenomenon in mothers of children from the main group, 43% of cases exhibited high anxiety levels. Additionally, a high score in maternal personal anxiety correlated with a predominant choice of ineffective parenting models.

Conclusions. Mothers of children with a RRI have significantly higher levels of situational and personal anxiety (p<0.01). 43% of mothers of children with RRIs exhibit excessively high levels of personal anxiety. Furthermore, more anxious mothers tend to adopt the following parenting models towards their own children: «Little looser», «Authoritarian hypersocialization» and «Rejection». The predictive value in the development of RRIs in children is associated with the level of maternal trait anxiety and the psychological portrait of the mother-child relationship, namely the score for by the «Cooperation» model.

Data collection and processing were conducted in accordance with the Helsinki Declaration of the World Medical Association regarding ethical principles in medical research involving human subjects.

The informed consent of patients was obtained for the studies.

No conflict of interests was declared by the authors.

Keywords: recurrent respiratory infections, anxiety, psychological portrait, children, predictors.

Рекурентні респіраторні інфекції в дітей молодшого шкільного віку та психологічні материнські предиктори
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Рекурентні респіраторні інфекції (РРІ) у дітей залишаються актуальною проблемою сучасної медицини. За літературними даними, поширеність цього феномену може сягати до чверті дитячого населення. РРІ погіршують фізичний розвиток дитини, соціальну адаптацію; породжують внутрішньосімейні конфлікти.

Мета — дослідити внесок психологічних предикторів із боку матері в розвиток рекурентного перебігу респіраторних інфекцій їхніх дітей молодшого шкільного віку.

Матеріали та методи. Дійсне дослідження включало анкетування матерів (тест особистісної та ситуативної тривожності Спілбергера–Ханіна, тест батьківського ставлення Варги–Століна) та їхніх дітей (проєктивний тест дитячої тривожності Р. Темпл, М. Доркі, Е. Амен «Обери обличчя»). До основної групи залучено дітей віком 5–7 років з РРІ відповідно до критеріїв Міжвідомчого консенсусу 2021 року. До групи контролю залучено дітей віком 5–7 років, які епізодично хворіли на респіраторні інфекції.

Результати. У дійсному дослідженні взяли участь 40 сімей (матерів і дітей). Нами виявлено, що в матерів дітей із РРІ були достовірно вищими рівні особистісної, ситуаційної тривожності та вищий бал за моделлю батьківського ставлення «Кооперація» порівняно з групою контролю. У структурі феномена тривожності матері дітей з основної групи у 43% випадків мали високу тривожність. При цьому високий показник особистісної материнської тривожності корелював із переважним вибором неефективних моделей ставлення.

Висновки. Матері дітей з рекурентним перебігом РРІ мають достовірно вищий рівень ситуативної та особистісної тривожності (p<0,01). 43% матерів дітей з РРІ мають надмірно високий рівень особистісної тривожності. Своєю чергою, більш тривожні матері схильні до формування таких моделей ставлення до власної дитини: «Маленький невдаха», «Авторитарна гіперсоціалізація» і «Відштовхування». Прогностичну цінність у формуванні дитячих РРІ має рівень особистісної тривожності матері та психологічний портрет взаємин «матір-дитина», а саме бальна оцінка за моделлю «Кооперація».

Збір та обробку даних виконано відповідно до Гельсінської декларації Всесвітньої медичної асоціації щодо етичних принципів медичних досліджень за участю людини як об'єкта дослідження. На проведення досліджень отримано інформовану згоду пацієнтів.

Автори заявляють про відсутність конфлікту інтересів.

Ключові слова: рекурентні респіраторні інфекції, тривожність, психологічний портрет, діти, предиктори.

Introduction

Recurrent respiratory infections (RRIs) in children remain a pressing issue in contemporary medicine. The lack of evidence-based methods for preventing this group of diseases leads to excessive and unjustified use of antimicrobial drugs, immune response stimulants, and immunomodulators, which typically contributes to the rise of antimicrobial resistance among microorganisms [4,6]. In turn, frequent respiratory illnesses have a negative impact on a child's physical and neuro-psychological development, their socialization processes, deteriorate intra-family relationships, and can lead to maladaptation phenomena [1,10].

Factors contributing to maladaptation may include the formation of «pathological» attitudes

Table 1

General characteristics of respondents

Indicator	Main group n=30 M (SD)	Control group n=10 M (SD)	The level of significance p
Mother's age	36.7 (4.89)	37.2 (3.73)	0.96
Child's age	6 (0.74)	5.7 (0.67)	0.206
Number of male children	15 (50%)	3 (30%)	0.363
Number of female children	15 (50%)	7 (70%)	
The number of episodes of respiratory infection in a child in 12 months	7.5 (1.27)	1 (0.66)	0.0001*

*Note: * — statistically significant differences.*

towards the child, excessive infantilization, and hyper-nurturing by parents. On the other hand, it is well-established that mothers can transmit their fears and anxieties to their own children, resulting in challenges in establishing warm emotional connections with their offspring and a tendency to intellectualize their development, often driven by fears that the child may not meet their expectations [2]. Preschool and young school-age children are the most dependent on the socio-economic and psychological characteristics of their families [10].

Purpose of the research — to investigate the contribution of psychological predictors from the mother's perspective in the development of recurrent courses of respiratory infections in their young school-age children.

Materials and methods of the research

Surveys of mothers were conducted using the Spielberger–Hanin State-Trait Anxiety Inventory (STAI) to assess reactive and personal anxiety, as well as the Varga–Stolin Parenting Attitudes Questionnaire (PAQ), which allows determining the parenting attitude model («Acceptance-Rejection», «Cooperation», «Symbiosis», «Authoritarian Hypersocialization», «Little looser»). To assess child anxiety, we employed the projective test «Choose a Face» by R. Temple, M. Dorki, and E. Amen [3].

The *inclusion criterion* for the main group of respondents was the age of the child, which ranged from 5 to 7 years old, and the RRI according to the criteria established by the 2021 Interagency Consensus [1]. Children aged 5–7 years who experienced occasional acute respiratory infections were included in the control group.

The actual study involved 40 families (mothers and children). An overview of the respondents' general characteristics is presented in Table 1.

Considering the data in Table 1, the main and control groups were similar in terms of age and gender, allowing for their comparison based on other parameters. The likely difference in the frequency of acute respiratory infections (Table 1) confirms the appropriateness of including patients in the main and control groups.

Data collection and processing were conducted in accordance with the Helsinki Declaration of the World Medical Association regarding ethical principles in medical research involving human subjects. All participants were informed of the procedures, and mothers of the children provided written informed consent for their participation as well as the participation of their children.

To identify the factors most strongly associated with the risk of developing a RRIs, we employed a «genetic algorithm» for feature selection [8]. Logistic regression models were constructed to assess the degree of influence of the factor variables. The odds ratio (OR) and its 95% confidence interval (CI) were calculated to measure the strength of the relationship between the factor variables and the outcome. Considering that over 90% of the data exhibited a normal distribution, we employed parametric statistical methods for data analysis.

Statistical significance was considered at a critical level of $p < 0.05$. The analysis of research results was performed using statistical software packages, including MedCalc v.22.003 (MedCalc Software Inc.) and MS Excel.

Results and discussion

The results of assessing mothers' responses using the Spielberger–Hanin and Varga–Stolin tests, which allowed us to evaluate the anxiety levels of mothers in the main and control groups and analyze the model of maternal attitudes in the examined families, are presented in Table 2.

According to our data, mothers of children with the RRIs had significantly higher levels of trait (p=0.005) and state (p=0.0009) anxiety, as well as a higher score in the 'Cooperation' parenting attitude model (p=0.0008) compared to the control group. It is worth noting that within

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Table 2

The results of the assessment of mothers' answers according to the Spielberger–Hanin and Varga–Stolin tests from the main and control groups

Indicator	Main group M (SD)	Control group M (SD)	The level of significance p
The State-Trait Anxiety Inventory			
Trait anxiety	44.37 (6.6)	37.6 (4.52)	0.005*
State anxiety	38.4 (8.58)	30.6 (4.5)	0.0009*
Varga–Stolin test (mother-child relationship models)			
Acceptance-Rejection	28.6 (3.4501)	29.2 (2.65832)	0.6193
Cooperation	6.43 (0.8172)	5.3 (0.9487)	0.0008*
Symbiosis	4.73 (1.4126)	3.9 (1.4491)	0.1166
Authoritarian hypersocialization	3.73 (1.3113)	3.7 (1.8886)	0.9508
Little loser	1.53 (1.1958)	1.5 (0.8498)	0.9357

*Note: * — statistically significant differences.*

Table 3

Correlation array of relationships between the results of the STAI and PAQ questionnaires

Models of maternal attitude towards the child	Mother's state anxiety		Mother's trait anxiety	
	r	p	r	p
Acceptance-Rejection	-0.505	0.002*	-0.459	0.005*
Cooperation	-0.252	0.090	-0.254	0.088
Symbiosis	0.381	0.019*	0.173	0.180
Authoritarian hypersocialization	0.359	0.03*	0.425	0.01*
Little loser	0.443	0.009*	0.402	0.014*

*Note: * — statistically significant differences.*

the structure of the anxiety phenomenon, 43% of mothers of children in the main group exhibited high anxiety levels, and low anxiety levels were not encountered in our study.

When comparing the results of the R. Temple, M. Dorki, and E. Amen child anxiety test between the main and control groups, we did not find statistically significant differences (p=0.856, 60.46 (14.21705) versus 61.43 (14.75422) points) in the anxiety levels of the examined children. In our study, the analysis of anxiety levels showed that no respondent had a low level of anxiety, and a high level of anxiety was demonstrated by 82.5% of children from both groups combined (n=33).

Fig. 1. Statistically significant correlations between the psychological factors of the mother–child construct with RRI

In accordance with the research objective, we conducted a correlation analysis based on the results of the utilized methodologies (Table 3).

According to our data, the higher the score in maternal trait anxiety, the less likely it is for her to choose an effective and healthy parenting attitude model («Acceptance» or «Cooperation») in her relationships with her child. Conversely, highly anxious mothers tend to have thoughts of their child's inadequacy in life and attempt to control their actions, which subsequently shapes ineffective models such as «Little looser» and «Authoritarian Hypersocialization».

The identified inverse relationship with the «Acceptance-Rejection» parenting attitude model indicates that highly anxious mothers are more inclined toward rejection. In the context of interpersonal relationships, this suggests that they believe their child will not succeed. These mothers tend not to trust their child, exhibit disdain for their decisions, and express sadness and anger when mentioning their children [7].

In cases where the «Little looser» interpersonal model predominates in relationships, parents infantilize their child's interests, thoughts, and feelings, believing that they are more susceptible to bad influences and negative external factors. Such parents often try to shield their child from life's difficulties and rigorously control their actions [9].
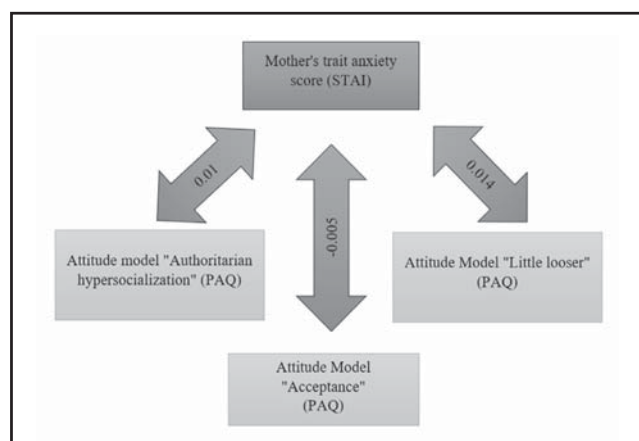
Table 4

Logistic regression results

Predictive variables	Coefficient of regression β	Standard error of coefficient β	χ² Wald	p-value χ² Wald
Mother's trait anxiety score	0.20896	0.096440	4.6946	0.03*
Score based on the «Cooperation» model	1.23093	0.50700	5.8946	0.015*
Constant	-14.77320	5.22930	7.9811	0.005*

Note: * — statistically significant.

On the other hand, parents with a high score on the «Authoritarian Hypersocialization» scale actively control their child's behavior, monitor their achievements, thoughts, beliefs, and demand strict discipline adherence, with mandatory punishment for expressing their own opinion [9].

To identify the factors most strongly associated with the risk of RRI in children, we conducted the selection of the most significant features using a genetic algorithm (selection of significant variables). As a result, two significant factor variables were identified: the score of maternal trait anxiety and the score for the «Cooperation» parenting attitude model. These variables, within the mother-child construct, influence the prognosis of RRI in children.

At the next stage, a logistic regression was carried out, in which the obtained result varied in the range from 0 (no recurrent course) to 1 (probable RRI in the child), within the limits of the assessment of indicators of the mother's trait anxiety and the level of the point assessment of the mother's choice of the model «Cooperation» (Table 4).

The equation for predicting RRI in a child will be as follows: $y = \exp(-14.7732 + 0.20896 \times x1 + 1.23093 \times x2) / [1 + \exp(-14.7732 + 0.20896 \times x1 + 1.23093 \times x2)]$, where x represents the predictor variables, the indicators of each individual mother regarding the child for whom the prediction is calculated.

Regardless of the values of x, the predicted outcome (y) in this model will always fall within the range from 0 to 1. Typically, if the calculated probability is less than 0.5, it can be assumed that the event will not occur; otherwise, the opposite effect is predicted.

The assessment of logistic regression by the Chi-square value showed its adequacy, as its statistical significance level was determined as $\chi^2=17.001$ (p=0.0002). The accuracy rate of correctly predicting a patient's actual group membership was 90%. A high level of concordance indicates a sufficient degree of agreement between the actual distribution of observations and the distribution based on the logistic regression equation.

The accuracy of the logistic regression equation was evaluated using the ROC curve and the area under the curve (AUC). It was determined that the prognostic model in the form of a logistic regression equation has good operational characteristics: sensitivity of 70%, specificity of 96.67%, and the area under the ROC curve is 0.858 (95% CI 0.712–0.948; p=0.0002).

It's worth noting that for predicting the recurrent course of respiratory diseases, it may be sufficient to complete two questionnaires: one regarding the level of maternal trait anxiety (STAI 20 questions) and 8 questions from the Varga–Stolin questionnaire related to the «Cooperation» model. This can significantly reduce the time spent and provide additional opportunities for practicing physicians.

According to the analysis of the logistic regression model, one of the risk factors for the development of RRI in children is an elevated level of maternal trait anxiety, OR=1.2324 (95% CI 1.0201–1.4888), p=0.03.

Trait anxiety is a relatively stable individual trait that characterizes the degree of one's worry, concern, and emotional tension due to the impact of stressors. It is inherent to a specific personality and accompanies them throughout their life [5]. Elevated levels of anxiety serve as a leading «obligatory mechanism» of maladaptive disorders and reflect the individual's well-being. Highly anxious individuals tend to perceive self-esteem and life activities as threatened and respond with pronounced anxiety. This can subsequently have an impact on the «adult-child» relationship vertically and is reflected in their attitude towards their own child.

On the other hand, a predictor of the phenomenon of recurrent respiratory infections in children is the mother's choice of the «Cooperation» model of parenting (Varga–Stolin questionnaire) (p=0.0152). In this regard, when a mother has a higher score on the «Cooperation» model, her child will have a higher risk of RRI,

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OR=3.4244 (95% CI 1.2677–9.2502). According to the methodology, this scale reflects a socially desirable form of parenting. The content of the scale is as follows: parents are interested in the child's plans, try to help, empathize with them, highly value the child's intellectual and creative abilities, and feel proud of them. They encourage the child's initiative and independence. Parents trust the child and seek to support them in all matters, indicating a unique mechanism of «adjustment» to the child's individual characteristics. This connection can be explained by the fact that having a child with RRI necessitates the formation of a specific psychological environment and the selection of a socially desirable type of parenting, «Cooperation», which is in line with contemporary child-rearing trends in the 21st century.

Conclusions

Mothers of children with RRI have significantly higher levels of state and trait anxiety (p<0.01). 43% of mothers of children with RRI exhibit excessively high levels of trait anxiety. More anxious mothers tend to adopt the following models of parenting towards their own child: «Little looser», «Authoritarian Hypersocialization» and «Rejection». The predictive value in the development of RRIs in children is associated with the level of maternal trait anxiety, OR=1.2324 (95% CI 1.0201–1.4888) and the psychological portrait of the mother-child relationship, namely the score for by the «Cooperation» model OR=3.4244 (95% CI 1.2677–9.2502) (p=0.0002).

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