sciendo

ARS Medica Tomitana - 2023; 2(29): pag. 127 - 132
doi: 10.2478/arsm-2023-0019

IS THERE A RELATIONSHIP BETWEEN SOCIO-DEMOGRAPHIC CHARACTERISTICS, LIFESTYLE AND THE SEVERITY OF RESPIRATORY INFECTIONS IN PEDIATRIC PATIENTS?

Raisa-Eloise Barbu[1], Roxana-Elena Bogdan–Goroftei[1,2], Mircea Pompiliu Bogdan[3], Claudiu Elisei Tanase[4], Cristina Mihaela Marin[1,2], Alexia Anastasia Baltă[5], Silvia Aura Costin[1]

[1] Pediatric Departament. Clinical Emergency Hospital for Children "Sfântul Ioan", Galați
[2] Clinical Medical Department, "Dunărea de Jos" University, Faculty of Medicine and Pharmacy, Galati
[3] ICU Departament, County Emergency Clinical Hospital Sfântul Apostol Andrei, Galati
[4] Department of Morphological and Functional Sciences, Dunărea de Jos" University, Faculty of Medicine and Pharmacy, Galati
[5] Medical Department, "Dunărea de Jos" University, Faculty of Medicine and Pharmacy, Galati

Raisa-Eloise Barbu

email: raisauibariu@gmail.com

ABSTRACT

Globally, acute respiratory tract infections (ARIs) are a leading cause of morbidity and mortality in children under five, particularly pneumonia. In 2019, pneumonia claimed 740,180 children's lives, constituting 14% of under-five deaths, with a child succumbing every 39 seconds. Predisposing factors vary, including low birth weight, pollutants, inadequate nutrition, and low maternal education. This study aims to assess the impact of socio-demographic factors on respiratory infection severity in pediatric patients.

A cross-sectional study included 221 pediatric patients with respiratory infections, analyzing socio-demographic and lifestyle factors. Statistical methods explored relationships between socio-demographics, lifestyle, and infection severity.

Descriptive statistics showed quasi-equal gender distribution and a mean age of 4.88 years with a normal distribution. Seasonal variations had gender and environment correlations, but chi-square tests found no statistical differences. Bivariate correlations revealed significant associations between gender and hospitalization days, C-reactive protein, and procalcitonin values.

This study sheds light on socio-demographic factors influencing respiratory infections in pediatric patients, emphasizing the need for targeted interventions.

Keywords: respiratory tract infections, pediatric patients, socio-demographic factors, disease severity, child health

Introduction

Globally, acute respiratory tract infection stands out as the predominant cause of illness and death among children under the age of five. The most severe manifestation of this respiratory ailment is pneumonia, contributing to approximately 15% of all deaths in this age group on an annual basis. The majority of cases, as indicated in specialized literature, are prevalent among infants under one year old, primarily in rural areas. Acute respiratory infection (ARI) also serves as a significant driver for hospitalizations in young children, with over 12 million cases of severe ARI leading to hospital admissions worldwide each year (1).

In low-income countries, the mortality rates associated with ARI are markedly elevated, exhibiting a tenfold increase compared to more economically developed nations. Notably, around 70% of hospitalizations due to childhood pneumonia occur among children under five in the United States. The World Health Organization (WHO) reported that in 2019, 740,180 children succumbed to pneumonia, constituting 14% of all deaths in this age group. Additionally, according to UNICEF data, a child loses their life to pneumonia approximately every 39 seconds (2).

Predisposing factors for various forms

of acute respiratory failure in children exhibit variations across different countries. The specialized literature underscores associations with factors such as low birth weight, exposure to environmental pollutants, insufficient natural nutrition in infants, incomplete immunization, suboptimal nutrition, low maternal educational status, and premature birth in contributing to the severity of ARI (3). Furthermore, the lack of access to adequate medical care, low family income, and exposure to smoking are identified as risk factors associated with pneumonia (4). Environmental factors linked to the origin's climate, the cold season, and the presence of comorbidities in patients are also acknowledged as contributing risk factors.

Research findings suggest that male children aged 1-11 months, residing in urban areas, and having parents with completed primary education, exhibit increased susceptibility to pneumonia. Furthermore, children from lower socio-economic backgrounds in larger families are more prone to developing pneumonia. Consequently, the primary aim of this study is to assess the severity of pneumonia concerning associated socio-demographic factors.

Material and methods

The main mission of this article is to investigate and deeply analyze the existing relationship between the socio-demographic characteristics of pediatric patients, their way of life, and the severity of respiratory infections. We aim to shed light on the socio-demographic factors that may influence the predisposition to respiratory infections in children and to assess how their lifestyle may affect the severity of the disease.

To obtain a representative sample, we selected 221 pediatric patients aged 0–18 years diagnosed with respiratory infections. This study includes participants from diverse socio-demographic backgrounds, paying particular attention to factors such as age, gender, socio-economic status, and geographic region. The participant recruitment was carried out in collaboration with the St. Ioan Galati Emergency Clinical Hospital for Children. Parents or legal representatives received detailed information about the purpose of the study and the procedures involved and offered informed consent before the patients' inclusion in the research.

For data analysis, we used advanced statistical methods, including regression analysis, correlations, and patterns between socio-demographic characteristics, lifestyle, and severity of respiratory infections. This approach allowed a deeper understanding of the relationships between the studied variables.

Finally, we analyzed the study limitations, acknowledging potential shortcomings and suggesting directions for further research that could improve our understanding of the link between socio-demographics, lifestyle, and respiratory infections in pediatric patients.

This detailed methodology was implemented to ensure the collection of accurate and relevant data, thus providing a solid basis for further analysis and interpretation of the results obtained in our research.

Results and discussion

At the level of the previously mentioned sample, general data on the particularities of interest for the study were initially collected. We noted the existence of a quasi-equal distribution related to the sex of the patients, with approximately 9% percentage differences in favor of the male sex (53.4%). We observed a similar situation in the case of reporting dependent on the environments of origin: the rural environment predominates (50.2%).

Statistics

Vârstă

N	Valid	221
	Missing	0
Mean		4.88
Median		5.00
Mode		1
Std. Deviation		2.770
Variance		7.671
Skewness		-.008
Std. Error of Skewness		.164
Kurtosis		-1.380
Std. Error of Kurtosis		.326
Minimum		1
Maximum		9

Figure 1 – Descriptive statistics of group distribution on the scalar variable defined as age

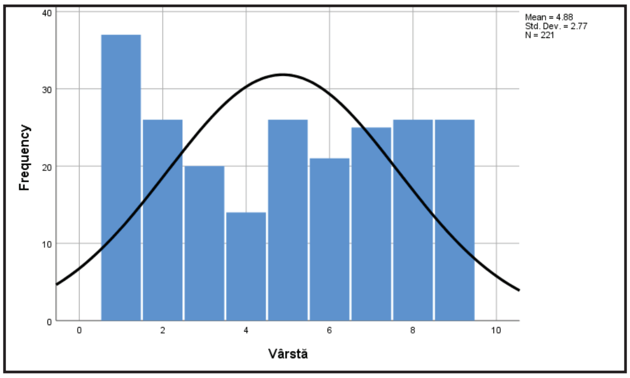

Figure 2 – Histogram of the age distribution

The mean age of the patients included in our study group was statistically analyzed using descriptive statistics. As seen in Figure (1) the mean age is 4.88 years, with a SD of ± 2.77 years. Following the creation of the frequency table within this variable, the maximum age was nine years, while the lowest age was one year. The Skewness index for this variable has the value of -0.008, which means that this study group is distributed according to age symmetrically, possessing a Gaussian bell appearance. The kurtosis index appreciates the degree of curvature of the histogram, so a value of this index close to or equal to 0 represents a normal distribution as well. In the present case, the value of this index is less than 0, respectively -1.380, which means that this distribution is platykurtic with an occasional peak around one one-year age mark.

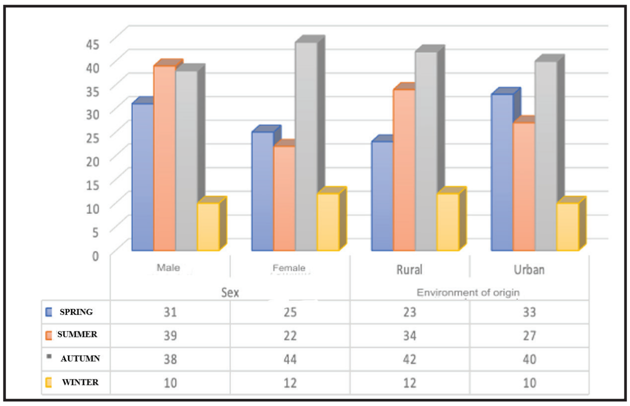

Figure 3 – The incidence of seasonal variations depending on the patients' gender and environment of origin

The figure above graphically summarizes the incidence of seasonal variations for acute respiratory infections, depending on the gender and the environment of origin of the patients. We can conclude the following:

In the spring, the incidence of the male sex (n=31) was higher compared to the female sex (n=25) with a predominance in the urban environment (n=33) compared to the rural one (n=23)

During the summer, as in the case of the spring season, a predisposition of the male gender was observed (n=39), this time the urban environment being more interested (n=34)

In autumn and winter, we observed a higher prevalence amongst females, with 44 cases for autumn and 12 for winter. Moreover, the prevalence based on the environment of origin had a qvasi-simetrical distribution in these two seasons.

At the level of the analyzed sample, it will be observed, by performing chi-square tests, that there are no statistically significant differences between these subgroups of patients (sig=.171 related to sex, respectively sig=.421 related to the defined variable as well as the environment of origin).

From the point of view of the severity of the respiratory pathology, we defined three scalar variables that we use as support variables: the number of days of hospitalization, the C-reactive protein value, and thethe PCT values. Descriptive statistics show that the average hospitalization days was 5.36, with an average PCR value of 1.04 mg/L, and an average procalcitonin value of 1.41.

Correlations

		Environment of origin	Gender	Number of hospitalization days	C-reactive protein	Procalcitonin
Environment of origin	Pearson Correlation	1	.050	-.015	.059	-.109
	Sig. (2-tailed)		.463	.825	.379	.108
	N	221	221	221	221	221
Gender	Pearson Correlation	.050	1	-.193**	.135*	.134*
	Sig. (2-tailed)	.463		.004	.044	.046
	N	221	221	221	221	221
Number of hospitalization days	Pearson Correlation	-.015	-.193**	1	-.142*	-.087
	Sig. (2-tailed)	.825	.004		.035	.196
	N	221	221	221	221	221
C-reactive protein	Pearson Correlation	.059	.135*	-.142*	1	.603**
	Sig. (2-tailed)	.379	.044	.035		.000
	N	221	221	221	221	221
Procalcitonin	Pearson Correlation	-.109	.134*	-.087	.603**	1
	Sig. (2-tailed)	.108	.046	.196	.000	
	N	221	221	221	221	221

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Figure 4 – Bivariate correlations with Pearson's index

The above table defines the working hypotheses that are the basis of this research: if there are statistically significant differences between the individual variables defined as specific for the socio-demographic, namely the previously mentioned scalar variables. We observed highly significant bivariate correlations between the subject's gender and the number of days of hospitalization, suggesting that at the batch level, males are associated with a higher hospitalization days median, compared to females. Also, the CRP values are positively correlated with the PCT values, and with the number of hospitalization days.

These hypotheses are reinforced by the table below in which we tried to summarize all these key elements within the given sample, the conclusions being reinforced by the association of chi-square tests for the evaluation of significative differences.

We observed (sig=.04) a significant difference from a statistical point of view between the type of nutrition and the gender of the patients (for males, artificial nutrition predominated, while female patients benefited from natural nutrition in the first year of life). Several (n=111) male patients were vaccinated (sig = .012) raising the hypothesis that, by association with the previous conclusion, at the batch level the existence of a complete vaccination schedule did not influence the number of days of hospitalization, but neither did the response inflammatory of the body in the context of a lung infection.

By referring to the environment of origin, the chi-square test reveals only one statistically significant correlation (sig=.04), namely with previous hospitalizations. Moreover, we identified a higher number of previous hospitalizations in patients from rural areas. This hypothesis partially contradicts the current situation according to which urban patients benefit from increased accessibility to investigations and follow-up. At the same time, we have a future research hypothesis: do rural patients show an increased number of hospitalizations, due to the severity of the pathologies

		Sex				Chi-square test	Environment of origin				Chi-square test
		Male		Female			Rural		Urban		
		Mean	Count	Mean	Count		Mean	Count	Mean	Count	
Age		5		5			5		5		
Number of hospitalization days		6		5			5		5		
Alimentation	Natural		24		32	.032*		31		25	0.432475
	Artificial		40		20			32		28	
	Mixed		54		51			48		57	
Allergies	No		91		87	0.168699		91		87	0.587243
	Yes		27		16			20		23	
Collectivity	No		116		103	0.184		109		110	0.157
	Yes		2		0			2		0	
Previous hospitalization	No		90		69	0.125529		73		86	.040*
	Yes		28		34			38		24	
Sick relatives	No		102		85	0.420833		90		97	0.143511
	Yes		16		18			21		13	
Vacinnated	No		7		0	.012*		5		2	0.254
	Yes		111		103			106		108	
Additional vaccines	No		113		95	0.265934		106		102	0.381855
	Yes		5		8			5		8	

Figure 5 – Centralizing table

Discussions

Malnutrition emerges as the predominant factor contributing to the mortality of children under the age of five experiencing acute respiratory failure. This condition is ascribed to insufficient breastfeeding and inadequate complementary feeding during the early stages of life (5). The gravity of acute malnutrition is correlated with heightened mortality rates associated with pneumonia, diarrheal diseases, and malaria. These risks are compounded by adverse socio-economic conditions, including youth, low birth weight, incomplete immunization, parental smoking, and other correlated diseases. Not only do these factors escalate the prevalence and severity of diseases, but they also impede the cognitive and physical development of children, perpetuating health disparities.

Offspring of mothers with limited formal education, or those who have only completed primary education, exhibit an increased likelihood of developing Acute Respiratory Infections (ARI) compared to their counterparts with more educated mothers. The educational level of the mother assumes a pivotal role in shaping the quality of the child's care and determining exposure to various social and environmental factors. Ujunwa et al. identified a significant association with maternal education, particularly in lower respiratory tract infections, a finding substantiated by other studies indicating a positive correlation between poor maternal education and ARI (6).

Secondhand smoking emerges as a notable risk factor, elevating the likelihood of ARI by 4.67 compared to children unexposed to secondhand smoke. This discovery aligns with findings from other specialized studies, indicating a two to fourfold increase in the risk of passive smoking compared to non-passive smokers. The association is elucidated by the detrimental impact of smoking on the natural protective mechanism of the respiratory tract, facilitating the compromise of the initial defense line of the respiratory system by pathogens (8).

Remarkably, a child's age and gender do not significantly influence the incidence of acute respiratory infections. Jackson et al.'s meta-analysis revealed inconsistencies in the impact of age and gender on ARI, with some studies demonstrating a significant association and others failing to establish a link between age, gender, and Acute Kidney Injury (AKI) (9).

The World Health Organization (WHO) underscores the significance of low birth weight in the prevalence of AKI (5). Nevertheless, research by Lira et al. in Brazil found no substantial difference between low birth weight and the prevalence of ARI, suggesting that the effect of low birth weight might be more pronounced in neonates.

Exclusive breastfeeding in the initial six months of life plays a crucial role in enhancing immunity, health, growth, and development. Ideally, this practice should persist until the child attains the age of two. Children exclusively breastfed for the first six months in developing countries witness a 30-42% reduction in the incidence of acute Respiratory Tract Infections (RTI) compared to those who do not receive exclusive breastfeeding (7). Despite these advantages, 2017 UNICEF data reveals variable breastfeeding rates in low-, middle-, and high-income countries, potentially indicating a recent decline in breastfeeding. Initiatives aiming to prevent protein-energy malnutrition should prioritize the promotion of exclusive breastfeeding in the initial six months by identifying and addressing the obstacles leading mothers to forsake this natural nutritional source. Growth failure is most prevalent between 3 and 18 months, coinciding with the introduction of early weaning, insufficient complementary feeding, and diets deficient in protein (10).

References

1. Roth GA, Abate D, Abate KH, Abay SM, Abbafati C, Abbasi N, et al. Global, regional, and national age-sex-specific mortality for 282 causes of death in 195 countries and territories, 1980–2017: a systematic analysis for the global burden of disease study 2017. Lancet. 2018;392(10159):1736–1788.
2. UNICEF. What are the malnutrition trends In Egypt? UNICEF; 2018.
3. Solomon O, Odu O, Amu E, Solomon O, Bamidele J, Emmanuel E, et al. Prevalence and risk factors of acute respiratory infection among under-fives in rural communities of Ekiti state Nigeria. Global J Med Public Health. 2018;7(1):12.
4. Tazinya AA, Halle-Ekane GE, Mbuagbaw LT, Abanda M, Atashili J, Obama MT. Risk factors for acute respiratory infections in children under five years attending the Bamenda regional Hospital in Cameroon. BMC Pulmon Med. 2018;18(1):7.
5. World Health Organization (WHO). WHO Anthro survey analyser and other tools: WHO; 2011. Available from: https://www.who.int/tools/child-growth-standards/software. Accessed 27 June 2022.
6. Imran MIK, Inshafi MUA, Sheikh R, Chowdhury MAB, Uddin MJ. Risk factors for acute respiratory infection in children younger than five years in Bangladesh. Public Health. 2019;173:112–9. https://doi.org/10.1016/J.PUHE.2019.05.011.
7. Jama A, Gebreyesus H, Wubayehu T, Gebregyorgis T, Teweldemedhin M, Berhe T, Berhe N. Exclusive breastfeeding for the first six months of life and its associated factors among children age 6–24 months in Burao district, Somaliland. Int Breastfeed J. 2020;15:1–8. doi: 10.1186/S13006-020-0252-7/TABLES/5.
8. Di Cicco ME, Ferrante G, Amato D, et al. Climate change and childhood respiratory health: a call to action for paediatricians. Int J Environ Res Public Health. 2020;17(15):5344. https://doi.org/10.3390/

ijerph17155344.
9. Savitha A, Gopalakrishnan S. Determinants of acute respiratory infections among under-five children in a rural area of Tamil Nadu, India. J Fam Med Prim Care. 2018;7(6):1268.
10. Ujunwa F, Ezeonu C. Risk factors for acute respiratory tract infections in under-five children in Enugu Southeast Nigeria. Ann Med Health Sci Res. 2014;4:95–99. https://doi.org/10.4103/2141-9248.126610.