SECCIÓN

Frequency and preventive practices for acute respiratory infections in children under five years of age

Frecuencia y prácticas preventivas de infecciones respiratorias agudas en niños menores de cinco años

Frequência e práticas preventivas de infecções respiratórias agudas em crianças menores de cinco anos

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Abstract

Introduction: Acute respiratory infections represent one of the main causes of morbidity and mortality in children under the age of five, particularly in rural communities in Mexico, where factors such as poverty, overcrowding, and inadequate preventive practices increase child vulnerability. **Objective:** To determine the relationship between frequency and preventive practices for acute respiratory infections in children under five from a rural community in Oaxaca, Mexico. **Methodology:** This quantitative, descriptive-correlational study was conducted with 133 mothers/primary caregivers of children under the age of five. The participants were selected through non-probabilistic sampling and were residents of the community and registered in the nutritional records of an integrated community hospital. A questionnaire was administered to assess knowledge, practices, and attitudes regarding respiratory diseases in children. Informed consent was requested, guaranteeing the anonymity of participants. Data were analyzed using descriptive and inferential statistics. **Results:** The average age of mothers/caregivers was 28 years, and 2.5 years for children. The mean score on the preventive practices scale was 102.7, SD= 12.6. 91.7 % of preventive practices for acute respiratory infections were effective, and 69.7% of children under the age of five had a low frequency of respiratory infections. A moderate negative statistical correlation was seen between environmental control and infection frequency (p< 0.05), while dimensions such as breastfeeding and vaccination produced heterogeneous results. **Conclusions:** Preventive practices impact acute respiratory infections, but their effectiveness depends on structural and social factors. Educational programs and public policies that reduce inequalities are needed to improve children's health in vulnerable communities.

Key words: Respiratory system infections; Disease prevention; Child health; Rural population; Home environment (DeCS).

Resumen

Introducción: Las infecciones respiratorias agudas representan una de las principales causas de morbilidad y mortalidad en niños menores de cinco años, particularmente en comunidades rurales de México, donde factores como pobreza, hacinamiento y prácticas inadecuadas aumentan la vulnerabilidad infantil. **Objetivo:** Determinar la relación de la frecuencia y prácticas preventivas de infecciones respiratorias agudas en niños menores de cinco años en una comunidad rural de Oaxaca, México. **Metodología.** Estudio cuantitativo, descriptivo correlacional, con 133 madres/cuidadoras principales de niños menores de cinco años, seleccionadas con muestreo no probabilístico, residentes en la comunidad y registradas en las tarjetas nutricionales de un hospital integral comunitario. Se aplicó cuestionario para evaluar conocimiento, práctica y actitudes sobre enfermedades respiratorias en niños, se solicitó consentimiento informado, garantizando anonimato de participantes. Los datos se analizaron con estadística descriptiva e inferencial. **Resultados:** El promedio de edad de madres/cuidadoras fue 28 años y de los niños 2.5 años. El puntaje promedio en la escala de prácticas preventivas 102.7, DE= 12.6, un 91.7 % de las prácticas preventivas fueron eficientes y 69.7 % tuvo nivel bajo en frecuencia de infecciones respiratorias en niños menores de cinco años. Se observó correlación estadística significativa negativa moderada entre control del entorno y frecuencia de infecciones p< 0.05, mientras que dimensiones como lactancia materna y vacunación presentaron resultados heterogéneos. **Conclusiones:** Las prácticas preventivas inciden en las infecciones respiratorias agudas, pero dependen de factores estructurales y sociales; se requieren programas educativos y políticas públicas que reduzcan inequidades para mejorar la salud infantil en comunidades vulnerables.

Palabras clave: Infecciones del sistema respiratorio; Prevención de enfermedades; Salud infantil; Población rural; Ambiente en el hogar (DeCS).

Abstrato

As infecções respiratórias agudas representam uma das principais causas de morbidade e mortalidade em crianças menores de cinco anos, particularmente em comunidades rurais do México, onde fatores como pobreza, superlotação e práticas preventivas inadequadas aumentam a vulnerabilidade infantil. **Objetivo:** Determinar a relação entre a frequência e as práticas preventivas de infecções respiratórias agudas em crianças menores de cinco anos em uma comunidade rural em Oaxaca, México. **Metodologia**: Este estudo quantitativo, descritivo-correlacional, foi realizado com 133 mães/cuidadoras principais de crianças menores de cinco anos. As participantes foram selecionadas por amostragem não probabilística e eram residentes da comunidade e registradas nos registros nutricionais de um hospital comunitário integrado. Um questionário foi aplicado para avaliar conhecimentos, práticas e atitudes em relação a doenças respiratórias em crianças. O consentimento informado foi solicitado, garantindo o anonimato das participantes. Os dados foram analisados com estatística descritiva e inferencial. **Resultados:** A média de idade das mães/cuidadores foi de 28 anos e das crianças de 2,5 anos. A pontuação média na escala de práticas preventivas foi de 102,7, DP = 12,6, indicando 91,7 % de práticas preventivas eficientes e 69,7% apresentaram baixo nível de frequência de infecções respiratórias. Observou-se correlação negativa moderada significativa entre o controle ambiental e a frequência de $p < 0,05$ infecções, enquanto dimensões como aleitamento materno e vacinação apresentaram resultados heterogêneos. **Conclusões:** As práticas preventivas têm impacto nas infecções respiratórias agudas, mas dependem de fatores estruturais e sociais. Programas educacionais e políticas públicas que reduzam as desigualdades são necessários para melhorar a saúde das crianças em comunidades vulneráveis.

Palavras-chave: Infecções do sistema respiratório; Prevenção de doenças; Saúde infantil; População rural; Ambiente doméstico (DeCS).

Introduction

Acute respiratory infections (ARIs), which are mainly of viral origin [1], are one of the most common childhood illnesses and pose a significant threat to the health of children under five, particularly in rural communities [2]. These infections are a leading cause of morbidity and mortality in this age group, severely impacting their well-being and development. The high burden of ARIs in these communities is due to a combination of biological, environmental, and socio-economic factors that increase children's vulnerability [3,4]. The high incidence of ARIs in these communities is due to a combination of biological, environmental, and socio-economic factors that increase the vulnerability of children [3,4]. Over 95 % of these deaths occur in low- and middle-income countries, highlighting the disproportionate impact on vulnerable populations [5-7].

The 2022 National Health and Nutrition Survey (ENSANUT by its acronym in Spanish) in Mexico estimated that 27.6 % of children under five experienced an ARIs in the two weeks prior to the survey. This equates to 2,799,520 children affected. The prevalence was slightly higher among men (28.6 %) than women (26.5 %), with differences seen according to the level of urbanization, that is, 33.0% in rural areas versus 25.6 % in urban areas. Similarly, the prevalence was higher in the first socioeconomic tercile (44.1 %) than in the second (31.7 %) and third (24.2 %). The warning signs most commonly identified by caregivers were "looking sicker" (33.0 %) and "difficulty breathing" (28.0 %), while the least common identification was "pus coming out of the ear" (1.5 %) [8].

In Oaxaca, ARIs represent a significant public health problem in children under five, especially during the winter. In epidemiological week 30 of 2023, 355,092 cases were reported, which is a 31.4 % increase compared to 2022. Of these cases, 21.0 % were in children under five years of age and were concentrated in the Mixteca, Tuxtepec and Sierra Norte regions. By the end of week 47 in 2024, 508,252 cases had been reported, with a higher incidence in the Central Valleys and Isthmus [9], highlighting the need for region-specific prevention measures.

Among the most significant risk factors are premature birth and low birth weight, which weaken the infant's immune system. Overcrowding, indoor smoking, the use of smoky fuels and living in close proximity to open drainage systems increases exposure to respiratory pathogens [10]. Furthermore, a family history of ARIs and low levels of maternal education reduce the likelihood of adopting effective preventive practices for ARIs (PPIRA) [2,11].

In this framework, knowledge of ARIs and family socioeconomic status are key determinants of ARI incidence in childhood. Several studies emphasize the importance of mothers adhering to preventive behaviors, demonstrating that health education interventions can significantly reduce the prevalence of these infections [12,13]. Additionally, specific practices such as exclusive

breastfeeding for six months, timely weaning, full immunization, smoke-free environments and reduced overcrowding can help to reduce the frequency of ARIs [11,14,15].

Therefore, this study provides nursing with concrete evidence of the importance of preventive practices for ARIs in rural communities. This evidence can be used to facilitate educational interventions aimed at caregivers, optimize primary care and reduce serious complications. Furthermore, it establishes a scientific foundation for public policies tailored to vulnerable contexts, thereby strengthening the promotion of children's health [16].

Finally, the objective of this study was to determine the relationship between the frequency of ARIs and preventive practices in children under the age of five from a rural community in Oaxaca, Mexico. The research question was: What is the relationship between frequency and PPIRA in children under five years of age in a rural community in Oaxaca, México?

Methodology

A quantitative, non-experimental, descriptive-correlational study was conducted. Mothers or primary caregivers of children under the age of five, who were over the age of 18, who had a permanent residence in the rural community of the state of Oaxaca, and who were actively registered in the nutritional records of an integrated community hospital, were included. Those with non-continuous residence, cognitive or communication limitations, or who answered the questionnaires incompletely or inconsistently were excluded to ensure data quality and integrity [17].

 The sample consisted of 133 participants, who were selected using a non-probability convenience sampling method, supplemented by the snowball technique. Mothers were initially identified from hospital records and invited to participate in the study by local health personnel during home visits. Those mothers then invited other mothers to participate.

To assess ARIs in the target child population, a questionnaire was used to evaluate the population's knowledge, practices and attitudes regarding respiratory diseases in children. This questionnaire was adapted by the WHO and the Mongolian Ministry of Health [18]. The questionnaire consists of three sections: a) - Basic sociodemographic data, such as the mother's level of education, income, the child's age and sex. b) - Preventive practices for ARIs, comprising 31 items on a Likert scale (from 0 to 4 points) across six dimensions: Breastfeeding (BF), age-appropriate feeding (FEED), vaccination (VAC), environmental control (EC), hand washing (HW) and child hygiene (CH). c) - The third section covers the frequency of acute respiratory infections (FARIs) and comprises four multiple-choice questions considering episodes that occurred in the last year, semester, winter season and last 15 days [19].

The results of preventive PPARIs were classified into three categories: efficient (83-124 points), fair (41-82 points) and poor (0-40 points). The FARIs were categorized as low (0-2 events) or high (3+ events) to identify patterns of recurrence. The original questionnaire had a reliability index of α= 0.86. For this study, the questionnaire was culturally and linguistically adapted through a content review by a panel of three child health experts, followed by semantic adjustments to adapt the terms and practices to the Mexican rural context [20]. In addition, a pilot test involving 15 mothers from the same community was conducted to verify the comprehensibility, relevance and clarity of the items. Minor adjustments were made based on the feedback received [21]. Following adaptation, the instrument achieved reliabilities of α= 0.87 and α= 0.77 for preventive practices for ARIs and FARIs, respectively.

The study was approved by the educational institution and authorized by the directors of the integrated community hospital and local authorities, following the guidelines of the Declaration of Helsinki [22]. During home visits, the objective was explained, informed consent was obtained, and the questionnaire was administered. In addition, vaccination records were verified, and educational

material on the prevention of ARIs was provided. The entire process was carried out in accordance with the regulations of the general health law on health research and the ethical principles of autonomy, non-maleficence, and justice, guaranteeing the confidentiality, privacy, and anonymity of the participants [23].

The data were processed using the Statistical Package for the Social Sciences (SPSS), version 26.0. Descriptive statistics were applied: frequencies and percentages for categorical variables, and means and standard deviation for quantitative variables. The normality of the scores of PPIRA was verified for normality using the Kolmogorov-Smirnov test with Lilliefors correction. The reliability of the questionnaire was assessed using Cronbach's alpha coefficient. Spearman's correlation was used to analyze the relationship between the dimensions of PPIRA and the FIRAS. In addition, significance tests were performed with a 95 % confidence level.

Results

The female participants were aged between 17 and 40 (mean = 28, SD = 5.9). Of these, 43.6 % had completed high school level, and 42.1 % reported a monthly income of less than 1,000 Mexican pesos (MXN). Regarding the children, 28.6 % were one year old or younger (mean= 2.5 years, SD = 1.2), and 43.6 % were male, (Table 1).

Table 1. Sociodemographic data of mothers and their children under the age of 5, 2024 (n= 133)

Variables	f	%
Mother's level of education:		
Elementary School	22	16.5
Middle School	42	31.6
High School	58	43.6
University	11	8,3
Mother's monthly income:		
Less than 1,000 Mexican pesos	56	42.1
From 1,000 to 2,000 Mexican pesos	40	30.1
From 2,000 to 4,000 Mexican pesos	34	25.6
More than 5,000 Mexican pesos	3	2.3
Children's sex:		
Male	58	43.6
Female	39	29.3
Not specified	36	27.1
Children's age:		
One year or less	38	28.6
Two years	28	21.1
Three years	30	22.6
Four years	37	27.8

Source: Self-developed. Note: f = Frequency, % = Percentage.

The PPARIs scale achieved an average score of 102.7 (SD= 12.6). In terms of specific components, the average score for HW was 91.4 (SD= 17.0) and for EC it was 77.3 (SD= 12.7). The FARIs had an average score of 18.7 (SD= 16.8), (Table 2).

Table 2. Descriptive statistics and Kolmogorov–Smirnov test results for the study variables, 2024 (n = 133)

Variables	M	SD	MDN	MIN	MAX	Da	P
PPARIs	102.6	12.6	106.0	49.0	124.0	.165	.000
Breastfeeding (BF)	11.2	19.8	12.0	0.0	12.0	.417	.000
Feeding (FEED)	13.7	2.5	87.5	25.0	100.0	.219	.000
Vaccination (VAC)	7.1	1.4	8.0	3.0	8.0	.369	.000
Environmental Control (EC)	77.2	12.7	78.3	20.0	100.0	.121	.000
Handwashing (HW)	91.4	17.0	100.0	37.5	100.0	.397	.000
Child Hygiene (CH)	16.3	3.2	17.0	6.0	20.0	.161	.000
FARIs	18.6	16.8	16.6	0.0	83.3	.172	.000

Source: Self-developed. Note: PPARIs= Preventive practices for acute respiratory infections, FARIs= Frequency of acute respiratory infections, M= Mean, SD= Standard Deviation, MDN= Median, MIN= Minimum, MAX= Maximum, Da= Statistic from the Kolmogorov-Smirnov normality test with Lilliefors correction.

Additionally, the majority of participants (91.7 %) reported effective PPIRA. However, only 8.2 % of mothers or primary caregivers of children under five reported an average level of effectiveness in this regard, (Figure 1).

Figure 1. Level of effectiveness of preventive practices for acute respiratory infections (PPARIs) among mothers or primary caregivers of children under the age of five, 2025 (n = 133)
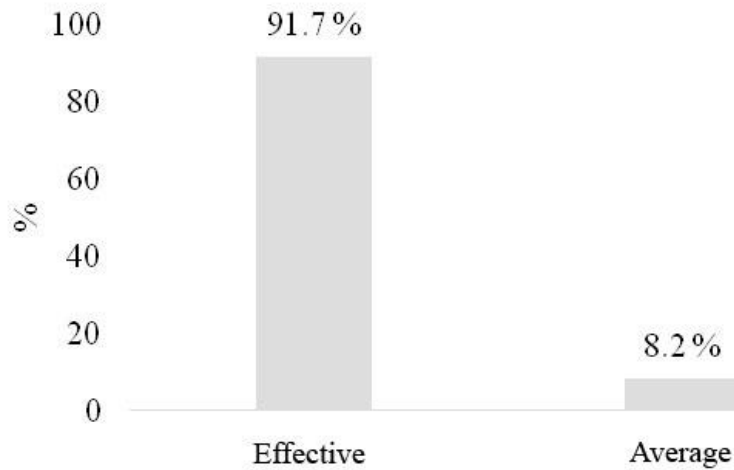
Source: Self-developed

Regarding the FARIs in children under five, the majority (69.7 %) had a low level, while 30.3 % had a high level. Overall, it was observed that nearly 7 out of 10 participants were in the low-level category, (Figure 2).

Figure 2. Frequency of acute respiratory infections (FARIs) in children under the age of 5, 2025 (n= 133)
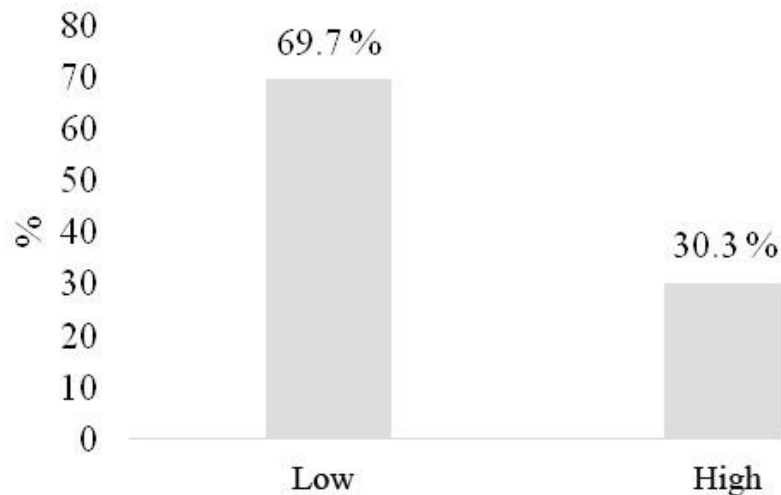
Source: Self-developed.

Regarding the correlation between the FARIs and the dimensions of PPARIs in children, a statistically significant and moderately negative correlation was found between environmental control and the frequency of such infections (*rs*= -0.191, p< 0.05), suggesting that better environmental control is associated with a lower FARIs.

In addition, there were statistically significant correlations between FEED and HW (rs= 0.480, p< 0.01), as well as between FEED and VAC (rs = 0.283, p < 0.01). This indicates that better FEED is related to key preventive measures for ARIs. VAC showed a statistically significant correlation with EC (*rs*= 0.206, p< 0.05), suggesting that good EC promotes VAC. Finally, CH exhibited positive statistical correlations with EC (*rs*= 0.335, p< 0.01) and VAC (*rs*= 0.383, p< 0.01), emphasizing its association with other vital preventive measures against ARIs, (Table 3).

Table 3. Correlations between preventive practices and the frequency of acute respiratory infections in children under the age of five, 2024 (n = 133)

Variables	FARIs	BF	FEED	VAC	EC	HW
Breastfeeding (BF)	-.040					
Feeding (FEED)	.081	.218*				
Vaccination (VAC)	.016	-.077	.283**			
Environmental Control (EC)	-.191*	.244**	.287**	.206*		
Handwashing (HW)	.056	.168	.480**	.198*	.124	
Child Hygiene (CH)	.083	-.019	.245**	.383**	.335**	.233**

Source: Self-developed. Note: FARIs= Frequency of acute respiratory infections, BF = Breastfeeding, FEED = Feeding, VAC= Vaccination, EC = Environmental Control, HW= Handwashing, CH = Child Hygiene.
* Correlation is significant at the 0.05 level (two-tailed).
** Correlation is significant at the 0.01 level (two-tailed).

Discussion

This study analyzed the relationship between the frequency of ARIs and preventive practices against ARIs in children under five in a rural community in Oaxaca, México. The results revealed significant socioeconomic vulnerability among the participants: over half of the mothers reported monthly incomes of less than 1,000 Mexican pesos, which is below the minimum rural welfare threshold set by CONEVAL in 2024. This highlights not only a situation of extreme poverty, but also the structural precariousness that limits access to basic health and wellbeing resources [24].

This precariousness, combined with low levels of education, creates a risk profile that reflects national poverty patterns. This highlights the need for targeted, intersectoral interventions to improve access to healthcare and break the cycle of poverty and child morbidity. These conditions limit access to information and preventative resources, partly explaining the differences in PPIRA [3,25]. Recent research emphasizes that education-based interventions alone are insufficient if they are not accompanied by policies that address structural inequalities [26-28].

The results showed that adherence to PPIRA proved effective. This finding is consistent with previous studies that have highlighted the positive impact of maternal health education [13,29]. However, disparities persist in key areas such as child hygiene and environmental control. This reflects the need for targeted interventions in communities with structural limitations [3,25].

In terms of EC, a moderately significant statistic was identified in relation to the frequency of ARIs, suggesting that better management of the home environment (e.g. adequate ventilation, smoke reduction and sanitation) is associated with a lower incidence of ARIs. This finding is consistent with previous studies, which have shown that children living in homes with poor sanitation are up to 2.7 times more likely to develop ARIs [25,26]. However, the EC study revealed that factors such as the use of solid fuels and overcrowding, which are prevalent in rural areas, remain inadequately addressed [10,30].

The results regarding breastfeeding and VAC, on the other hand, were mixed. Although breastfeeding was scored as low, the lack of a statistically significant correlation with the frequency of ARIs contradicts studies that have linked exclusive breastfeeding with a lower risk of such infections [13,31]. This discrepancy could be due to local factors, such as mothers entering the labor market at an early age, misinformation, or poor hygiene. Regarding VAC, although it was statistically significantly correlated with EC, no direct statistical association was observed with the frequency of ARIs, which could reflect uneven coverage in rural areas, as previous studies have

suggested [33,34]. It has also been suggested that circulation of pathogens not included in the VAC schedule could explain this relationship [35].

HW and CH, the HW variable scored highly and was significantly correlated with adequate FEED, thus supporting its key role in preventing ARIs [12,35]. In contrast, CH showed suboptimal levels, consistent with studies emphasizing its impact on reducing ARIs [25,36]. These findings emphasize the importance of providing children with education on personal hygiene, particularly in areas where access to safe drinking water is limited.

One of the strengths of this study is the use of a validated questionnaire adapted for the target population, which enhances the reliability of the collected data. However, it is important to note some limitations. The cross-sectional design does not allow for the establishment of causal relationships, and the study relies on self-reported data, which could be subject to recall bias. Additionally, the generalizability of the results may be limited by the sample size and the non-probabilistic nature of the sample selection.

These results highlight the importance of implementing community programs to strengthen the prevention of ARIs, particularly by educating mothers about hygiene and environmental care. Additionally, it is recommended that vaccination campaigns are reinforced and that public policies are promoted to reduce exposure to environmental risk factors, such as smoke from solid fuels and overcrowding [13,37].

Conclusions

This study found that practices aimed at preventing ARIs, particularly environmental control measures and hand washing, were associated with a lower frequency of ARIs in children under five in a rural community in Oaxaca. However, the effectiveness of these practices was found to depend on social factors such as poverty, a lack of basic infrastructure and unequal access to health services.

These findings emphasize the importance of designing comprehensive interventions to encourage the adoption of preventive practices for ARIs among individuals and families, as well as formulating public policies to reduce the structural disparities that impact children's health in rural communities. The results highlight the need for a multisectoral approach to addressing ARIs, in which nursing staff, community health teams, health promotion teams and those responsible for monitoring environmental risk factors work together to provide families with guidance on effective, culturally relevant prevention measures. Further research is needed to analyze the contextual barriers that limit the adoption of preventive practices for ARIs in rural communities, and to evaluate the medium- and long-term effectiveness of integrated interventions.

This study provides valuable evidence to support the development of primary care programs and child health policies tailored to the specific social and economic circumstances of rural communities. This will help to reduce morbidity and mortality from ARIs in children.

Conflict of interest

The authors stated that they have no conflicts of interest.

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Artificial Intelligence

The authors stated that they have not used any type of artificial intelligence resources in any of the sections of this manuscript.

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