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Assessment of Acute Respiratory Infection and Common Medication Use in Children below Five Years in Sulaimani, Kurdistan, Iraq

Bayan Omar Sharif[1], Avin Ali Mahmood[2], Kamal Jalal Rashid[3], Hawzhin Abdulrahman Rahim[4], Razya Sabah Hamid[4], Hanan Sabah Wali[4], Ako Muhammad Aziz[4]

[1]Department of Scientific, Directorate of Health, Health Development and Training Center, Sulaimani, Kurdistan Region, Iraq, [2]Department of Obstetric and Maternity Nursing, Sulaimani Technical Institute, Sulaimani, Kurdistan Region, Iraq, [3]Department of Anesthesia, College of Health and Medical Technology, Sulaimani Polytechnic University, Sulaimani, Kurdistan Region, Iraq, [4]College of Pharmacy, Sulaimani, Kurdistan Region, Iraq

ABSTRACT

In children under 5 years of age, acute respiratory infections (ARIs) represent a significant cause of morbidity and mortality, potentially leading to severe outcomes such as hearing loss and developmental delays. This study aims to assess the prevalence of frequent medication use and identify epidemiological risk factors associated with ARIs in this age group. The research was conducted at Dr. Jamal Pediatric Hospital in Sulaimani city, employing a cross-sectional descriptive approach that included a sample of 42 patients, from June 11th to July 1st, 2024. Data collection involved interviewing mothers and reviewing their children's medical records. The findings indicated that 45.2% of the children were under 1-year-old, 52.3% resided in metropolitan areas, and 66.7% were male. Notably, 47.6% of the children had received only partial vaccinations, 42.8% consumed bottle milk, and 66.7% experienced recurring illnesses. The majority of illnesses lasted between 1 and 5 days (83.3%). The medications administered included amoxicillin (26.2%), acetaminophen (54.8%), ventolin nebulizer (52.4%), dexamethasone (88%), and antihistamines (4.8%). Regarding parental education, 40.4% of mothers were illiterate, and 76.1% were unemployed. In contrast, 42.9% of fathers had completed elementary school. In addition, 73.9% of families reported insufficient financial resources. Smoking prevalence was high among fathers (71.4%) and lower among mothers (26.1%). Moreover, 12% of fathers had previously smoked, and 28.5% of mothers had been exposed to secondhand smoke. The majority of families (52.3%) were nuclear, with 66.7% consisting of three or more members. Data analysis was performed using Statistical Package for the Social Sciences version 24. The study concluded that significant risk factors for ARIs include male gender, incomplete immunization, exposure to smoking, low parental education and economic status, and inadequate diet. Public health initiatives should focus on improving nutrition, educating parents, reducing smoking exposure, and ensuring complete immunization to effectively decrease the prevalence of ARIs.

Index Terms: Epidemiology, Acute Respiratory Infection, Medication, Children below Five

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1. INTRODUCTION

Acute respiratory infections (ARIs) represent a significant global health issue due to their high morbidity and mortality rates. Data from the World Health Organization indicate that in 2016, ARIs were the fourth leading cause of global

Corresponding author's e-mail: Bayan Omar Sharif, Department of Scientific, Directorate of Health, Health Development and Training Center, Sulaimani, Kurdistan Region, Iraq. E_mail: omerbayan82@gmail.com

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mortality, accounting for approximately three million deaths, or 40 deaths/100,000 people. In particular, acute lower respiratory infections (ALRIs), such as pneumonia and bronchiolitis, are leading causes of hospital admissions and death among young children, especially in low- and middle-income countries [1].

The upper respiratory tract encompasses the airways from the nostrils to the vocal cords within the larynx, including the middle ear and paranasal sinuses. In contrast, the lower respiratory tract includes the airways extending from the trachea and bronchi to the bronchioles and alveoli. Mortality rates for infants, children, and the elderly are notably high, particularly in low- and middle-income countries [2].

Children under 5 years old are particularly vulnerable to respiratory tract infections (RTIs) due to a range of sociocultural, socioeconomic, and environmental risk factors. Even though many of these risk factors may be avoided, however, they have a major impact on the occurrence of these infections in this age group [3]. Ear infections frequently develop as a complication of upper RTIs, such as colds, caused by bacteria and viruses. These pathogens can enter the middle ear through the eustachian tube, leading to inflammation and potential blockage. This obstruction disrupts the function of the eustachian tube, resulting in the accumulation of infectious fluid in the middle ear [4].

Influenza viruses not only represent a significant global health threat but are also a leading cause of seasonal illness and mortality. Understanding the epidemiology and etiology of influenza is crucial for the effective identification, assessment, and treatment of affected individuals. Staying informed about the latest advancements in healthcare is vital for providing optimal patient care, particularly in an era of rapid technological progress. Recent developments include the introduction of new medications and software-driven tools for managing respiratory diseases. Maximizing the use of these advanced technologies, innovative drugs, and enhanced international surveillance is essential [5].

Studies indicated that various factors associated with ARIs vary across different countries. Evidence from developing countries suggests several significant risk factors for ARIs including low birth weight, exposure to indoor air pollution, non-exclusive breastfeeding, incomplete immunization, overcrowding in households, poor nutrition, formula feeding, weaning, young age of the mother, low parental educational status, premature birth, inadequate access to medical care, low family income, and parental cigarette smoking [6]. Interventions to control ARIs can be broadly categorized into four main areas: vaccination against specific infections, early diagnosis and treatment of diseases, improved nutrition, and the creation of safer environments [7]. It is recommended that preventative programs focusing on minimizing exposure to these risk factors be prioritized, particularly in less developed countries [8].

In 2009, the Global Action Plan for the Prevention and Control of Pneumonia was established to reduce pneumonia-related mortality [9]. Despite international efforts to combat pneumonia and diarrhea, fifteen countries account for more than two-thirds of the global mortality burden from these diseases. Notably, nearly half of the worldwide deaths from pneumonia and diarrhea occur in just two countries: Nigeria and India. Addressing the various risk factors identified in previous studies is crucial to reducing the mortality and morbidity associated with ARIs. These risk factors include aspects related to the home environment, the mother, and the child, such as age, gender, nutritional status, and household income [10]. Research has shown that children who are underweight and come from low-income families are at a higher risk of developing ARIs [11]. In addition, studies indicate that children who have recently experienced diarrhea are more susceptible to ARIs [12].

A cross-sectional study conducted in India has underscored the negative impact of other sources of indoor air pollution, such as the absence of a separate kitchen and exposure to second-hand smoke [13]. In addition, a quantitative systematic review of studies from developed countries has estimated that handwashing can reduce the prevalence of respiratory illnesses [14]. Previous research has also indicated that ambient humidity is a significant factor in respiratory illnesses, potentially explaining their increased incidence during winter months [15]. Moreover, a cross-sectional study in Brazil involving young children found that living in overcrowded households increases the risk of acute lower RTIs [16]. It is crucial for caregivers to promptly recognize symptoms of infection and provide the necessary care [17]. To prevent pneumonia-related deaths, it is essential to initiate a course of antibiotics immediately [18].

Health-seeking behaviors are influenced by a variety of factors, including financial, social, and demographic considerations. Previous studies have shown that maternal education positively affects healthcare-seeking behaviours [19]. In addition, research has demonstrated that family size, socioeconomic status, and accessibility to health-care facilities significantly impact individuals' actions when seeking

medical attention [20]. The aim of the current study was to assess ARI and common medication use in children below 5 years in Sulaimani, Kurdistan, Iraq' because the respiratory infection is associated with significant health burden as it is an important cause of hospitalization and death in children under 5 years.

2. PATIENTS AND METHODS

2.1. Study Design

A quantitative, cross-sectional, descriptive study was conducted to assess the risk factors associated with RTIs in children between March 12th and April 10th, 2022.

2.2. The Study Setting

This study was conducted at Dr. Jamal Pediatric Hospital in Sulaimani City. The research encompassed the hospital's pediatric wards.

2.3. Sampling

A non-probability (purposive) sample was used, including 42 patients under 5 years old who were diagnosed with ARI and admitted to the Dr. Jamal Pediatric Hospital in Sulaimani City.

2.4. Inclusion and Exclusion Criteria

The inclusion criteria for the study consisted of patients under 5 years old who were diagnosed with ARI and admitted to the Dr. Jamal Pediatric Hospital in Sulaimani City. Patients older than 5 years or those diagnosed with conditions other than ARI were excluded from the study.

2.5. Study Tools

The study utilized a two-part questionnaire developed based on a review of the literature. The first part collected demographic information about the children, including age, gender, and residency, as well as clinical details such as vital signs, recurrence and duration of ARIs, immunization status, nutritional condition, and use of medications such as antibiotics, analgesics, antihistamines, and nebulizers. The second part gathered information about the parents, including their level of education, number of family members, and smoking habits. Data on the children were extracted from their medical records, while parental information was obtained through face-to-face interviews with the mothers.

2.6. Study Validity

The validity of the data collection tool was established through a review process involving six experts. These experts evaluated the study questionnaire and provided feedback, leading to revisions that improved the instrument's relevance and clarity. This process enhanced the final \validity of the tool.

2.7. Pilot Study

A pilot study was conducted with 5 patients from the initial study sample in June 10th, 2024, and the results led to the exclusion of these patients from the final study sample.

2.8. Study Sample Reliability

The reliability of the study instrument was assessed using the Cronbach's Alpha Correlation Coefficient and the internal consistency (split-half) method, resulting in a strong correlation ($r = 0.80$).

2.9. Data Collection Approaches

All patients diagnosed with ARI and admitted to the Pediatric Hospital in Sulaimani City were included in the study sample. Data were collected through face-to-face interviews with the mothers for their information and from the children's medical records. The data collection period was from June 11th to July 1st, 2024. Completing the questionnaire on ARI took approximately 10 min. The study initially included 50 patients, but 5 were used for a pilot study and subsequently excluded, and 3 mothers declined to participate.

2.10. Statistical Analysis

Version 24 of the Statistical Package for the Social Sciences was utilized to code and organize the data into computer files. Inferential data analysis, along with frequency and percentage calculations, were employed to process and analyze the data.

3. RESULTS

3.1. Part 1: Socio-demographic and Clinical Characteristic of the Childrens

The current results indicated that 45.2% of the participants were neonates under 1 year old (6–11 months). Among the remaining respondents, 26.2% were aged 1–<2 years, 19% were 2–<3 years, and 9.6% were 3–<5 years. Of the total participants, 66.7% were male and 33.3% were female. Additionally, 52.3% of the participants resided in urban areas, while 47.7% lived in rural areas (Table 1).

From this study, it was demonstrated that 47.6% of the respondents were partially immunized, while 42.9% were fully immunized, and 9.5% were not immunized. In addition, 42.8% of the participants were bottle-fed, 33.3% were breast-fed, and 23.8% were fed a combination of food and milk (Table 2).

TABLE 1: Distribution of children's demographic data

Items	Frequency	Percentage
Age		
<1 year (6–11 months)	19	45.2
1–<2 years (12–23 months)	11	26.2
2–<3 years (24–35 months)	8	19
3–<5 years (36–59 months)	4	9.6
Total	42	100
Gender		
Male	28	66.7
Female	14	33.3
Total	42	100
Residential area		
Urban	22	52.3
Rural	20	47.7
Total	42	100

TABLE 2: Distribution of childrens according to vaccination and nutritional status

Items	Frequency	Percentage
Vaccination		
Complete	18	42.9
Partial	20	47.6
None	4	9.5
Total	42	100
Nutritional status		
Breastfeeding	14	33.3
Bottle feeding	18	42.8
Food and milk	10	23.8
Total	42	100

The current results showed that 66.7% of the participants experienced disease recurrence, while 33.3% did not. Among those with recurrence, 83.3% had episodes lasting 1–5 days, whereas 16.7% had episodes lasting more than 5 days (Table 3).

Our observations demonstrated that 26.2% of the participants received amoxicillin, 19% were administered ceftriaxone, 11.9% received a combination of amoxicillin and ceftriaxone, 2.4% were given amikacin and ceftriaxone, and 2.4% received azithromycin. Additionally, 38.1% of the participants did not use antibiotics. Regarding steroid medications, 88.1% of participants were treated with dexamethasone, while 4.8% did not receive steroids. The remaining participants were treated with either dexamethasone and hydrocortisone (2.4%), hydrocortisone alone (2.4%), or prednisolone (2.4%). Concerning analgesic drugs, 54.8% of participants used acetaminophen, 40.4% did not use paracetamol, and 4.8% were given a combination of ibuprofen and paracetamol. For nebulizers, 52.4% of participants used Ventolin, while 47.6% did not use nebulizers. Regarding Montelukast, 95.2%

TABLE 3: Distribution of children according to disease recurrence and duration

Items	Frequency	Percentage
Disease recurrence		
Yes	28	66.7
No	14	33.3
Total	42	100
Duration of disease recurrence		
1–5 day	35	83.3
>5 days	7	16.7
Total	42	100

of participants did not receive the drug, whereas 4.8% were treated with Montelukast (Table 4).

3.2. Part 2: Socio-demographic and Clinical Characteristic of the Children's Parents of the Study

It was showed that 42.9% of the fathers of the children had achieved a primary level of literacy, 33.3% were illiterate, 16.7% had secondary education, and 7.1% had attended college or an institute. Among the mothers, 40.5% were illiterate, 35.7% had a primary level of education, 19% had secondary education, and 4.8% had attended college or an institute (Table 5).

Regarding employment, 76.1% of the mothers were not employed, while 23.9% were employed. Additionally, 73.9% of the families were in an economically insufficient state. Smoking habits showed that 71.4% of fathers and 26.1% of mothers were smokers, whereas 12% of fathers were former smokers and 28.5% of mothers were exposed to second-hand smoke. The majority of families (66.7%) consisted of 3–5 members, with 52.3% being nuclear families and 47.7% being extended families (Table 5).

4. DISCUSSION

The current study revealed that neonates aged 6–11 months constituted over half of the participants. Less than 25% were between the ages of 2–<3 years and 3–<5 years, while more than 25% were aged 1–<2 years. More than half of the respondents were male, and the majority were from urban areas, with the remainder from rural areas. These findings align with those of Basiouny and Hamad [21] in Egypt, who reported a predominance of male participants from urban areas.

This study also found that nearly half of the respondents were either partially or fully immunized, while less than a quarter were not immunized. In terms of nutritional status,

TABLE 4: Sample distribution according analgesic using

Medications	Frequency	Percent
Antibiotics		
Amoxicillin	11	26.2
Amoxicillin/ceftriaxone	5	11.9
Amikacin/ceftriaxone	1	2.4
Azithromycin	1	2.4
No antibiotic	16	38.1
Ceftriaxone	8	19.0
Total	42	100.0
Analgesics		
No analgesic	17	40.4
Acetaminophen (paracetamol)	23	54.8
Ibuprofen/paracetamol	2	4.8
Total	42	100
Nebulizer		
No nebulizer	20	47.6
Ventolin	22	52.4
Total	42	100
Steroids		
No steroid	2	4.8
Dexamethasone	37	88
Hydrocortisone	2	4.8
Prednisolone	1	2.4
Total	42	100
Using Montelukast (antihistamine drugs)		
Yes	2	4.8
No	40	95.2
Total	42	100

TABLE 5: Distribution of sample according to parent's socio-demographic data

Items	Categories	Frequency	Percentage
Level of education			
Father	Illiterate	14	33.3
	Primary	18	42.9
	Secondary	7	16.7
	College or institute	3	7.1
	Total	42	100
Mother	Illiterate	17	40.4
	Primary	15	35.8
	Secondary	8	19
	College or institute	2	4.8
	Total	42	100
Mother's occupation	Employed	10	23.9
	Non employed	32	76.1
	Total	42	100
Monthly income	Sufficient	3	7.1
	Barely sufficient	8	19
	Insufficient	31	73.9
	Total	42	100
Smoking cigarette (father)	Smoker	30	71.4
	Non smoker	7	16.6
	Ex-smoker	5	12
	Total	42	100
Smoking cigarette (mother)	Smoker	11	26.1
	Non smoker	19	45.2
	Second hand smoke	12	28.5
	Total	42	100
Number of family members	3–5	28	66.7
	>5–7	9	21.4
	>7	5	11.9
	Total	42	100
Types of families	Nuclear	22	52.3
	Extended	20	47.7

less than a quarter consumed solid food, two-thirds drank milk, and nearly half were exclusively bottle-fed. More than half of the participants experienced disease recurrence, with the majority of illness episodes lasting 1–5 days, and less than a quarter having symptoms for more than 5 days.

Regarding medication use, more than a quarter of participants took amoxicillin, while less than a quarter used ceftriaxone, a combination of amoxicillin and ceftriaxone, amikacin and ceftriaxone, or azithromycin. Two-thirds of participants did not use antibiotics. Most participants received dexamethasone for steroid treatment, while less than a quarter used other steroids, including dexamethasone combined with hydrocortisone, hydrocortisone alone, or prednisolone.

In terms of analgesics, over half used acetaminophen, under half did not use paracetamol, and <25% used a combination of ibuprofen and paracetamol. For nebulizer use, over half utilized Ventolin, while nearly half did not use nebulizers. Only a small percentage of participants used Montelukast, with the majority not using it. These findings are consistent with the 2019 study by Basiouny and Hamad [21] in Egypt, which found that most participants used paracetamol. However, their study indicated higher usage rates for ibuprofen and antihistamines compared to this study.

In the current analysis, significant associations with ARI were found concerning the child's age and gender, vaccination status, paternal education level, and parental smoking habits. The multivariable analysis revealed that children aged 24–35 months and 36–59 months had a lower likelihood of developing ARIs. This finding is consistent with studies conducted by Prajapati *et al*. in Ahmedabad City and similar research in other low- and middle-income countries in India [22]. Additionally, research from the People's Republic of China and South India also indicated a high prevalence of ARIs among children aged 6–36 months. This is attributed to the strengthening of the immune system in older children, which enhances their ability to resist infections (Lu *et al*., 2013; Dhananjaya Sharma *et al*., 2013 in South India) [23], [24].

The current study revealed that a significant proportion of fathers had only a primary school education, while nearly

half of the mothers were illiterate. Approximately three-quarters of the families experienced economic hardship. Additionally, around three-quarters of the fathers and over a quarter of the mothers were active smokers. Less than a quarter of the fathers were former smokers, and more than a quarter of the mothers were exposed to secondhand smoke. Moreover, more than half of the families consisted of three or more individuals. This finding is consistent with the family structure observed in an Egyptian study [21], where the majority of families were nuclear. However, our study's parents predominantly had only primary education or were illiterate, in contrast to the Egyptian study, which included parents with higher education levels.

According to our study, nearly two-thirds of the mothers and almost half of the fathers had only an elementary education, and nearly three-quarters of families experienced financial difficulties. Higher parental education has been identified as a protective factor against ARI in children under five, which aligns with research by Ujunwa and Ezeonu in Southeast Nigeria [25]. However, studies conducted in Solapur, Ethiopia by Fekadu *et al*. and in southern Brazil by Cardoso *et al*. found no significant correlation between ARI and paternal education [26], [27]. Furthermore, <25% of mothers were employed, with more than 75% being unemployed. Working mothers, who often have secondary or higher education, tend to spend less time at home and cooking, thereby reducing their children's exposure to indoor air pollution. Thus, higher education and better income are considered protective factors against ARI in children under five, consistent with studies from southern Brazil, India, Ahmedabad City, and Gondar City in Ethiopia [6], [27]–[29]. Consequently, the current study recommends providing educational information to mothers as a crucial measure for protecting children under five from ARIs.

5. CONCLUSION

This study identified several significant risk factors associated with ARI among children under 5 years old in Sulaimani City. The findings highlighted that male patients, incomplete immunization, inadequate nutritional status, and low socioeconomic status are major contributors to the prevalence of ARI. In addition, low levels of parental education, particularly among mothers, along with cigarette smoking and exposure to secondhand smoke, further exacerbate these risk factors. The results emphasize the need for targeted public health interventions aimed at improving immunization rates, providing dietary support, and implementing educational programs for parents. Efforts to reduce cigarette smoking and minimize exposure to secondhand smoke are also crucial in addressing the percentage of ARI in this population.

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