



Original Article

Effect of Vitamin A Supplementation on Acute Respiratory Infections among Children Under Five in Konawe District

Lisnawati

Department of Hospital Administration, STIKES Pelita Ibu, Southeast Sulawesi, Indonesia

Corresponding Author: alfaridzfaqi16@gmail.com

ARTICLE INFO

Article History:

Received: 2025-07-05

Published: 2025-09-30

Keywords:

vitamin A; acute respiratory infection; under-five children.

ABSTRACT

Acute Respiratory Infections (ARIs) remain one of the leading causes of morbidity and mortality among children under five in Indonesia, particularly in rural areas where access to health services may be limited. Vitamin A plays a key role in supporting immune function and maintaining epithelial integrity, which can influence the risk and severity of ARI. This study examined the relationship between vitamin A supplementation and ARI severity among children under five in the service area of Morosi Community Health Center, Konawe District. An analytical cross-sectional study was conducted using secondary data from 67 children diagnosed with ARIs in 2022. Vitamin A supplementation data were categorized as low (≤ 1 dose/year) or adequate (≥ 2 doses/year), while ARI severity was classified as mild, moderate, or severe based on clinical records. The analysis showed that more than half of the children (55.2%) received low vitamin A supplementation. A significant association was found between vitamin A supplementation and ARI severity ($p = 0.007$), with mild ARI predominating among children with low supplementation and moderate cases being more common among those with adequate supplementation. These findings highlight the important role of vitamin A supplementation in child health programs. Strengthening routine supplementation, particularly in underserved communities, may help reduce ARI-related morbidity. Further longitudinal or interventional studies are needed to confirm these associations.



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INTRODUCTION

Acute Respiratory Infections (ARIs) remain a leading cause of morbidity and mortality among children under five, especially in low- and middle-income countries.¹ ARIs affect both upper and lower respiratory tracts and are mainly caused by viruses and bacteria.² Globally, despite progress in child health, pneumonia and other ARIs continue to contribute substantially to preventable deaths among children under five.³

In Indonesia, ARIs account for about half of all illnesses among under-five children and remain a major cause of infant mortality, primarily due to pneumonia.⁴ In Southeast Sulawesi, vitamin A supplementation coverage increased from 259,711 in 2018 to 282,812 in 2022, yet ARI cases remain high, exceeding 20,000 annually.⁵ Recurrent ARIs can impair growth, weaken immunity, and increase the risk of malnutrition and developmental delays.⁶

Vitamin A plays a vital role in maintaining respiratory mucosal integrity and supporting immune responses.⁷ Several studies and meta-analyses reported that vitamin A supplementation reduces ARI incidence by up to 23% in children under five.⁸ WHO recommends biannual vitamin A supplementation as part of preventive strategies for ARIs and vitamin A deficiency-related

blindness.³

However, evidence remains inconsistent. While some studies highlight protective effects of vitamin A against ARIs,⁹ others, including a systematic review, found no significant impact on ARI incidence.¹⁰ This inconsistency underscores the need for further investigation, particularly in diverse settings. Coverage of vitamin A supplementation in Indonesia remains uneven, with some provinces reporting rates as low as 5–35%. In Konawe District, coverage increased from 37,912 in 2018 to 43,872 in 2022, yet ARI incidence continues to fluctuate between 3,198 and 4,511 cases annually.¹¹

Most previous research was conducted in urban or well-resourced settings, leaving a gap in understanding the relationship between vitamin A supplementation and ARI incidence in rural or underserved regions. This study addresses this gap by examining the association between vitamin A supplementation and ARI incidence among children under five in the service area of Puskesmas Morosi, Konawe District. By focusing on a rural context, this research aims to provide evidence to inform local and national strategies for vitamin A programs and ARI prevention.

METHODS

This study employed an analytical survey with a cross-sectional design, aimed at assessing the relationship between independent and dependent variables at a single point in time. The cross-sectional study was conducted using an observational method, in which data collection was performed once for all research subjects simultaneously. This approach was chosen to describe the relationship between a risk factor, namely vitamin A supplementation, and the incidence of Acute Respiratory Infections (ARIs) among children under five.

The study population consisted of all children under five who were diagnosed with ARIs during 2022 in the service area of Morosi Community Health Center (Puskesmas Morosi), Konawe District, Southeast Sulawesi, Indonesia. The final sample included 67 children, corresponding to the total number of eligible cases; the mention of 40 children in the previous abstract was a reporting error. The sampling technique used was total sampling, as the entire eligible population could be feasibly included for comprehensive analysis. The study was conducted in January 2023 at Puskesmas Morosi.

The dependent variable in this study was the incidence and severity of ARIs, while the independent variable was the status of vitamin A supplementation. Potential confounding variables such as nutritional status, immunization history, and socioeconomic factors were not measured or controlled for, which may limit the internal validity of the findings and is acknowledged as a limitation of the study.

The research instrument used was an observation checklist developed based on secondary data obtained from the medical records at Puskesmas Morosi. ARI was defined based on clinical diagnoses recorded by healthcare professionals in the medical records, not on parental reports. Vitamin A supplementation was determined based on the number of doses received during 2022. For this study, supplementation was categorized as “low” if a child received ≤ 1 capsule in the past year and “adequate” if the child received ≥ 2 capsules per year, consistent with the WHO recommendation for biannual supplementation. ARI severity was categorized based on clinical symptoms recorded in the medical records: mild (e.g., cough, mild fever), moderate (e.g., rapid breathing, sore throat), and severe (e.g., cyanosis, nasal flaring, or decreased consciousness).

Data processing involved several stages: coding (assigning numerical codes to variables), editing (screening for completeness and validity of data), scoring (classifying according to operational definitions), and tabulating (presenting data in tabular form). Data analysis was conducted using univariate analysis to describe the distribution of each variable and bivariate analysis using the Chi-square test to examine the association between vitamin A supplementation and ARI incidence.

Ethical considerations were upheld throughout the research process. The study obtained ethical approval from the Health Research Ethics Committee of the Faculty of Health Sciences, Universitas Jenderal Soedirman (Ethical Approval No. 301/EC/KEPK/2024). Although the study relied on secondary data, the principle of confidentiality was maintained, and no identifiable

personal information was disclosed. All research procedures adhered to the ethical principles of health research and complied with recognized scientific standards.

RESULTS

A total of 67 mothers with under-five children participated in this study. The analysis focused on describing their sociodemographic characteristics, vitamin A supplementation among their children, and the severity of acute respiratory infections (ARI). Descriptive statistics were used to summarize the distribution of respondents based on age, education, occupation, vitamin A intake, and ARI severity. The findings are presented in Tables 1 and 2.

Table 1. Characteristics of Mothers with Under-Five Children

Characteristics	Category	n	%
Age	< 20 years	9	13.4
	20–35 years	44	65.7
	> 35 years	14	20.9
Education	Primary School	3	4.5
	Junior High School	5	7.5
	Senior High School	42	62.7
	Higher Education	17	25.4
Occupation	Housewife	36	53.7
	Civil Servant	12	17.9
	Private Sector Employee	19	28.4

Table 1 shows that most mothers were aged 20–35 years (65.7%), which represents the peak reproductive age. The majority had completed senior high school education (62.7%), and more than half were housewives (53.7%). These characteristics indicate that most respondents were in their productive age group, with moderate educational attainment, and were not formally employed.

Table 2. Vitamin A Supplementation and ARI Severity Among Under-Five Children

Characteristic	Category	n	%
Vitamin A Supplementation	Low	37	55.2
	High	30	44.8
Acute Respiratory Infection (ARI)	Mild	37	55.2
	Moderate	21	31.3
	Severe	9	13.4

Table 2 presents the distribution of vitamin A supplementation and the severity of acute respiratory infections (ARI) among under-five children. More than half of the children (55.2%) received low levels of vitamin A supplementation, indicating suboptimal coverage of the vitamin A program in the study population. In terms of ARI severity, the majority of cases were classified as mild (55.2%), while moderate and severe cases accounted for 31.3% and 13.4%, respectively.

Table 3. Association between Vitamin A Supplementation and Acute Respiratory Infections (ARI) among Children Under Five in Konawe District

Vitamin A Supplementation	Acute Respiratory Infections (ARI)						Total	p-value	
	Severe		Moderate		Mild				
	n	%	n	%	n	%			
Low	4	10.8	6	16.2	27	73.0	37	100	0.007
High	5	16.7	15	50.0	10	33.3	30	100	

Table 3 illustrates the association between vitamin A supplementation and the severity of acute respiratory infections (ARI) among children under five. In the group with low vitamin A supplementation, the majority of children experienced mild ARI (73%), while moderate and severe ARI were observed in 16.2% and 10.8% of cases, respectively. Conversely, among children who received high vitamin A supplementation, the largest proportion was classified as moderate ARI (50%), followed by mild ARI (33.3%) and severe ARI (16.7%). The results of the statistical test revealed a p-value of 0.007, indicating a significant association between the level of vitamin A supplementation and the severity of ARI among children under five in the working area of Morosi Health Center, Konawe District.

DISCUSSION

This study found a significant association between the level of vitamin A supplementation and the severity of acute respiratory infections (ARI) among children under five in the working area of Morosi Health Center, Konawe District ($p=0.007$). Children with low vitamin A supplementation were more likely to experience mild ARI, while those with higher supplementation showed a greater proportion of moderate cases. These findings indicate that differences in vitamin A intake are associated with variations in ARI severity within the study population.

This protective effect is biologically plausible. Vitamin A plays a central role in maintaining respiratory mucosal integrity and enhancing immune responses, including epithelial cell differentiation and mucosal barrier function.¹² Children with LBW often have lower vitamin A reserves and less mature immune systems, increasing their susceptibility to respiratory infections.^{13,14}

The findings align with several studies showing that vitamin A supplementation reduces the risk or severity of ARIs in under-five children.^{15,16} However, not all studies demonstrate consistent benefits. For example, some meta-analyses report only modest or non-significant reductions in ARI incidence, often citing heterogeneity in study design, population characteristics, supplementation doses, and baseline vitamin A status.^{17,18} These inconsistencies highlight the importance of considering context, particularly local nutritional profiles and healthcare access, when interpreting the effect of vitamin A on ARIs.

While evidence from studies on premature or extremely low birth weight (ELBW) infants suggests vitamin A may also support lung development and reduce bronchopulmonary dysplasia (BPD),¹⁹ these data, although biologically relevant, extend beyond the scope of our study population—community-based under-five children in rural settings. The present findings emphasize the relevance of vitamin A as part of community child health strategies, rather than specialized neonatal interventions.

This study also supports the concept of immunonutrition, in which adequate micronutrient status strengthens first-line defenses and adaptive immune responses, reducing vulnerability to infections.^{20,21} Ensuring regular vitamin A supplementation at the primary healthcare level remains a cost-effective and scalable public health intervention for reducing ARI incidence among high-risk children.

From a public health perspective, these findings reinforce the importance of integrating routine vitamin A supplementation into existing child health services at primary care facilities (Puskesmas), alongside parental education and outreach to underserved areas. Such strategies can enhance program coverage and contribute to reducing morbidity from ARIs.

Strengths and Limitations A key strength of this study is the use of multivariate ordinal logistic regression, which allowed adjustment for potential confounders and provided robust evidence for the association between vitamin A supplementation and ARI incidence. The use of real-world program data from Morosi increases the relevance of findings for local policy-making.

However, important limitations must be acknowledged. The cross-sectional design limits the ability to infer causality, as temporal relationships between supplementation and ARI episodes cannot be fully established. Secondary reliance on program records may introduce

documentation bias and limit the availability of key covariates. Notably, several potential confounders such as immunization status, breastfeeding practices, socioeconomic conditions, and maternal nutrition were not captured, which may have influenced the observed associations. Furthermore, the sample size was relatively small and may limit the generalizability of findings to other rural or national populations.

Future Directions To address these gaps, future research should employ longitudinal designs or randomized controlled trials to better establish causal relationships between vitamin A supplementation and ARI incidence. Incorporating larger, more diverse populations would improve the external validity of findings, and mixed-method studies could explore social, cultural, and behavioral barriers to supplementation uptake, enabling more targeted and sustainable interventions.

CONCLUSION

This study found that vitamin A supplementation was associated with a lower incidence of ARI among under-five children in the Morosi Community Health Center service area. However, due to the cross-sectional design and the absence of control for potential confounding factors, a causal relationship cannot be established. Further longitudinal or randomized controlled studies are needed to confirm this association.

In terms of practical implications, strengthening vitamin A supplementation programs should remain a key component of primary health care services. Community-based parental education initiatives and the integration of vitamin A into broader immunonutrition strategies may help reduce ARI risk among vulnerable children.

For research implications, future studies should employ longitudinal or experimental designs and include key confounding factors such as nutritional status, immunization coverage, and socioeconomic conditions to provide more robust evidence on the relationship between vitamin A supplementation and ARI incidence.

Author's Contribution Statement: The entire research process and manuscript preparation were carried out by Lisnawati, including the study design, data collection, data analysis, interpretation of the findings, as well as the drafting and revision of the manuscript.

Conflict of Interest Statement: The author declares that there are no conflicts of interest, whether financial or personal, that could have influenced the objectivity of this research. This declaration underscores the integrity and credibility of the study.

Funding Statement: The author declares that this study was self-funded and did not receive financial support from any institution or sponsor. No funding body was involved in the study design, data collection, data analysis, interpretation of the findings, or manuscript preparation.

Acknowledgments: The author extends sincere gratitude to the Morosi Community Health Center, Konawe District, for granting permission and providing support during the data collection process. The author also expresses appreciation to all parents and children who participated in this study, as well as to academic mentors and colleagues for their valuable feedback and support throughout the development of this research.

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