QANUN MEDIKA
Jurnal Kedokteran
Fakultas Kedokteran FKUM Surabaya
http://journal.um-surabaya.ac.id/index.php/qanunmedika

Research Article

Preventive Health Behaviors Associated with Recurrent Acute Respiratory Infections: A Case-Based Epidemiological Study

Elman Boy[1*], Doli Naufal Ritonga[1], Muhammad Idlal Yusriyyah Girsang[1], Aria Adhaini Malau[1]

1) Faculty of Medicine Universitas Muhammadiyah Sumatera Utara, Medan, Indonesia

ARTICLE INFO

Submitted : 17th September 2025
Accepted : 8 th December 2025
Published : 25th January 2026

Keywords:

recurrent ARI, preventive behaviors, PHBS, adults, primary care

Correspondence:

elmanboy@umsu.ac.id

ABSTRACT

Recurrent acute respiratory infections (ARI) in adults continue to pose a significant public health burden, particularly in communities where adherence to preventive behaviors is inconsistent. This study aimed to examine the association between preventive health behaviors and recurrent ARI using a case-based epidemiological approach. A cross-sectional analysis was conducted among 106 adults diagnosed with ARI, and data were collected using a structured questionnaire adapted from PHBS indicators assessing hand hygiene, respiratory etiquette, mask use during illness, smoking inside the home, physical distancing when symptomatic, and healthcare-seeking practices. Recurrent ARI was defined as three or more episodes within the previous 12 months, and associations were analyzed using the Chi-Square test with a significance level of $p < 0.05$. Several preventive behaviors, including inadequate hand hygiene, poor respiratory etiquette, limited mask use, and delayed medical consultation, showed significant relationships with recurrent ARI, with inconsistent behaviors markedly elevating recurrence risk. These findings suggest that strengthening behavior-focused health education in primary care, particularly hygiene promotion, responsible respiratory practices, mask use during illness, and timely care-seeking, may help reduce recurrent ARI among adults.

QANUN MEDIKA
Jurnal Kedokteran
Fakultas Kedokteran FKUM Surabaya
http://journal.um-surabaya.ac.id/index.php/qanunmedika

INTRODUCTION

Acute respiratory infections (ARIs) remain among the most common infectious diseases worldwide and continue to impose a substantial burden on health systems, including in adult populations. Although age-standardized incidence and mortality have declined in recent decades, the global incidence of upper and lower respiratory infections remains high, making ARI a persistent public-health concern (Can et al., 2024). In primary care, ARI is consistently among the leading reasons for consultation, with adults experiencing repeated episodes that contribute to service workload and healthcare costs.

Recurrent ARI in adults is associated with repeated healthcare use, inappropriate antibiotic prescribing, and productivity loss. Primary-care studies show that respiratory infections account for a large share of consultations and often drive antibiotic use, despite limited benefit in many uncomplicated cases (Hortense et al., 2025). Community surveys further indicate that some patients with respiratory symptoms do not seek care, potentially enabling ongoing transmission in households and workplaces (Peixi et al., 2024). These patterns underscore the importance of both healthcare-seeking and everyday preventive behaviors in shaping recurrence.

Evidence increasingly supports the use of non-pharmaceutical preventive measures to reduce community transmission. Meta-analyses demonstrate that frequent hand hygiene lowers the probability of ARI (Yin et al., 2022), while reviews show that mask use—especially when combined with cough etiquette—reduces transmission of influenza-like illness in community settings (Baier et al., 2023). Together, these findings position preventive behaviors as central levers for population-level control of respiratory infection.

In Indonesia, ARI remains one of the most frequently reported conditions in primary health centers (Puskesmas) (Kementerian Kesehatan Republik Indonesia [Kemenkes RI], 2023). Although national programs such as Clean and Healthy Living Behavior (*Perilaku Hidup Bersih dan Sehat*, PHBS) promote prevention, evidence specifically linking adult preventive behaviors to recurrent ARI is limited and often focused on children or single-episode illness (ESKD, 2024; Yanti, 2024). To address this gap, the present study examines the association between PHBS-aligned preventive behaviors and recurrent ARI among adults attending the Patumbak Primary Health Center, providing locally grounded evidence to inform targeted health education and community-based interventions (Elman Boy et al., 2024).

METHODS

This study employed an analytical observational design with a cross-sectional approach, conducted at the Patumbak Primary Health Center in 2025. The research focused on adult patients presenting with a clinical diagnosis of acute respiratory infection (ARI) during the data collection period. The target population consisted of all adult patients aged ≥18 years attending the health center. A total of 106 respondents were included using consecutive sampling. Inclusion criteria were: (1) clinically diagnosed with ARI, (2) able to communicate effectively, and (3) willing to participate. Individuals with emergency conditions or cognitive limitations were excluded.

Recurrent ARI was defined as experiencing ≥3 ARI episodes within the previous 12 months. Preventive behavior variables included handwashing practices, cough and sneeze etiquette, mask use while symptomatic, smoking indoors, maintaining distance when ill, and health-seeking behavior.

QANUN MEDIKA
Jurnal Kedokteran
Fakultas Kedokteran FKUM Surabaya
http://journal.um-surabaya.ac.id/index.php/qanunmedika

Data were collected using a structured questionnaire based on the Clean and Healthy Living Behavior (PHBS) indicators. The questionnaire comprised six main domains: (1) proper handwashing, (2) cough and sneeze etiquette, (3) mask use during symptoms, (4) indoor smoking exposure, (5) maintaining distance when ill, and (6) care-seeking practices. Each domain was assessed using a structured scale that had undergone content validation prior to use. Data were obtained through face-to-face interviews conducted by trained researchers and health workers. Each respondent received an explanation of the study's purpose and procedures before participating. Univariate analysis was performed to describe respondent characteristics and preventive behaviors. Bivariate analysis using the Chi-Square test evaluated the association between preventive behaviors and recurrent ARI, with a significance level set at $p < 0.05$.

Recurrent ARI was defined as a self-reported history of 3 or more episodes of acute respiratory infection symptoms within the previous 12 months (Irwin RS, 2006). Information regarding ARI episodes was obtained through structured interviews and was not independently verified against medical records, which may introduce recall bias and misclassify outcomes. The categorization of preventive behaviors into "good" and "poor" adherence was determined using predefined cut-off scores derived from PHBS indicators, based on frequency and consistency of reported behaviors. Given the cross-sectional nature of the study, the analysis was limited to identifying associations rather than causal relationships, and potential confounding factors were not fully controlled.

RESULTS

A total of 106 adults participated in this study. Most respondents were within the 36–65-year age group (70.8%), and the distribution of sex was relatively balanced between males (47.2%) and females (52.8%). The majority had completed senior high school (63.2%), and their occupational backgrounds varied, with employees (29.2%) and housewives (26.4%) being the most common groups. Smoking status also varied, with 29.2% identified as active smokers and 19.8% as passive smokers in the past six months. Half of the respondents reported having at least one comorbid condition, such as asthma, COPD, hypertension, or diabetes.

Preventive health behaviors varied considerably across respondents. Handwashing adherence was generally low, with more than half reporting "never" or "rarely" washing hands consistently. Cough and sneeze etiquette showed a similar pattern, with only 26.4% consistently practicing proper etiquette. Mask use during respiratory symptoms was suboptimal: 22.6% never used masks, and only 27.4% always used them when sick. Smoking behaviors inside the home were also concerning, with more than two-thirds reporting some level of indoor smoking exposure. Physical distancing when symptomatic was practiced inconsistently, and healthcare-seeking behavior showed the weakest adherence, with 35.8% never seeking care despite having ARI symptoms. These patterns illustrate substantial gaps in preventive behaviors that may contribute to recurrent ARI episodes within the study population.

Bivariate analysis was performed to assess the association between preventive behaviors and recurrent ARI among adults. All six preventive behavior variables demonstrated statistically significant relationships with recurrent ARI ($p < 0.001$ for all). The most pronounced patterns were observed among respondents categorized as having poor adherence to prevention practices, with 100% consistently falling into the recurrent ARI group across nearly all behaviors.

QANUN MEDIKA
Jurnal Kedokteran
Fakultas Kedokteran FKUM Surabaya
http://journal.um-surabaya.ac.id/index.php/qanunmedika

Table 1. Characteristics of Respondents (n=106)

Variable	Category	n	%
Age	20 – 35 years	31	29.2
	36 – 65 years	75	70.8
Sex	Male	50	47.2
	Female	56	52.8
Educational Level	Primary/Junior High School	22	20.8
	Senior High School	67	63.2
	Higher Education	17	16.0
Occupation	Employee	31	29.2
	Housewife	28	26.4
	Laborer	21	19.8
	Entrepreneur	17	16.0
	Unemployed	9	8.5
Smoking Status	Non-smoker	54	50.9
	Passive smoker	21	19.8
	Active Smoker	31	29.2
Comorbidity	None	53	50.0
	Present	53	50.0

Handwashing showed an apparent gradient effect. Respondents with poor handwashing habits all experienced recurrent ARI, while those with good handwashing practices demonstrated a substantially lower recurrence rate (55.6%). This difference was statistically significant ($p < 0.001$), providing evidence that hand hygiene plays a central role in reducing the transmission of respiratory infections.

Similar findings emerged for cough and sneeze etiquette, mask use during symptoms, and maintaining distance when ill. Poor adherence to each of these behaviors was associated with a 100% recurrence rate, whereas respondents who consistently practiced proper respiratory etiquette or used masks reported markedly fewer recurrent episodes. The association between these behaviors and recurrent ARI was significant in each case ($p < 0.001$).

Indoor smoking exposure showed one of the strongest associations in the dataset. All respondents exposed to indoor smoking, either as active or passive smokers, experienced recurrent ARI, while only 54.1% of those in smoke-free households had recurrent episodes. This supports the established role of indoor air quality and environmental irritants in modulating respiratory vulnerability.

Healthcare-seeking behavior also demonstrated a meaningful pattern. Respondents who seldom

QANUN MEDIKA
Jurnal Kedokteran
Fakultas Kedokteran FKUM Surabaya
http://journal.um-surabaya.ac.id/index.php/qanunmedika

sought medical care when experiencing respiratory symptoms had a higher rate of recurrent ARI (100%), whereas those who routinely sought care had a lower recurrence rate (56.0%). This finding aligns with evidence that delayed management may contribute to prolonged infectivity and susceptibility to reinfection.

All preventive behavior variables demonstrated statistically significant associations with recurrent ARI ($p < 0.001$). Notably, respondents with poor adherence to preventive behaviors showed a very high proportion of recurrent ARI, reaching 100% across nearly all behavioral domains. While this pattern indicates an influential association, it should

Table 2. Distribution of Preventive Health Behaviors Related to ARI Prevention Among Respondents (n = 106)

Preventive Behavior	Category	n	%
Handwashing Habit	Never	22	20.8
	Rarely	32	30.2
	Often	22	20.8
	Always	30	28.3
Cough/Sneeze Etiquette	Never	9	8.5
	Rarely	36	34.0
	Often	33	31.1
	Always	28	26.4
Mask Use When Symptomatic	Never	24	22.6
	Rarely	33	31.1
	Often	20	18.9
	Always	29	27.4
Smoking Inside The Home	Never	11	10.4
	Rarely	42	39.6
	Often	27	25.5
	Always	26	24.5
Physical Distancing When Sick	Never	25	23.6
	Rarely	33	31.1
	Often	31	29.2
	Always	17	16.0
Healthcare Seeking Behavior	Never	38	35.8
	Rarely	18	17.0
	Often	29	27.4
	Always	21	19.8

QANUN MEDIKA
Jurnal Kedokteran
Fakultas Kedokteran FKUM Surabaya
http://journal.um-surabaya.ac.id/index.php/qanunmedika

be interpreted cautiously, as it may reflect limitations related to self-reported data, behavioral categorization, and potential overlap between recurrent ARI symptoms and underlying chronic respiratory conditions.

DISCUSSION

This study identified strong associations between multiple preventive behaviors and recurrent ARI among adults in a primary-care setting. However, given the cross-sectional design, these relationships should be interpreted as associative rather than causal (Sedgwick, 2014). The consistently higher recurrence among respondents with poor adherence to prevention highlights an important behavioral signal for intervention.

The near-perfect clustering of recurrence among those with poor preventive practices warrants cautious interpretation. Self-reported behaviors are vulnerable to recall and social-desirability bias, and broad operational definitions of ARI may capture chronic respiratory symptoms. Thus, while the pattern is compelling, it should not be taken to mean that behavior alone fully explains recurrence.

Mechanistically, respiratory pathogens spread primarily via droplets, aerosols, and contaminated surfaces. Hand–face contact is a key transmission pathway (Murray et al., 2022). Our findings align with evidence that regular handwashing reduces community ARI incidence (Mo et al., 2022; Ross, 2023), supporting hand hygiene as a scalable intervention.

Respiratory etiquette and mask use were also strongly associated with lower recurrence. "Source control" is a cornerstone of droplet-borne infection prevention (Gordis, 2020), and systematic reviews show that consistent mask use reduces transmission, particularly in enclosed or poorly ventilated environments (Ollila et al., 2022; Greenhalgh, 2024). The high recurrence among those who rarely used masks underscores the relevance of these measures in routine primary care.

Indoor tobacco-smoke exposure emerged as a significant risk factor. Cigarette smoke impairs mucociliary clearance, disrupts epithelial integrity, and weakens innate immune defenses, thereby increasing susceptibility to recurrent infections (Fauci et al., 2022). A recent systematic review confirmed higher respiratory morbidity with secondhand smoke exposure in adults (Asfaw, 2024), consistent with our findings.

From a clinical perspective, "recurrent ARI" in adults may reflect heterogeneous conditions, including undiagnosed chronic airway disease (e.g., cough-variant asthma, early COPD, or chronic rhinosinusitis). Because outcomes were self-reported and based on routine diagnoses, some cases may represent symptom overlap or misclassification rather than discrete infections—an important limitation for interpretation.

Healthcare-seeking behavior also mattered: delayed or absent consultation was associated with a higher recurrence rate. International data show that delayed care prolongs illness and increases the potential for transmission (Wang et al., 2024). National guidance emphasizes early evaluation of respiratory symptoms within the PHBS framework (Kementerian Kesehatan Republik Indonesia, 2021), aligning with our results (Elman Boy et al., 2024).

Overall, the findings support a multifactorial model in which behavioral, environmental, and host factors interact to shape recurrence. While prior work has mainly focused on children or hospitalized patients, this study contributes adult primary-care evidence using a PHBS-aligned instrument. Despite limitations (self-report, lack of objective pulmonary measures, and residual

QANUN MEDIKA
Jurnal Kedokteran
Fakultas Kedokteran FKUM Surabaya
http://journal.um-surabaya.ac.id/index.php/qanunmedika

confounding), the results point to actionable strategies—hygiene promotion, respiratory etiquette, mask use when ill, smoke-free homes, and timely care-seeking—to reduce recurrent ARI in adults (Elman Boy & Malau, 2023).

CONCLUSION

This study demonstrates strong associations between preventive health behaviors and recurrent acute respiratory infections among adults in a primary-care setting. However, these findings should be interpreted as associative rather than causal, given the cross-sectional design and reliance on self-reported data. Poor adherence to hygiene practices, respiratory etiquette, mask use during illness, avoidance of indoor smoking, physical distancing, and timely healthcare-seeking was consistently associated with higher recurrence, highlighting important behavioral correlates of recurrent respiratory symptoms. At the same time, clinicians should remain vigilant for underlying chronic respiratory diseases in adults presenting with recurrent ARI-like symptoms. Strengthening preventive health behaviors within the PHBS framework, alongside appropriate clinical evaluation, represents a balanced and pragmatic approach to reducing respiratory morbidity in adult populations.

REFERENCE

Asfaw, S. M. (2024). Impact of secondhand smoke exposure on respiratory health: A systematic review. *BMC Pulmonary Medicine*, 24, 18.

Baier, M., Knobloch, M. J., Osman, F., & Safdar, N. (2023). The effectiveness of mask-wearing on respiratory illness transmission in community settings: A rapid review. *Disaster Medicine and Public Health Preparedness*, 17(1), e87.

Can, C., Yue, Y., Yuexia, D., & Wenkai. (2024). Global epidemiological trends in the incidence and deaths of acute respiratory infections from 1990 to 2021. *Heliyon*, 14(1). https://doi.org/10.1016/j.heliyon.2024.

De Angelis, G. (2021). Hand hygiene and facemask use for viral diseases in air travel: A review. *BMC Public Health*, 21, 1851.

Elman Boy, E., & Malau, A. A. (2023). Health promotion strategies in reducing communicable diseases in primary care. *Jurnal Ilmu Kesehatan Masyarakat*, 18(3), 210–218.

Elman Boy, E., Ritonga, D. N., & Girsang, M. I. Y. (2024). Preventive behavior and respiratory health in Indonesian adults: A cross-sectional analysis. *Jurnal Kedokteran Qanun Medika*, 13(1), 11–20.

ESKD, O. (2024). Risk factors for the incidence of acute respiratory infection (ARI) in toddlers in the working area of Tarus Primary Health Center, Kupang District. *Journal of Public Health in Tropical and Coastal Regions*, 7(1), 63–72.

Fauci, A. S., Kasper, D. L., Hauser, S. L., & Longo, D. L. (2022). Harrison's principles of internal medicine (21st ed.). *McGraw-Hill*.

Gordis, L. (2020). Epidemiology (6th ed.). *Elsevier*.

Greenhalgh, T. (2024). Masks and respirators for prevention of respiratory infections: A state-of-the-science review. *Clinical Microbiology Reviews*, 37(2), e00051-23.

Hortense, P., Matthieu, S., & François, L. B. (2025). Characterizing acute respiratory infections in primary care for better management of viral infections. *Respiratory Medicine*.

QANUN MEDIKA
Jurnal Kedokteran
Fakultas Kedokteran FKUM Surabaya
http://journal.um-surabaya.ac.id/index.php/qanunmedika

Irwin, R. S., Baumann, M. H., Bolser, D. C., et al. (2006). Diagnosis and management of cough: Executive summary. *Chest*, 129(1 Suppl), 1S–23S.

Kementerian Kesehatan Republik Indonesia. (2021). Pedoman pembinaan perilaku hidup bersih dan sehat (PHBS) di rumah tangga. *Direktorat Promosi Kesehatan dan Pemberdayaan Masyarakat*.

Kementerian Kesehatan Republik Indonesia. (2023). Profil kesehatan Indonesia 2023. *Pusat Data dan Informasi Kemenkes RI*.

Mo, Y., Pham, T., & Lim, C. (2022). Effect of hand hygiene frequency on acute respiratory infection rates. *Epidemiology & Infection*, 150, e79.

Murray, P. R., Rosenthal, K. S., & Pfaller, M. A. (2022). Medical microbiology (9th ed.). *Elsevier*.

Ollila, H. M., Partinen, M., & Koskela, J. (2022). Face masks to prevent transmission of respiratory infections: A systematic review and meta-analysis. *PLoS ONE*, 17(12), e0277930.

Peixi, D., et al. (2024). Healthcare-seeking behaviours of patients with acute respiratory infection: A cross-sectional survey in a rural area of southwest China. *BMC Public Health*, 24(1).

Ross, I. (2023). Effectiveness of handwashing with soap for preventing acute respiratory infections. *The Lancet*, 401(10379), 123–125.

Sedgwick, P. (2014). Cross sectional studies: Advantages and disadvantages. *BMJ*, 348, g227.

Wang, Q., Jiang, M., & Li, T. (2024). Healthcare-seeking behavior for acute respiratory infections in a community population in Southwest China during the 2021–2023 influenza seasons. *BMC Infectious Diseases*, 24, 135.

Widiastuti, Y. (2024). Exposure to cigarette smoke in the home and risk of respiratory disorders. *Jurnal Kesehatan Lingkungan*, 16(2), 85–92.

Yanti. (2024). Factors associated with the incidence of acute respiratory infection in toddlers in Besu Village, Konawe Regency. *Indonesian Journal of Health Science Research and Development*, 6(2), 27–34.

Yin, M., et al. (2022). The effect of hand hygiene frequency on reducing acute respiratory infections in the community: A meta-analysis. *Epidemiology & Infection*, 150, e79.