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Factors Related to Acute Respiratory Infection Prevention Behavior After the COVID-19 Pandemic in Urban Communities: The Integration of Protection Motivation Theory

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ABSTRACT
Following the end of the COVID-19 pandemic status, the incidence of acute respiratory infections (ARIs) has increased, affecting not only children but also adolescents and adults. The Protection Motivation Theory (PMT) provides a framework for understanding how individuals engage in preventive behaviors against ARIs. This study aimed to examine the relationship between factors influencing preventive behavior against ARIs by integrating PMT, which includes threat appraisal and coping appraisal components. A cross-sectional research design was employed using an online questionnaire distributed to a randomly selected sample of 320 respondents. Data were analyzed using both bivariate and multivariate logistic regression methods. The multivariate analysis revealed that among the five assessed factors—perceived severity, perceived threat, self-efficacy, response efficacy, response cost, and behavioral intention—the most significant predictors were response efficacy (p = 0.002, OR = 3.439) and behavioral intention (p = 0.004, OR = 1.988). The findings indicate that individuals with higher response efficacy were 3.4 times more likely to engage in ARI prevention behavior, while those with stronger behavioral intentions were 1.9 times more likely to do so, compared to other influencing factors.

Keywords: Acute Respiratory Infection, Prevention Behavior, Protection Motivation Theory

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INTRODUCTION

Acute respiratory infections (ARIs) are prevalent worldwide and are a major cause of morbidity and mortality. They are among the most common diseases, resulting in numerous clinical visits and hospitalizations, particularly affecting young children and the elderly (1). Various viruses, including influenza viruses, coronaviruses, parainfluenza viruses, adenoviruses, respiratory syncytial viruses, human metapneumoviruses, bocaviruses, rhinoviruses, and enteroviruses, are recognized as common etiologic agents of ARIs (2–5). Rhinovirus types A and C, as well as respiratory syncytial virus (RSV), have also been linked to chronic respiratory conditions such as asthma (6,7).

ARIs encompass a wide spectrum of illnesses, ranging from the common cold and sore throat to tonsillitis, influenza, COVID-19, and lower respiratory tract infections (9). These conditions can be caused by viruses, bacteria, fungi, or parasites (10). In late 2019, a novel respiratory virus, Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), emerged, resulting in over 2.4 million deaths globally within a year. During the early phase of the COVID-19 outbreak in China, non-pharmaceutical interventions such as travel restrictions, physical distancing, and mask-wearing

were implemented to control viral transmission nationwide (11).

The prevalence of various ARIs often follows seasonal patterns, peaking during autumn and winter due to climatic factors such as temperature and humidity, which influence virus stability, transmission rates, and immune responses (12–14). According to the 2023 Indonesian Health Survey (SKI), the prevalence of ARIs was highest among toddlers aged 1–4 years (35.7%), followed by children aged 5–14 years (28.6%), young adults aged 15–24 years (22.5%), adults aged 25–54 years (20.3%), and the elderly aged 55–74 years (23.2%). Regionally, East Nusa Tenggara ranked third in ARI incidence, with a prevalence of 36.3%. In Manggarai Regency, upper respiratory tract infections were reported as the most common disease (24.44%), while lower respiratory tract infections ranked seventh (2.74%), as stated in the 2023 Regional Government Performance Report.

The transmission of ARIs is closely linked to interaction patterns between susceptible individuals and those infected with respiratory viruses. Since the onset of the COVID-19 pandemic, such interaction patterns have changed significantly, with behavioral adjustments including limited social contact, use of masks, hand hygiene, and reduced mobility (15,16). These interventions effectively reduced the transmission of SARS-CoV-2, RSV, and influenza A/B viruses. However, after the pandemic status was lifted, compliance with these preventive measures declined, leading to a resurgence of non-COVID-19 respiratory infections. The variability of circulating respiratory viruses is thought to be influenced by viral interference and interaction among different viral strains.

Community compliance with respiratory infection prevention protocols now varies across regions and countries, particularly after the relaxation of COVID-19-related restrictions. This inconsistency likely affects the dynamics of respiratory pathogen transmission (8). The Protection Motivation Theory (PMT), developed by Rogers in 1975, offers a useful framework for understanding how fear-based health messages influence attitudes and behaviors (17). PMT explains how individuals adapt to health threats, focusing on disease prevention behaviors. The model consists of two main constructs: threat appraisal (perceived severity and vulnerability) and coping appraisal (response efficacy and self-efficacy), both of which contribute to protective behavioral intentions.

Perceived severity refers to an individual's belief about the seriousness of a threat to their health. PMT also outlines how individuals assess potential health threats and adopt either adaptive or maladaptive responses (18)(19). Several studies have confirmed that threat perception and coping strategies are significant predictors of preventive behaviors (19–21). Conversely, low motivation to adopt protective behaviors may contribute to the continued spread of infectious diseases such as COVID-19 (22). Threat perceptions and belief in the effectiveness of recommended health interventions strongly influence preventive behavior (23). Furthermore, PMT-based interventions have been shown to be effective in preventing various diseases (24–26).

Given that respiratory tract infections were the most prevalent disease in Manggarai in 2023, it is critical to understand the community’s behavioral adaptations in preventing ARIs. Therefore, this study aims to assess

adaptive and maladaptive behaviors related to ARI prevention by integrating the Protection Motivation Theory within urban communities in Manggarai.

METHODS

This study employed a cross-sectional design to investigate the relationship between key variables. All variables were measured and observed simultaneously. Data collection was conducted from November 2023 to January 2024. A simple random sampling technique was used, in which respondents were randomly selected via an online questionnaire distributed through Google Forms. The questionnaire was tested for validity and reliability before use.

The instrument measured PMT predictors and ARI prevention behaviors using a 5-point Likert scale. Data were analyzed using the SPSS statistical software. The analysis included univariate, bivariate, and multivariate procedures. Univariate analysis was used to describe respondent demographics, while bivariate analysis—using the chi-square test—was applied to identify associations between individual variables and as a prerequisite for multivariate testing. Multivariate analysis employed logistic regression to determine which factors had the greatest probability (odds ratio) of being associated with ARI prevention behavior in the community.

RESULTS AND DISCUSSION

The results of this study consist of a univariate analysis describing the frequency distribution of respondents, a bivariate analysis examining the relationship between Protection Motivation Theory factors, and a multivariate analysis identifying the factors most strongly associated with acute respiratory infection prevention behavior after the COVID-19 pandemic in rural communities.

Table 1 shows that the majority of respondents were in the early adulthood age category (26–35 years), totaling 300 individuals (93.7%), while the fewest were in the late elderly category (0.6%). In terms of gender, most were women (243 individuals or 75.9%). Regarding education level, the majority had a college education (196 individuals or 61.3%), and the fewest were junior high school graduates (6 individuals or 1.9%). In terms of vaccination status, most respondents had completed their vaccinations (271 individuals or 84.7%), and the fewest (3 individuals or 0.9%) had not been vaccinated.

Table 2 shows that threat appraisal factors, including perceived vulnerability and perceived severity, were identified in at least 226 respondents (70.6%) and 256 respondents (80%), respectively. As for coping appraisal factors, 269 individuals (84.1%) had good self-efficacy, and 281 individuals (87.8%) responded positively regarding response efficacy. The cost response was rated positively by 124 individuals (38.8%). Additionally, the most dominant behavioral intention was adaptive behavior (169 individuals or 52.8%). In terms of preventive behavior for acute respiratory infection, most respondents in Manggarai were in the compliant category (166 individuals or 51.9%), while 154 individuals (48.1%) were non-compliant.

The bivariate analysis, as a prerequisite for multivariate logistic regression, is presented in Table 3. The results showed that variables such as perceived vulnerability, perceived severity, self-efficacy, response efficacy, and behavioral intentions had p-values < 0.25, qualifying them for further multivariate analysis.

Table 1. Frequency Distribution of Respondent Characteristics (N = 320)

Variable	Category	Frequency		Total	
		N	%	N	%
Age	Early Adult (26-35)	300	93.7	320	100
	Late Adult (36-45)	12	3.8		
	Early Elderly (46-55)	6	1.9		
	Late Elderly (56-65)	2	0.6		
Gender	Female	243	75.9	320	100
	Male	77	24.1		
Education	Junior High School	6	1.9	320	100
	Senior High School	118	36.9		
	University	196	61.3		

Source: Primary Data, 2024

Table 2. Frequency Distribution of Factors Related to Community Behavioral Intention Toward Acute Respiratory Infection Prevention in Manggarai (N = 320)

Variable	Category	Frequency	
		N	%
Perceived Vulnerability	Vulnerable	94	29.4
	Not Vulnerable	226	70.6
Perceived Severity	Severe	256	80
	Not Severe	64	20
Self-Efficacy	Good	215	67.2
	Not Good	105	32.8
Response Efficacy	Positive Response	281	87.8
	Negative Response	39	12.2
Response Cost	Positive Response	124	38.8
	Negative Response	196	61.3
Behavior Intention	Adaptive	169	52.8
	Maladaptive	151	47.2
Prevention Behavior	Obedient	166	51.9
	Not Obedient	154	48.1

Source: Primary Data, 2024

Table 4 presents the results of multivariate logistic regression analyzing the factors that influence acute respiratory infection prevention behavior, focusing on threat appraisal and coping appraisal. The results showed that the factors most significantly influencing community prevention behavior were self-efficacy (OR = 6.949), behavioral response (OR = 2.174), and behavioral intention (OR = 1.672).

This study integrates the Protection Motivation Theory (PMT) to evaluate the factors influencing acute respiratory infection prevention behavior in urban communities in Manggarai Regency after the COVID-19 pandemic. These factors include perceived vulnerability, perceived severity, self-efficacy, response efficacy, cost response, and behavioral intention. Analysis was conducted using multivariate logistic regression, with data collected through online questionnaires. These factors represent threat and coping appraisals, which significantly impact public compliance with health protocols and recommendations, including perceived

Table 3. Bivariate Analysis of Protection Motivation Theory Factors on Acute Respiratory Infection Prevention Behavior after the COVID-19 Pandemic in Rural Communities (N = 320)

Variable	Category	Obedient		Not Obedient		p-value	RO	IK95%	
		N	%	N	%			min	max
Perceived Vulnerability	Vulnerable	56	59.6	38	40.4	0.075	1.554	0.954	2.531
	Not Vulnerable	110	48.7	116	51.3				
Perceived Severity	Severe	138	53.9	118	46.1	0.146	1.504	0.866	2.610
	Not Severe	28	43.8	36	48.1				
Self-Efficacy	Good	145	67.4	70	32.6	0.000	8.286	0.999	3.390
	Not Good	21	20.0	84	80.0				
Response Efficacy	Positive Response	157	55.9	124	44.1	0.000	4.220	1.932	9.218
	Negative Response	9	23.1	30	76.9				
Response Cost	Positive Response	65	52.4	59	47.6	0.877	1.036	0.661	1.625
	Negative response	101	51.5	95	48.5				
Behavior Intention	Adaptive	104	61.5	65	38.5	0.000	2.297	1.1467	3.597
	Maladaptive	62	41.1	89	58.9				

Source: Primary Data, 2024

Table 4. Results of Multivariate Logistic Regression Analysis of Protection Motivation Theory Factors on Acute Respiratory Infection Prevention Behavior After the COVID-19 Pandemic in Rural Communities (N=320)

Step	Variable	Coeffecient	p-value	OR (95% CI)
1st Step	Perceived Vulnerability	0.235	0.141	1.265 (0.730-2.193)
	Perceived Severity	0.121	0.717	1.129 (0.587-2.168)
	Self-Efficacy	1.924	0.000	6.846 (3.864-12.127)
	Response Efficacy	0.781	0.089	2.183 (0.887-5.372)
	Behavior Intention	0.486	0.061	1.626 (0.978-2.703)
	Konstanta	-1.167	0.000	0.311
2nd Step	Perceived Vulnerability	0.247	0.375	1.472 (0.889-2.437)
	Self-Efficacy	1.919	0.000	6.817(3.851-12.067)
	Response Efficacy	1.247	0.079	2.225 (0.912-5.432)
	Behavior Intention	0.664	0.053	1.645 (0.993-2.724)
	Konstanta	-1.158	0.000	0.314
3rd Step	Self-Efficacy	1.939	0.000	6.949 (3.931-12.285)
	Response Efficacy	0.777	0.084	2.174 (0.901-5.250)
	Behavior Intention	0.514	0.045	1.672 (1.012-2.765)
	Konstanta	-0.997	0.001	0.369

Source: Primary Data, 2024

regulation effectiveness and self-efficacy in adhering to such measures.

The study revealed that 51.9% of respondents were compliant with health protocols such as handwashing and mask-wearing. Data showed that 70.6% of respondents perceived themselves as vulnerable to acute respiratory infections. Among these, 51.3% were

non-compliant, while 48.3% were compliant. This suggests that the perception of vulnerability alone may not strongly influence compliance with preventive behavior. On the other hand, 80% of respondents perceived acute respiratory infections as severe. Of these, 59.3% were compliant, and 40.7% were not. While this shows a positive influence, statistical analysis indicated no significant effect of perceived vulnerability and severity on prevention behavior.

Various factors may influence these findings, such as health knowledge, current health status, and vaccination status (21,27). Nevertheless, the results align with other studies indicating that individuals perceiving high vulnerability or severity tend to be more compliant with health recommendations (28). Conversely, some research has shown that a higher perception of vulnerability and severity may correlate negatively with protective behavior, possibly due to fear or fatalism (29). Still, these perceptions can lead to improved health behaviors like maintaining hygiene and adopting a healthy lifestyle.

Adaptive behaviors, such as frequent handwashing, mask-wearing, and avoiding immunity-compromising activities, become more prevalent when individuals perceive a real threat and believe in the effectiveness of the recommended actions. Self-efficacy emerged as the strongest predictor of preventive behavior, followed by response efficacy. Individuals with strong self-efficacy are more likely to adopt preventive behaviors as they believe in their ability to maintain well-being. These findings are consistent with previous research utilizing the Protection Motivation Theory framework.

Coping appraisal—particularly high self-efficacy and response efficacy—is a key supporting factor in adopting protective behavior, enhancing both the sense of self-protection and belief in behavioral effectiveness. The success of coping strategies depends on the type and severity of health threats (29). Given that acute respiratory infections continue to evolve, consistent preventive behaviors such as handwashing, mask-wearing, consuming nutritious foods, and maintaining adequate rest are essential, yet often neglected.

Therefore, raising awareness and providing continuous health education are necessary to improve community prevention behavior. Behavior change is a gradual process. According to the theoretical framework used in this study, coping appraisal—leading to protective motivation—occurs after individuals have assessed the threat. Thus, increasing public awareness, fostering trust, promoting effective response strategies, and facilitating adaptive behaviors should be prioritized as early as possible.

LIMITATIONS

This study utilized a survey method in which respondents' subjective factors may have influenced their answers to the questionnaire. It is suggested that future research includes direct observations of the behaviors of respondents who are used as samples to enhance data validity.

RESEARCH ETHIC

This research was conducted following ethical approval from the Research Ethics Committee with reference number 010/KE/USP/R04/11/2023. Respondents were informed that all data would remain anonymous and confidential. Written informed consent was obtained from all participants prior to their involvement in the study.

CONFLICT OF INTEREST

There are no conflicts of interest in this research.

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CONCLUSION

The results of this study reveal that threat appraisal factors, including perceived vulnerability and perceived severity, are negative predictors of acute respiratory infection prevention behavior. In contrast, coping appraisal factors such as self-efficacy, response efficacy, and behavioral intention are positive predictors of protective behavior, promoting increased preventive actions against acute respiratory infections.

Therefore, implementing appropriate interventions to enhance community self-efficacy may be an effective strategy for preventing and controlling this disease. In this study, the level of compliance with health protocols was nearly equal to the level of non-compliance. Hence, there is a need to increase public awareness regarding preventive behaviors, such as maintaining environmental cleanliness, avoiding smoke and air pollution, wearing masks, washing hands frequently, consuming nutritious food, and getting adequate rest.

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