Assessment of Knowledge, Perception, and Attitude of Health Cadres Toward Zoonotic Diseases in Rural Area, Malang Regency

Milanitalia Gadys Rosandy✉[1)], Didi Candradikusuma[1)], Dewi Indiastari[1)], Niniek Budiarti[1)], Heri Sutanto[1)], Sinta Silvia[1)]

[1] Division of Tropical Medicine and Infectious Disease, Department of Internal Medicine, Faculty of Medicine, Universitas Brawijaya – dr. Saiful Anwar Malang General Hospital, East Java, Indonesia
✉Email: milanitalia@ub.ac.id

ABSTRACT

***Background**: Zoonotic diseases are infections transmitted between animals and humans. Human life is closely intertwined with animals, as many people live alongside animals, consume animal meat, and so forth, which increases their exposure to zoonotic infections. **Objectives**: This study aims to assess the level of knowledge, perception, and attitude of health cadres toward zoonotic diseases in rural area of Malang Regency. **Methods**: This study used a cross-sectional approach with a sample size of 108 selected using simple random sampling in rural area of Malang Regency. Data were collected through a questionnaire, including respondent characteristics as well as predisposing, knowledge, perception, and attitude factors for zoonotic diseases. Data were analyzed using a chi-square test for bivariate analysis and a logistic regression test for multivariate analysis. **Results**: The average age of respondents was 48.1±14,3 years the majority graduating from elementary school (47.2%) and working as farmers (63.9%). The average knowledge score on zoonotic diseases was 8.0 ± 3.9, with 63.9% of respondents scoring below average. The average perception score was 13.4 ± 1.8, with 44.4% of respondents scoring below average. Additionally, 63.9% of respondents had below-average attitude scores (17.3±2,2). The level of education and occupation had a significant relationship with the level of knowledge, perception, and attitude of respondents. **Conclusions**: The results indicate that the knowledge, perceptions, and attitudes of respondents toward zoonotic diseases are still insufficient. There is a need for enhanced education in this disease to improve public understanding and facilitate early detection.*

***Keywords**: Attitude, Health Cadres, Knowledge, Perception, Zoonotic diseases*

INTRODUCTION

One of the health issues in Indonesia that still requires attention is zoonotic diseases. Zoonotic diseases are any infectious diseases that have the potential to be transmitted from animals, both wild and domestic, to humans (Majiwa et al., 2023). As stated by the World Health Organization (WHO), zoonotic diseases result from pathogens like bacteria, viruses, parasites, or fungi, which are transmitted to humans through direct contact, food, water, or the environment. These animals can transmit pathogens to humans, posing health risks (Sadiq et al., 2021). Zoonotic diseases represent a significant disease burden, particularly in tropical regions. These diseases can directly impact human health and well-being as a common cause of human illness and indirectly affect livelihoods and food security (Majiwa et al., 2023).

According to the Asia Pacific Strategy for Emerging Diseases: 2010, it is estimated that approximately 60% of new human infections are zoonotic, with more than 70% of these pathogens originating from wild animal species. Globally, 868 out of 1,415 (61%) known human pathogens and 132 out of 175 (75%) newly emerging diseases affecting humans are zoonotic (Alemayehu et al., 2024). Currently, priority zoonotic diseases in Indonesia include avian influenza, particularly H5N1, and swine flu (H1N1), which have infected birds since 2003 and are highly pathogenic to poultry (Yusuf et al., 2021). Additionally, SARS-CoV-2 and MERS-CoV infections, which have caused global pandemics with reported death

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tolls reaching 161,918 in Indonesia, have had detrimental impacts and paralyzed various sectors (Wiyono et al., 2021; Aisyah et al., 2022). Another priority zoonotic disease is rabies, which causes 99% of deaths in both animals and humans (Aptriana et al., 2022; Adnyana et al., 2023). In addition to viral infectious diseases, zoonotic bacterial diseases also negatively impact farmers, with anthrax experiencing a resurgence in several provinces in Indonesia in recent months (Negara et al., 2022). Other instances of zoonotic diseases have raised concerns across all related sectors, particularly vector-borne diseases such as dengue hemorrhagic fever, chikungunya, yellow fever, Japanese encephalitis, malaria, and zika, which are reported to occur and fluctuate throughout the year (Harapan et al., 2019; Lempang et al., 2022; Adnyana, 2023).

Globally, in the last decade, zoonotic diseases have resulted in substantial economic losses, amounting to direct losses reaching $20 billion and indirect losses totaling $200 billion *(Mekonnen et al.*, 2021). Furthermore, around 50 million people worldwide are affected, with 80% of the most impacted coming from developing countries, leading to 2.2 million deaths each year (Abrahim et al., 2024). Vulnerable groups susceptible to zoonotic diseases include workers who have close contact with animals in their daily routines. The increased risk of disease emergence and potential spread is associated with growing human and livestock populations, as well as changes in subsistence systems reflected in agricultural practices, leading to intensified farming and significant recent environmental changes (Alemayehu et al., 2021).

Close living conditions with animals, along with a limited awareness of the role of pets and their by-products in the transmission of zoonotic diseases, are key contributing factors. Community awareness among workers about zoonotic diseases plays a crucial role in the life cycle and transmission pathways of these diseases to various hosts; risk factors, prevention, and control of zoonotic diseases are essential steps toward developing and implementing effective prevention and control strategies (Alemayehu et al., 2024). Such issues often arise in rural areas, where animals and humans sometimes share the same living spaces (Tsegaye et al., 2022).

Culture, norms, knowledge, perceptions, and attitudes of the community can contribute to the spread, control, and eradication of various diseases, including zoonosis (Kiffner et al., 2019). This also affects their health behaviors (Majiwa et al., 2023). Therefore, one of the efforts that can be made to prevent zoonotic diseases is through education. Education is a broad-based process aimed at changing community behavior so that better habits can be adopted in daily life. Through education, individuals will gain a deeper understanding of zoonotic diseases. Increasing community knowledge about the risks associated with zoonotic diseases from consuming animal products and implementing protective measures is crucial for controlling and preventing zoonotic diseases (Alemayehu et al., 2024; Hadush Desta, 2015). Knowledge is the result of a series of insights acquired by individuals. Knowledge will be a determining factor in a person's actions or behaviors (Prabandari et al., 2023). Individuals who tend to have low knowledge about zoonotic diseases are at an increased risk of contracting these infections. Perception may be influenced by knowledge and life experiences, and can subsequently predict actions or attitudes (Majiwa et al., 2023). This study was conducted with the aim of assessing community knowledge, perceptions, and attitudes regarding zoonosis, as well as the relationship between different sociodemographic risk factors and community knowledge, perceptions, and attitudes in the rural area of Malang Regency. The findings of this research can enrich critical studies in the field of tropical diseases and infections, and serve as evaluation material for the government or various stakeholders to take appropriate actions in preventing and controlling zoonotic diseases.

METHODS

Study Area

This study was conducted in the rural area of Malang Regency which is Poncokusumo District. Geographically, it is located between 11,1330 to 122,5455 East longitude and 7,5890 to 8,6813 South

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latitude (Badan Pusat Statistik, 2024). The target population for this research consists of health cadres in Malang Regency, Indonesia. This area was chosen because it is situated in a mountainous region where most of the community's livelihoods are based on farming, and the average household owns livestock, thus increasing the potential for zoonotic diseases to occur.

Study Design, Population, and Determination of Sample Size

This research is a cross-sectional study using a structured instrument conducted in July 2024. Approval for the study was obtained from the Ethics Committee of the Universitas Brawijaya (No. 325/EC/KEPK/10/2024). Sample size calculation was performed using the Lemeshow formula with a 95% confidence interval. The calculation resulted in a sample size of 96 respondents. However, after considering a 5% non-response rate, the total sample size was adjusted to 101, which is deemed the final sample for this study. Inclusion criteria for this study were individuals aged 18 years and older, who owned pets or worked in the fields, and who agreed to participate in the research by signing the informed consent. Exclusion criteria included respondents who did not attend 100% of the educational sessions, did not complete the questionnaire, or were unwilling to sign the informed consent. Sampling was conducted using the simple random sampling method. This method ensures that every individual in the population has an equal chance of being selected as a respondent in the study.

Data Collection

Data collection for this research was conducted through interviews using a questionnaire. The questionnaire was written in Indonesian and administered orally to ensure that participants fully understood the questions. The questionnaire consists of four sections. The first section covers the sociodemographic characteristics of the respondents, including gender, age, educational level, marital status, occupation, medical history, and monthly income. The second section focuses on questions regarding knowledge about zoonotic diseases, including definitions, symptoms, and risks associated with these diseases. This section contains five closed-ended questions with response options of "yes," "no," and "don't know.” The third section addresses respondents' perceptions of zoonotic diseases, such as whether anyone can contract zoonotic diseases regardless of age, whether handwashing can reduce the risk of transmission, whether zoonotic diseases are very dangerous and can cause death, and whether education is beneficial in preventing the transmission of zoonotic diseases. This section includes four closed-ended questions using a 5-point Likert scale: "strongly agree," "agree," "uncertain," "disagree," and "strongly disagree.” The fourth section examines the respondents’ attitudes toward preventing zoonotic diseases, such as washing hands with running water, maintaining household cleanliness, keeping animal enclosures away from homes, and seeking medical attention at a community health center if experiencing health symptoms. This section contains four closed-ended questions with response options of "100%," "75%," "50%," "25%," and "0%."

To assess respondents' knowledge, a scoring system was applied to each response. A "yes" answer received a score of 2, a "don't know" answer received a score of 0, and a "no" answer received a score of 1. Consequently, the knowledge scores ranged from 0 to 15. For evaluating respondents' perceptions and attitudes, a Likert scale was used as a continuous value, and cumulative scores were calculated. The scores for perception and attitude ranged from 0 to 20. Based on the cut-off value (mean score), respondents' knowledge, perceptions, and attitudes were categorized as either good or poor.

Data Analysis

Data from the questionnaire were recorded manually and then entered into a Microsoft Excel spreadsheet for categorization. The data were subsequently analyzed using SPSS Statistics Version 26. Before use, the questionnaire was tested for reliability and validity. An item was considered valid if the Pearson correlation value was greater than the critical value, and an item was deemed to have good reliability if the Cronbach's alpha value was greater than 0.6. The obtained Cronbach's alpha

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value was 0.941, indicating that the questionnaire used in this study was valid, had a high correlation, and was reliable.

The analysis in this study included univariate analysis to describe the research variables in terms of frequency distribution and percentages. Bivariate analysis was used to examine the relationship between independent and dependent variables, employing the c chi square test. Statistical significance was determined at $p < 0.05$.

Multivariate analysis utilized logistic regression to determine the extent of the relationship or influence of each independent variable on the dependent variable. If the bivariate test result was $p < 0.25$, it was included in the multivariate model. In this analysis, a *p*-value of < 0.05 was considered significant, and factors were presented in terms of odds ratios (OR) with 95% confidence intervals (CI).

RESULTS AND DISCUSSION

Sociodemographic Characteristics of Respondents

A total of 108 respondents completed the questionnaire, with an average age of 48.1 ± 14.3 years (SD). The majority of respondents were female (76.9%) and married (80.6%). An equal proportion of respondents were in the age groups of 19-30 years (16.7%), 31-50 years (33.3%), and over 50 years (50%). Most respondents had an elementary school education (47.2%) and worked as farmers (63.9%), with an average monthly income of ≤Rp 1,000,000 (69.4%). Additionally, a significant portion of respondents reported having a medical history of illness (72.2%). The sociodemographic characteristics of the respondents are presented in Table 1.

Table 1. Sociodemographic Characteristics of Respondents

Variable	Frequency [n(%)] (n=101)
Age (years old), mean ± SD	**48.1±14,3**
19-30	18 (16.7)
31-50	36 (33.3)
>50	54 (50.0)
Gender	
Male	25 (23.1)
Female	83 (76.9)
Marital Status	
Unmarried	6 (5.6)
Married	87 (80.6)
Widow/widower	15 (13.9)
Education Status	
Did not finish school	9 (8.3)
Elementary school	51 (47.2)
Middle school	36 (33.3)
High school	3 (2.8)
Bachelor degree	9 (8.3)
Occupation	
Unemployed	9 (8.3)
Housewife	18 (16.7)
Private sector worker	12 (11.1)
Farmer	69 (63.9)
Medical History	
There is medical history	30 (27.8)
There is no medical history	78 (72.2)
Monthly Income	
≤Rp 1.000.000	75 (69.4)
Rp 1.000.001 – Rp 3.000.000	30 (27.8)
Rp 3.000.001 – Rp 5.000.000	3 (2.8)

SD = Standard Deviation, n = total

Respondents' Knowledge of Zoonotic Diseases

A total of 33.3% of respondents correctly answered questions regarding knowledge about zoonotic diseases, as shown in Table 2. Meanwhile, the majority of respondents (63.9%) indicated that they "did not know" that zoonotic diseases are transmitted through livestock. The majority of respondents (72.2%) answered "did not know" that zoonotic diseases generally have symptoms. Most respondents (66.7%) answered "did not know" that zoonotic diseases are incurable, while 11.1% answered "yes," and the remaining 22.2% answered "no". Similarly, a majority of respondents (66.7%) answered "did not know" that farmers are at higher risk of contracting zoonotic diseases, while the remaining 33.3% answered "yes". More than half of the respondents (63.9%) answered "did not know" that consuming infected livestock can transmit zoonotic diseases (Table 2).

In comparison to the study conducted by Alamenyu et al. (2024), the majority of respondents (89%) answered that zoonotic diseases can be transmitted from animals to humans. This proportion is higher compared to the results of this study. In this study, not all respondents came from educational backgrounds related to agriculture or veterinary medicine, which may explain why they

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were not previously introduced to terms such as "zoonotic diseases" during their schooling.

The average knowledge score of respondents regarding zoonotic diseases was 8.0 ± 3.9 SD, with a maximum score of 15 and a minimum of 5. A total of 69 respondents (63.9%) scored above average, indicating a good level of knowledge, while the remaining 39 respondents (36.1%) scored below average and were categorized as having a poor level of knowledge (Table 5).

Table 2. Distribution of Respondents' Knowledge Answers on Zoonotic Diseases

Questions	Distribution of Answers (n[%])		
Knowledge section	Yes	No	Don't Know
1. Zoonotic diseases are diseases transmitted through livestock	36 (33.3)	3 (2.8)	69 (63.9)
2. Zoonotic diseases generally do not have symptoms	24 (22.2)	6 (5.6)	78 (72.2)
3. Zoonotic diseases are diseases that cannot be cured	12 (11.1)	24 (22.2)	72 (66.7)
4. Farmers will have a higher risk of contracting zoonotic diseases	36 (33.3)	0 (0.0)	72 (66.7)
5. Consuming infected livestock can transmit zoonotic diseases	36 (33,3)	3 (2,8)	69 (63,9)

Respondents' Perception of Zoonotic Diseases

Perception is an individual's view regarding a particular matter. In relation to respondents' perceptions of zoonotic diseases, the majority of respondents expressed uncertainty (65.7%), agreed (31.5%), and only a small portion disagreed (2.8%) with the statement that people of all ages can contract zoonotic diseases. Most respondents were uncertain (40.7%) about whether proper handwashing can reduce the risk of zoonotic disease transmission. A total of 66.7% of respondents were uncertain that zoonotic diseases are very dangerous and can cause death, while the remaining respondents agreed (22.2%) and disagreed (11.1%). Following guidance or education from doctors is very beneficial in preventing the transmission of zoonotic diseases; 53.7% of respondents agreed with this statement, while the rest strongly agreed (4.6%), were uncertain (38.9%), and disagreed (2.8%) (Table 3).

Table 5 shows that the average perception score of respondents is 13.4 ± 1.8 SD, with a maximum score of 17 and a minimum of 10. A total of 60 respondents (55.6%) scored below average, indicating a poor perception, while 48 respondents (44.4%) scored above average and were considered to have a good perception. In this study, the majority of respondents expressed uncertainty regarding their perceptions of zoonotic diseases. This may be due to the fact that the respondents had not previously received information or education about zoonotic diseases.

Table 3. Distribution of Respondents' Answers on Perception of Zoonotic Diseases

Questions	Distribution of Answers (n[%])				
Perception section	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
1. In my opinion, people of all ages can contract zoonotic diseases	0 (0.0)	34 (31.5)	71 (65.7)	3 (2.8)	0 (0.0)
2. In my opinion, proper handwashing can reduce the risk of zoonotic disease transmission	11 (10.2)	43 (39.8)	44 (40.7)	7 (6,5)	3 (2.8)
3. In my opinion, zoonotic diseases are very dangerous and can cause death	0 (0.0)	24 (22.2)	72 (66.7)	12 (11,1)	0 (0.0)
4. In my opinion, following guidance or education from doctors is very beneficial in preventing the transmission of zoonotic diseases	5 (4.6)	58 (53.7)	42 (38.9)	3 (2,8)	0 (0.0)

Respondent's Attitudes Toward Zoonotic Diseases

Based on the distribution of questionnaire responses regarding

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respondents' attitudes toward zoonotic diseases, it can be observed that 46.3% of respondents wash their hands with running water. The majority (50.9%) of respondents maintain cleanliness in their homes, and 45.4% ensure that animal shelters are not close to their houses. Additionally, 51.9% of respondents would visit a health center if they experienced health symptoms (Table 4). This finding is similar with the study in North Sulawesi, which found that respondents were aware of the importance of visiting a doctor when feeling unwell or experiencing symptoms after contact with or injury from wild animals (Kusumaningrum et al., 2022).

In this study, the average attitude score of respondents toward zoonotic diseases was 17.3 ± 2.2 SD, with a maximum score of 20 and a minimum of 11. A total of 69 respondents (63.9%) scored below average, indicating a poor attitude, while 39 respondents (36.1%) scored above average, indicating a good attitude (Table 5).

Table 4. Distribution of Respondents' Attitudes Answers Toward Zoonotic Diseases

Questions	Distribution of Answers (n[%])				
Attitude section	**100%**	**75%**	**50%**	**25%**	**0%**
1. I wash my hands with running water	50 (46.3)	52 (48.1)	6 (5.6)	0 (0.0)	0 (0.0)
2. I maintain cleanliness in my home	50 (46.3)	55 (50.9)	3 (2.8)	0 (0.0)	0 (0.0)
3. I ensure that animal shelters are not close to my house	44 (40.7)	49 (45.4)	9 (8.3)	0 (0.0)	6 (5.6)
4. I will visit the health center if I have health symptoms	56 (51.,9)	44 (40.7)	2 (1.9)	6 (5.6)	0 (0.0)

Table 5. Average Score Obtained by Respondents

Outcome Variable	Maximum Obtainable Score	Score Received by Respondent's		Mean ± SD	Good	Poor
		Minimum	Maximum		n (%)	n (%)
Knowledge	15	5	15	8.0 ± 3.9	39 (36.1)	69 (63.9)
Perception	20	10	17	13.4 ± 1.8	48 (44.4)	60 (55.6)
Attitude	20	11	20	17.3 ± 2.2	39 (36.1)	69 (63.9)

Factors Influencing Respondent's Knowledge, Perception, and Attitudes Toward Zoonosis

The issue of zoonotic diseases is a health problem that requires attention. Knowledge, perception, attitude, as well as preventive practices and factors influencing people in handling livestock and its products concerning zoonotic disease interventions are very interesting to study due to the emergence and re-emergence of these infections. These issues are exacerbated by inadequate health infrastructure and ineffective collaboration among veterinarians, healthcare providers, farmers, and public health organization (Kiffner et al. 2019). This study provides information about the knowledge, perception, and attitudes of respondents toward zoonotic diseases in Malang Regency.

The findings of this study reveal that the majority of respondents have a poor level of knowledge, perception, and attitude regarding zoonotic diseases. More than half of the respondents (63.9%) were unaware of zoonotic diseases. This proportion is higher compared to a study conducted in Ethiopia, where 54.90% of respondents were unaware of the transmission of zoonotic diseases. The level of knowledge among respondents can be influenced by both internal and external factors, such as disease prevalence, time and place, access to information, and educational level (Abunna, Gebresenbet and Megersa, 2024).

Previous studies have also shown a lack of knowledge among farmers regarding the transmission, prevention, and control of zoonosis (Hundal *et al.*, 2016; Singh *et al.*, 2019; Sadiq *et al.*, 2021). Meanwhile, a study conducted by Alamenyu et al. (2024) found that 52.5% of respondents had good knowledge about zoonotic diseases (Abrahim et al., 2024). The varying levels of knowledge in different studies may be attributed to differences in access to information and education between urban and rural areas (Mekonnen et al., 2021).

To understand the sociodemographic factors (age, gender,

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education, occupation, marital status, medical history, and monthly income) that may affect respondents' knowledge, perceptions, and attitudes toward zoonotic diseases, we ran a logistic regression analysis (Tables 6, 7, and 8). Educational level (p=0.001), marital status (p=0.007), employment status (p=0.027), and disease history (p=0.001) have significant relationships with level of knowledge. Respondents who did not complete formal education, such as elementary school (OR = 0.9; 95% CI = 0.3-2.7) and junior high school (OR = 3.0; 95% CI = 1.0-8.5), had lower knowledge levels compared to those who completed high school and higher education. In line with the study by Sadiq et al. (2028), the level of education is linked to farmers' understanding of various health and welfare issues in Malaysia. Education can influence individuals, including their behaviors and attitudes. Education is necessary to obtain information, especially in health fields, thereby positively impacting an individual's quality of life (Vlaanderen et al., 2024). Individuals with higher levels of education generally possess a broader knowledge (Adnyana et al., 2023).

In line with research by Abrahim et al. (2024), respondents with high school education or higher had better knowledge about zoonotic diseases than those with elementary education or who were illiterate. This higher level of knowledge is also associated with their exposure to educational materials and curricula covering zoonotic diseases (Abrahim et al., 2024). Highly educated respondents are more likely to have more access to information regarding public health issue.

Likewise, respondents who worked as farmers (OR = 0.2; 95% CI = 0.4-0.7) largely (73.9%) had lower knowledge levels compared to those employed in other occupations. According to research by Abnunna et al. (2024), urban residents have higher awareness levels compared to those living in rural areas. This is linked to several factors, including differences in educational levels, accessibility, lifestyle, disease prevalence, as well as proximity to sources of information and the frequency of information received (Abunna, Gebresenbet and Megersa, 2024).

Table 6. Multivariate Logistic Regression of Factors Influencing Respondents' Knowledge

Variable	Good n (%)	Poor n (%)	*p*-value (X^2)	OR	95% (CI)	*p*-value
Age (years old)						
19-30	6 (33.3)	12 (66.7)	0.096[a]	Ref.	Ref.	na.
31-50	18 (50.0)	18 (50.0)		2.0	0.6 – 6.4	0.249
>50	15 (27.8)	39 (72.,2)		0.7	0.2 – 2.4	.654
Gender						
Male	6 (24.0)	19 (76.0)	0.150[a]	Ref.	Ref.	na.
Female	33 (39.8)	50 (60.2)		2.0	0.7 – 5.7	0.156
Marital Status						
Unmarried	3 (50.0)	3 (50.0)	0.007*	Ref.	Ref.	na.
Married	36 (31.4)	51 (58.6)		0.7	0.1 – 3.6	0.680
Widow/widower	0 (0.0)	15 (100.0)		na.	na.	0.998
Education Status						
Did not finish school	0 (0.0)	9 (100.0)	0.001*	Ref.	Ref.	na.
Elementary school	12 (23.5)	39 (76.5)		0.9	0.3 – 2.7	0.953
Middle school	18 (50.0)	18 (50.0)		3.0	1.0 – 8.5	0.038*
High school	3 (100.0)	0 (0.0)		na.	na.	0.999
Bachelor degree	3 (33.3)	3 (33.3)		0.5	0.8 - 35	0.067
Occupation						
Unemployed	6 (66.7)	3 (33.3)	0.027*		Ref.	na.
Housewife	9 (50.0)	9 (50.0)		0.5	0.09 – 2.6	0.415
Private sector worker	6 (50.0)	6 (50.0)		0.5	0.8 – 2.9	0.448
Farmer	18 (26.1)	51 (73.9)		0.2	0.4 – 0.7	0.02*
Medical History						
There is medical history	39 (50.0)	39 (50.0)	0.001*	Ref.	Ref.	na.
There is no medical history	0 (0.0)	30 (100.0)		na.	na.	0.998

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Monthly Income						
≤Rp 1.000.000	27 (36.0)	48 (64.0)	0.055[a]	Ref.	Ref.	na.
Rp 1.000.001 - Rp 3.000.000	9 (30.0)	21 (70.0)		0.7	0.3 - 1.8	0.559
Rp 3.000.001 - Rp 5.000.000	3 (100.0)	0 (0.0)		na.	na.	na.

OR = odds ratio, CI = confidence interval, * = significant at 5% (p<0.05), [a] = significant at 25% (p<0.25), Ref = reference, X^2 = chi-square

Table 5 shows that the majority of respondents as many as 132 people (60%) were Perception is a realistic interpretation, where each person views reality from a different perspective. Based on the results of the bivariate and multivariate tests, it was found that sociodemographic factors such as education level (p=0.001), occupation (p=0.001), and marital status (p=0.043) have significant relationships with respondents' perceptions. Respondents who did not complete formal education, such as elementary school (OR = 3.2; 95% CI = 1.2-8.5) and junior high school (OR = 0.7; 95% CI = 0.2-2.2), had poorer perceptions compared to those who completed high school and higher education. This aligns with the study by Abrahim et al. (2024), which found a significant relationship between respondents' perceptions regarding the transmission of zoonosis and education level (p = 0.05). Likewise, respondents who worked as farmers (OR = 1.2; 95% CI = 0.2 - 5.5) and housewives (OR = 1.0; 95% CI = 0.18 - 5.4) had lower perceptions compared to those in other occupations (Abrahim *et al.*, 2024). The differences in perceptions among respondents may be influenced by factors such as education level, availability of information sources, residence, income, beliefs, and cultural practices (Ward, 2011; Abrahim et al., 2024).

Table 7. Multivariate Logistic Regression of Factors Influencing Respondents' Perception

Variable	Good n (%)	Poor n (%)	*p*-value (X^2)	OR	95% (CI)	*p*-value
Age (years old)						
19-30	9 (50.0)	9 (50.0)	0.259	Ref.	Ref.	na.
31-50	12 (33.3)	24 (66.7)		0.5	0.15 - 1.5	0.239
>50	27 (50.0)	27 (50.0)		1.0	0.3 - 2.9	1.000
Gender						
Male	9 (36.0)	16 (64.0)	0.332	Ref.	Ref.	na.
Female	39 (47.0)	44 (53.0)		1.5	0.6 - 3.9	0.334
Marital Status						
Unmarried	0 (0.0)	6 (100.0)	0.043*	Ref.	Ref.	na.
Married	39 (44.8)	48 (55.2)		na.	na.	0.999
Widow/widower	9 (60.0)	6 (40.0)		na.	na.	0.999
Education Status						
Did not finish school	0 (0.0)	9 (100.0)	0.001*	Ref.	Ref.	na.
Elementary school	30 (58.8)	21 (41.2)		3.2	1.2 - 8.5	0.016*
Middle school	6 (16.7)	30 (83.3)		0.7	0.2 - 2.2	0.622
High school	3 (100.0)	0 (0.0)		na.	na.	0.999
Bachelor degree	9 (100.0)	0 (0.0)		na.	na.	0.999
Occupation						
Unemployed	3 (33.3)	6 (66.7)	0.001*	Ref.	Ref.	na.
Housewife	6 (33.3)	12 (66.7)		1.0	0.18 - 5.4	1.000
Private sector worker	12 (100.0)	0 (0.0)		na.	na.	0.998
Farmer	27 (39.1)	42 (60.9)		1.2	0.2 - 5.5	0.737
Medical History						
There is medical history	15 (50.0)	15 (50.0)	0.471	Ref.	Ref.	na,
There is no medical history	33 (42.3)	45 (57.7)		1.3	0.5 - 3.1	0.472

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Monthly Income						
≤Rp 1.000.000	30 (40.0)	45 (60.0)	0.094[a]	Ref.	Ref.	na.
Rp 1.000.001 - Rp 3.000.000	15 (50.0)	15 (50.0)		1.5	0.6 – 3.5	0.351
Rp 3.000.001 - Rp 5.000.000	3 (100.0)	0 (0.0)		na.	na.	0.999

OR = odds ratio, CI = confidence interval, * = significant at 5% (p<0.05), [a] = significant at 25% (p<0.25), Ref = reference, X^2 = chi-square

Bivariate and multivariate tests of sociodemographic factors against respondents' attitudes revealed a significant relationship with occupation status (p=0.001), education level (p=0.011), and marital status (p=0.043). It was found that respondents with a bachelor's degree (OR = 3.0; 95% CI = 0.49 - 18.8) and those with a junior high school education (OR = 1.2; 95% CI = 0.45 – 3.3) had poorer attitudes toward zoonotic diseases compared to those with an elementary school education. Similarly, respondents employed in the private sector (OR = 6.0; 95% CI = 0.89 – 40.30) and housewives (OR = 2.0; 95% CI = 0.37 – 10.57) had poorer attitudes toward zoonotic diseases. In line with Sadiq et al. (2021), farmers with higher education were more likely to have satisfactory attitudes (OR = 3.2; 95% CI 1.1 to 8.9) compared to those with lower education levels.

In the study by Deka et al. (2020), a positive relationship was found between preventive practices against brucellosis and the management system in India, where farmers were more likely to understand the necessity of preventive practices. This finding supports research in Turkey, where, despite low knowledge scores about zoonotic diseases, the attitude and practice scores of farmers were aligned with recommendations from veterinary and medical bodies (Çakmur et al., 2015). Thus, if respondents are provided with good information and education about zoonotic diseases, their positive attitudes will likely improve. This study showed that the majority of respondents already wash their hands with running water, maintain cleanliness in their homes, ensure animal shelters are not close to their houses, and seek medical attention promptly if they experience symptoms. Attitudes toward particular diseases can also be influenced by experiences from previous outbreaks (Sadiq et al., 2021).

Table 8. Multivariate Logistic Regression of Factors Influencing Respondents' Attitudes

Variable	Good n (%)	Poor n (%)	*p*-value (X^2)	OR	95% (CI)	*p*-value
Age (years old)						
19-30	9 (50.0)	9 (50.0)	0.259	Ref.	Ref.	na.
31-50	12 (33.3)	24 (66.7)		0.5	0.15 – 1.58	0.23
>50	18 (33.3)	36 (66.7)		0.5	0.16 – 1.47	0.21
Gender						
Male	5 (20.0)	20 (80.0)	0.056[a]	Ref.	Ref.	na.
Female	34 (41.0)	49 (59.0)		2.7	0.94 – 8.11	0.062
Marital Status						
Unmarried	3 (50.0)	3 (50.0)	0.043*	Ref.	Ref.	na.
Married	33 (37.9)	54 (62.1)		0.6	0.11 – 3.20	0.560
Widow/widower	3 (20.0)	12 (80.0)		0.2	0.03 – 1.92	0.183
Education Status						
Did not finish school	6 (66.7)	3 (33.3)	0.011*	Ref.	Ref.	na.
Elementary school	12 (23.5)	39 (76.5)		0.4	0.16 – 1.26	0.130
Middle school	15 (41.7)	21 (58.3)		1.2	0.45 – 3.33	0.689
High school	0 (0.0)	3 (100.0)		na.	na.	0.999
Bachelor degree	6 (66.7)	3 (33.3)		3.0	0.49 – 18.8	0.227
Occupation						
Unemployed	3 (33.3)	6 (66.7)	0.001*	Ref.	Ref.	na.
Housewife	9 (50.0)	9 (50.0)		2.0	0.37 – 10.57	0.415
Private sector worker	9 (75.0)	3 (25.0)		6.0	0.89 – 40.3	0.065
Farmer	18 (26.1)	51 (73.9)		0.7	0.16 – 3.12	0.646

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Medical History						
There is medical history	12 (40.0)	18 (60.0)	0.471	Ref.	Ref.	na.
There is no medical history	27 (34.6)	51 (65.4)		1.2	0.52 – 2.99	0.602
Monthly Income						
≤Rp 1.000.000	33 (44.0)	42 (56.0)	0.094[a]	Ref.	Ref.	na.
Rp 1.000.001 – Rp 3.000.000	6 (20.0)	24 (80.0)		0.3	0.11 – 0.86	0.025*
Rp 3.000.001 – Rp 5.000.000	0 (0.0)	3 (100.0)		na.	na.	0.999

OR = odds ratio, CI = confidence interval, * = significant at 5% (p<0.05), [a] = significant at 25% (p<0.25), Ref = reference, X^2 = chi-square

Knowledge, perception, and attitudes surveys offer essential insights for identifying risk factors and possible intervention strategies for disease management. There are many ways to enhance respondents' knowledge, perception, and attitudes toward zoonotic diseases, such as through a One Health approach, education, and increasing access to information and resources to help bridge knowledge gaps and raise public awareness about zoonotic diseases. Additionally, incorporating zoonosis into the curriculum starting from elementary education and implementing zoonosis programs on social media platforms can also be effective (Ward, 2011; Abrahim et al., 2024). Research on knowledge, perception, and attitude is essential for evaluating the community's level of understanding regarding zoonotic diseases. The results of this study are useful for providing baseline information and guiding public health education programs, particularly concerning zoonotic diseases. Sociodemographic groups associated with risky attitudes may serve as a target for policymakers aiming to enhance awareness of zoonosis, enabling them to take more effective actions to reduce zoonotic risks (Vlaanderen et al., 2024).

Limitations of this study include that the assessment of zoonotic diseases was only conducted in rural areas, without comparison to urban areas, and there may have been biases during the research process. Conversely, the strength of this study lies in its focus on several risk factors for zoonotic diseases, allowing for the identification of which factors have the most significant impact on the occurrence of zoonotic diseases. Furthermore, this study has notable strengths, particularly in identifying specific sociodemographic groups at risk, which allows for more targeted interventions. The findings also have important policy implications, providing insights for policymakers to design effective educational programs and interventions. By focusing on enhancing literacy about zoonosis in rural areas, this research contributes to improving public health and animal welfare.

CONCLUSION

This study reveals the relationship between sociodemographic factors and respondent's knowledge, perception, and attitudes regarding zoonotic diseases in rural area. Some respondents have a low level of knowledge, perception, and attitude. A significant relationship was found between education level and occupation concerning respondents' knowledge, perception, and attitudes. Lower education levels are associated with poorer knowledge, perception, and attitudes. Further research is needed to explore other factors such as cultural beliefs and access to healthcare services, as well as to develop targeted interventions to improve community knowledge, perception, and attitudes.

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