Original article

Awareness, knowledge, and preventive practices of zoonotic diseases among Bangkok residents aged 15-60 years

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Abstract

Zoonotic diseases, or zoonoses, are infectious diseases transmitted between animals and humans and pose significant public health challenges worldwide. Factors such as urbanization, global travel, and increased human–animal interactions have heightened the risk of zoonotic disease transmission. Public awareness and preventive behaviors play a critical role in outbreak control and risk reduction. This study aimed to assess the awareness, knowledge, and preventive behaviors related to zoonotic diseases among Bangkok residents aged 15–60 years and to identify factors predicting preventive behaviors. A quantitative cross-sectional study was conducted among 1,209 participants selected through convenience sampling. Data were collected using a structured questionnaire covering demographic characteristics, knowledge of zoonotic diseases, and preventive behaviors. Descriptive statistics and multiple regression analyses were employed to identify predictors of preventive behaviors. The results indicated that most participants demonstrated good knowledge of zoonotic diseases (75.19%) and high levels of preventive behaviors (92.31%). Multiple regression analysis revealed that knowledge was the strongest predictor of preventive behaviors ($\beta=0.295$, $p<0.05$), followed by gender ($\beta=0.126$, $p<0.05$) and age ($\beta=0.099$, $p<0.05$). Nevertheless, gaps were observed in specific preventive practices, particularly the use of insect repellents and protective equipment during high-risk activities. These findings have important implications for public health policy and intervention design. Although high levels of knowledge are associated with improved preventive behaviors, the identified behavioral gaps highlight the need for targeted interventions beyond general awareness campaigns. Policymakers and public health agencies should emphasize behavior change strategies, including tailored health education programs, digital health initiatives, and One Health collaborations between human and veterinary health sectors. Furthermore, integrating zoonotic disease education into school curricula and strengthening hygiene regulations in wet markets and animal trade industries are essential for reducing transmission risks. The study contributes to evidence-based policymaking and the development of sustainable public health strategies to mitigate zoonotic disease risks in urban settings. Future research should incorporate rural populations, mixed-methods approaches, and longitudinal designs to evaluate the long-term effectiveness of interventions.

Keywords: Zoonotic diseases, public health, knowledge, preventive behaviors, Bangkok, One Health approach

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Introduction

Zoonotic diseases, or zoonoses, are infectious diseases transmitted between animals and humans, representing significant global public health challenges (World Health Organization [WHO], 2020). The increasing risk of zoonotic transmission is driven by urbanization, deforestation, globalization, and pet ownership. These factors contribute to the spread of diseases such as rabies, avian influenza, and Lyme disease, resulting in severe health impacts and substantial socio-economic burdens on affected communities (Centers for Disease Control and Prevention [CDC], 2021).

Public awareness and knowledge about zoonotic diseases are crucial for preventing transmission and controlling outbreaks. Preventive measures, including proper hygiene, food safety, vaccination, and responsible pet care, play an essential role in mitigating risks (World Organisation for Animal Health [OIE], 2022). However, gaps in understanding and awareness often hinder these efforts, leaving populations vulnerable to zoonotic infections. This highlights the need for comprehensive education and outreach initiatives to promote awareness and encourage best practices (United Nations Environment Programme [UNEP], 2021).

While zoonotic diseases are a global concern, previous research has primarily focused on regions such as China, Indonesia, and India, where high population densities and frequent human-animal interactions contribute to the emergence of zoonotic infections (Guo et al., 2021; Kusumaningrum et al., 2018; Korbua, 2016; Widyastuti et al., 2015). Studies in these countries have identified critical knowledge gaps and risky behaviors, such as the handling of wildlife in traditional markets and limited understanding of zoonotic disease prevention. These findings underscore the urgent need for targeted public health interventions tailored to regional contexts.

In Thailand, and particularly in Bangkok, zoonotic disease transmission remains an underexplored issue despite its status as a highly urbanized and densely populated city with extensive human-animal interactions. Bangkok is home to numerous wet markets, pet trade centers, and urban wildlife, which present significant zoonotic risks. Furthermore, pet ownership practices, food consumption habits, and population density all contribute to disease emergence. Despite these risk factors, Bangkok-specific data on zoonotic disease incidence and public awareness remain limited. Existing studies, such as Mungkalarungsi et al. (2023), have assessed general knowledge and awareness but have not explored variations in knowledge levels across different demographic groups or specific risk factors unique to the city.

This study aims to fill this gap by assessing the awareness, knowledge, and preventive behaviors of Bangkok residents aged 15–60 years regarding zoonotic diseases. Additionally, the research seeks to identify predictive factors influencing these behaviors, addressing previous research limitations in Bangkok by providing a comprehensive assessment of knowledge variations and behavioral risks. The findings will contribute to developing targeted public health interventions and policy recommendations, aligning with the One Health approach to improve zoonotic disease prevention in urban settings (Food and Agriculture Organization [FAO], 2020).

Objectives of the study

1. To assess the current levels of public awareness and knowledge about zoonotic diseases
2. To evaluate the behaviors that contribute to the prevention of these diseases
3. To Identify predictive factors for behavior preventing zoonotic diseases

Study Methods

This study utilized a quantitative, cross-sectional survey design to assess public awareness, knowledge, and preventive behaviors regarding zoonotic diseases. Data were collected between November 15 and December 7, 2024, through an online questionnaire, which allowed for a broad and efficient distribution among the target population. However, the use of an online survey introduces potential limitations, such as self-selection bias (where more health-conscious individuals may be more likely to participate) and exclusion of individuals without internet access. These factors may limit the generalizability of the findings to the entire population of Bangkok.

Population and Sampling

The study population comprised Thai residents aged 15–60 years in Bangkok who could access the internet. The sample size was calculated using Cochran's formula (Cochran, 2021), resulting in a required minimum of 385 participants. However, to enhance the reliability of findings, 1,209 volunteers participated.

Convenience sampling was used due to practical constraints, which may introduce selection bias. To alleviate this bias, the research team 1) Distributed the survey across multiple online platforms to capture a diverse range of respondents. 2) Included demographic weighting in statistical analyses to account for differences in age, gender, and educational background and 3) Assessed response distributions to detect any overrepresentation of specific demographic groups.

Instrument

The primary instrument for data collection was a structured questionnaire developed through a comprehensive review of cross-species transmission literature, prevention guidelines from authoritative organizations such as WHO and the Ministry of Public Health, and related research studies published between 2019 and 2023.

The survey instrument was then validated by experts from three fields: Infectious Disease, Veterinary Science, and Health Science Research, with an Item-Objective Congruence (IOC) score 1.0, 1.0 and 1.0. Following expert validation, the tool underwent pilot testing with 30 people to assess its difficulty level, with the results indicating no modification. The final version of the questionnaire contained 44 questions; 4 personal data (gender, age, educational level, domestic pet) and 40 items divided into 2 sections.

1) The knowledge assessment on zoonotic disease consists of 20 multiple-choice questions. Each question has four answer options, with only one correct answer. The total score will be calculated based on the number of correct responses, with a possible score range from 0 to 20. The score interpretation is as follows: (Table 1)

2) Question assessing Preventive Behaviors consists of 20 questions, and the response categories consist of a Three-point Likert scale (from 1–Never practice to 3–Always practice), with the highest score corresponding to more positive attitudes toward preventive behaviors. Some items on the scale were inverted for the analysis. The total score will be calculated based on the number of correct responses, with a possible score range from 20 to 60. The score interpretation is as follows: (Table 2)

Data Collection

Data were collected via an online survey distributed to individuals aged 15–60 years living in Bangkok. The sampling frame comprised internet users, with 1,209 respondents participating. The sample size exceeded the calculated minimum of 385 based on Cochran's formula, ensuring robust data.

Instrument Validation

The content validity of the questionnaire was assessed by three experts in Infectious Disease, Veterinary Science, and Health Science Research, using Item-Objective Congruence (IOC) scores, all of which were 1.0. The internal consistency and reliability of the questionnaire were tested using Cronbach's alpha:

- Knowledge assessment section: $\alpha = 0.86$ (high reliability)
- Preventive behavior assessment section: $\alpha = 0.92$ (excellent reliability)

A pilot test with 30 respondents was conducted to evaluate the clarity and difficulty level of the questions. No modifications were needed based on pilot responses.

Data Analysis

Descriptive statistics were used to analyze demographic characteristics and assess the distribution of knowledge and preventive behaviors. Inferential statistical tests included the Chi-square test (χ^2) to examine associations between categorical variables, such as education level and knowledge scores, and ANOVA (Analysis of Variance) to compare mean knowledge and preventive behavior scores across different demographic groups. Logistic regression was applied to identify predictive factors influencing preventive behaviors, with knowledge level, gender, and age as independent variables. Additionally, multicollinearity assessment was performed before conducting regression analysis by calculating the Variance Inflation Factor (VIF) to ensure that no strong correlations among independent variables would distort the results. All VIF values were below 5, indicating an acceptable level of collinearity.

Ethical Considerations

Ethical guidelines were followed to protect participant confidentiality and autonomy. Personal information was anonymized, and data access was restricted to the research team. Results were presented in aggregate form to prevent the identification of individuals. Participation was voluntary, with respondents informed of their right to withdraw at any time without repercussions.

Study results

Among the 1,209 survey participants, the majority were female, comprising 764 individuals (63.19%). The largest age group was 41–50 years, representing 338 participants (27.96%), followed by the 15–20 age group, with 297 individuals (24.57%). Regarding educational attainment, a significant majority (69.4%) held at least a bachelor's degree, while 22.58% had advanced degrees, including master's and doctoral qualifications. (Table 3)

The table below presents the distribution of knowledge levels about zoonotic diseases, categorized into three groups: good, moderate, and low. A significant majority of respondents (75.19%, or 909 participants) demonstrated a good level of knowledge by scoring 16–20. This was followed by the moderate knowledge group, comprising 21% (258 participants) who scored 12–15. The limited knowledge group was the smallest, with only 3.47% (42 participants) scoring below 12. (Table 4)

The results in Table 3 indicate that most respondents exhibited a strong understanding of preventive measures against zoonotic disease transmission from animals to humans. A substantial 92.31% of participants achieved a "good" level, with scores ranging from 48 to 60, corresponding to the top 80% performance. Additionally, 6.62% of respondents were categorized as "fair," scoring between 36 and 47, or 60–79%. The remaining 1.08% fell into the "marginal" category, with scores below 36, indicating less than 60% proficiency. These findings reflect a generally high level of preventive behavior among participants, with minor gaps requiring attention.

The three questions with the highest percentage of correct responses were: (1) "What are zoonotic diseases?" with 97.11% of participants answering correctly, (2) "Which group is most at risk of severe complications from zoonotic diseases?" with 96.94% correct responses, and (3) "Why is public awareness of zoonotic diseases important?" with 96.20% correct responses. (Table 5)

Conversely, the questions with the lowest correct response rates were: (1) “Which pathogen commonly causes Lyme disease?” with only 65.59% answering correctly, (2) “Which disease is associated with unpasteurized dairy products?” with 66.50% correct responses, and (3) “Which zoonotic disease is most commonly transmitted by mosquitoes?” with 66.83% correct responses. These results highlight areas where knowledge gaps exist and require targeted educational interventions. (Graph 1)

Graph 2 highlights the responses related to zoonotic disease prevention practices. The three most consistently practiced behaviors were: (1) “How do you protect yourself when hiking in areas with a high risk of tick bites?” with 93.80% of respondents indicating consistent practice, (2) “How do you handle pet waste?” at 93.55%, and (3) “What do you do when bitten by an animal that may carry a zoonotic disease?” at 93.05%.

In contrast, the three least consistently practiced behaviors were: (1) “Do you use insect repellent when spending time in areas with a high risk of mosquito-borne diseases?” with only 46.57% adherence, (2) “How often do you wash your hands after handling animals?” at 76.59%, and (3) “Do you use protective gear, like gloves, when gardening or cleaning areas with animal droppings?” at 78.33%. These findings point to specific areas where public health education and interventions could enhance adherence to preventive measures. (Graph 2)

The linear regression analysis identified key factors influencing preventive behaviors against zoonotic disease transmission within the sample group. Knowledge about zoonotic disease risks and prevention methods emerged as the most significant predictor, explaining 29.50% of the variance (Beta = 0.295, $p < 0.05$, Cohen’s $f^2 = 0.42$), indicating a moderate-to-large effect size. Gender followed as a significant factor (Beta = 0.126, $p < 0.05$, Cohen’s $f^2 = 0.15$), with women being more likely to engage in preventive behaviors than men. Age also played a role (Beta = 0.099, $p < 0.05$, Cohen’s $f^2 = 0.12$), as older individuals exhibited higher adherence to preventive behaviors. Interestingly, formal education had a limited impact, highlighting the need for targeted interventions beyond educational attainment to address behavioral gaps. Multicollinearity was assessed using the Variance Inflation Factor (VIF), with all values below 5, confirming that no strong correlations among independent variables distorted the results. Additionally, a logistic regression model was applied to classify preventive behavior levels, achieving an overall accuracy of 78.6% in predicting individuals with high versus low preventive behavior scores. These findings reinforce the importance of knowledge and demographic factors in shaping preventive health behaviors, emphasizing the need for tailored public health strategies. (Table 6)

Discussion

This study aimed to evaluate public awareness, knowledge, and preventive behaviors regarding zoonotic diseases among Bangkok residents aged 15–60 years and to identify predictive factors influencing these behaviors. The results revealed that the majority of participants (75.19%) demonstrated a good level of knowledge about zoonotic diseases, and 92.31% exhibited good preventive behaviors. Knowledge emerged as the strongest predictor of preventive behaviors (Beta = 0.295), followed by gender (Beta = 0.126) and age (Beta = 0.099). These findings suggest a strong foundation of health literacy and preventive practices among the population, significantly influenced by demographic and educational factors. However, notable gaps in specific behaviors, such as using insect repellent and protective gear during high-risk activities, indicate areas requiring targeted intervention.

The findings of this study indicate that the majority of participants possessed a strong level of knowledge about zoonotic diseases, with only 3.47% exhibiting poor knowledge. This high level of awareness aligns with the educational background of the sample population, as 69.4% held at least a bachelor’s degree. Higher education likely facilitated access to reliable health information, enhanced awareness of zoonotic risks, and promoted critical thinking about preventive measures. These findings are consistent with those of Mungkalarungsi et al. (2023), which reported that individuals with higher education levels demonstrated greater knowledge of zoonotic diseases.

However, comparisons with studies from Bangladesh (Mamun et al., 2023) and Indonesia (Kusumaningrum et al., 2022) reveal that lower levels of educational attainment are associated with significantly reduced awareness and understanding of zoonotic risks. These studies highlight education as a pivotal factor in fostering public health knowledge, emphasizing the need for tailored interventions in populations with lower educational access.

In addition to education, the COVID-19 pandemic may have contributed to heightened awareness of infectious diseases in Bangkok. The global health crisis increased public interest in disease prevention and risk communication, which may have positively influenced knowledge retention about zoonotic diseases. This suggests that recent pandemics can serve as catalysts for improving public understanding of emerging infectious diseases, including zoonoses.

Despite the overall strong knowledge levels, analysis of individual survey responses revealed critical knowledge gaps. For instance, only 65.59% correctly identified Lyme disease as a tick-borne illness, while 66.50% associated unpasteurized dairy products with zoonotic disease risks, and 66.83% recognized mosquito-borne transmission as a major route for zoonotic infections. These findings indicate a lack of understanding of specific transmission pathways, which may hinder the effectiveness of preventive behaviors.

These gaps align with previous research in Thailand and Southeast Asia, which has reported that while general awareness of zoonotic diseases is high,

knowledge of specific diseases and transmission routes remains limited (Mungkalarungsi et al., 2023; Kusumaningrum et al., 2022). This underscores the need for public health education campaigns to extend beyond broad awareness efforts and instead focus on disease-specific knowledge, particularly transmission mechanisms and evidence-based preventive actions. Addressing these gaps through targeted, accessible educational interventions could further strengthen the population's ability to effectively prevent zoonotic disease transmission.

Preventive behaviors among the participants were notably strong, with 92.31% scoring in the "good" range. Knowledge was the most significant predictor of preventive practices, accounting for nearly 30% of the variance in behavior. This finding supports the Health Belief Model (Jaidee, C, 2012), which posits that individuals with greater knowledge and awareness are more likely to perceive risks and adopt preventive measures.

While the overall behaviors were commendable, certain preventive actions—such as using insect repellent and protective gear—were less consistently practiced. These findings align with research by Kassa Demelash Alemayehu et al. (2024), which also highlighted gaps in adherence to specific protective measures. Such behavioral inconsistencies suggest the need for targeted interventions focusing on these less practiced but critical preventive behaviors.

Additionally, the study revealed gender and age as important predictors of preventive actions. Women and older individuals demonstrated better adherence, possibly due to heightened risk perception and life experience. This is consistent with Abdulaziz Abrahim's (2024) findings, which also emphasized gender-specific differences in knowledge and practices. In Bangkok, cultural norms and gender roles may further influence these behaviors, making it essential to consider these factors in designing interventions.

The regression analysis confirmed that knowledge, gender, and age significantly influenced preventive behaviors. Knowledge was the strongest factor, highlighting the need for educational interventions as a primary strategy to mitigate zoonotic risks. Gender accounted for 12.6% of the variance, indicating that women are generally more health-conscious, a finding supported by global research on gendered health behaviors (Ek, S, 2015). Age explained 9.9% of the variance, reflecting the role of accumulated life experience in shaping preventive practices.The findings align with other studies, such as those by Demelash Alemayehu et al. (2024) and Abrahim (2024), which emphasized the interplay of demographic factors in determining preventive behaviors. This study further strengthens the evidence that demographic-specific interventions can significantly enhance public health outcomes.

This research emphasize the importance of integrating zoonotic disease education into public health strategies. Tailored campaigns are needed to address behavioral gaps, particularly regarding the use of insect repellent and protective gear. These interventions should prioritize high-risk groups, such as individuals frequently in contact with animals, and consider demographic factors like gender and age to enhance effectiveness.

Limitation

This study has several limitations. Selection bias may have occurred due to convenience sampling and online data collection, potentially overrepresenting digitally literate and health-conscious individuals, thus limiting generalizability. Self-reported data introduce social desirability bias, as participants may have overstated their knowledge or adherence to preventive behaviors. The cross-sectional design prevents establishing causality between knowledge and behavior, warranting future longitudinal studies. Additionally, the study lacks exploration of cultural beliefs and behavioral motivators, which could be addressed through qualitative research. Finally, rural populations and non-internet users were not included, necessitating broader sampling methods for more representative findings.

Conclusion

This study highlights the high levels of knowledge and preventive behaviors regarding zoonotic diseases among Bangkok residents aged 15–60 years. Education emerged as the strongest predictor of preventive practices, followed by gender and age, underscoring the importance of demographic and educational factors in shaping health behaviors. While the majority of participants exhibited good preventive behaviors, gaps were identified in specific practices, such as the consistent use of insect repellent and protective gear during high-risk activities. These gaps suggest that awareness alone is not always sufficient to drive behavior change, emphasizing the need for targeted interventions that address both knowledge and behavioral barriers. The findings of this study provide valuable insights for public health strategies aimed at reducing zoonotic disease transmission in urban settings. However, addressing specific knowledge gaps and behavioral inconsistencies will require a combination of educational initiatives, community engagement, and policy-driven approaches.

Recommendation

Public Health Campaigns and Education Initiatives

1. Develop targeted health education campaigns focused on specific knowledge gaps, particularly zoonotic disease transmission routes and high-risk behaviors. Campaigns should incorporate clear, accessible messaging tailored to different population segments.
2. Leverage digital platforms such as social media, mobile apps, and interactive e-learning tools to enhance knowledge dissemination. Engaging infographics, short videos, and interactive quizzes can help improve public awareness and retention.
3. Integrate zoonotic disease education into school curricula and workplace health programs to ensure long-term awareness, especially among

younger populations and professionals working in high-risk environments.

4. Conduct community workshops and training programs for pet owners, farmers, and individuals frequently exposed to animals to promote proper hygiene practices and preventive measures.

Policy Recommendations and Structural Interventions

5. Strengthen regulatory measures in animal trade and wet markets, ensuring proper hygiene standards to minimize zoonotic disease risks. Collaboration between public health authorities and market operators is essential.

6. Enhance access to preventive healthcare resources, such as affordable insect repellents and protective gear, particularly in high-risk areas where zoonotic diseases are more prevalent.

7. Encourage collaboration between veterinary and human health sectors through a One Health approach, ensuring coordinated surveillance and response strategies for zoonotic disease outbreaks.

Future Research Directions

8. Expand research to include rural populations and non-internet users to capture a broader representation of knowledge and behaviors across different socio-economic and geographic contexts.

9. Utilize mixed-method research approaches, combining quantitative surveys with qualitative interviews or focus groups, to explore social and behavioral factors influencing zoonotic disease prevention.

10. Conduct longitudinal studies to assess long-term changes in knowledge and behavior and evaluate the effectiveness of public health interventions over time.

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Table 1 The score interpretation is as follows:

Score	Percentage	Consumption Behavior Level
16-20	80-100	Good
12-15	60-79	Moderate
<12	<60	Poor

Table 2 The score interpretation is as follows:

Score	Percentage	Consumption Behavior Level
48-60	80-100	Good
36-47	60-79	Moderate
<36	<60	Poor

Table 3 Personal data of participants (n=1,209)

Variable	Frequency (%)
Gender	
Male	445 (36.81)
Female	764 (63.19)
Age	
15-20	297 (24.57)
21-30	122 (10.09)
31-40	196 (16.21)
41-50	338 (27.96)
51-60	256 (21.17)
Education	
High School	370 (30.60)
Bachelor's degree	566 (46.82)
Master's degree	241 (19.93)
Ph. D Degree	32 (2.65)
Total	1,209 (100.00)

Table 4 Levels of Knowledge Scores About Zoonotic Diseases Among Survey Respondents (n=1,209)

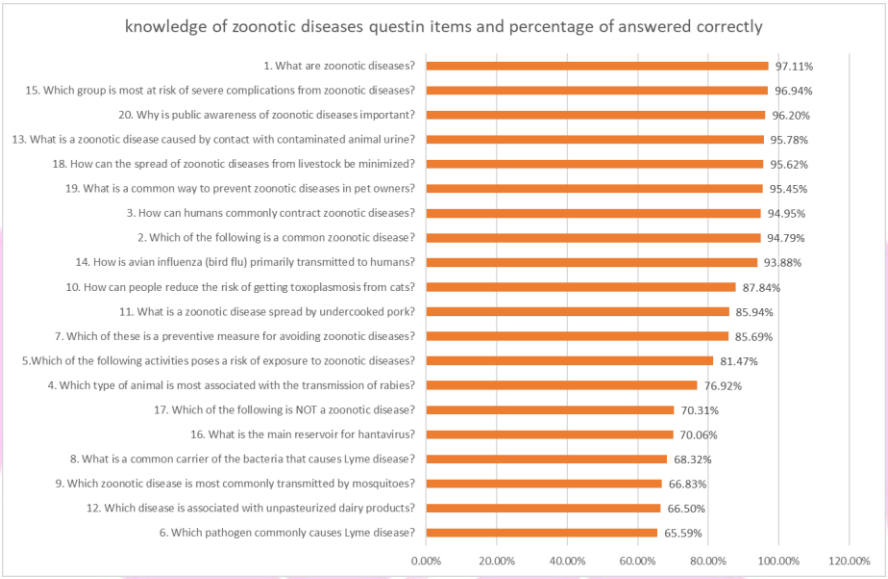
Number (%)	Percentage (Score)	Knowledge Scores About Zoonotic Diseases
909 (75.19)	80-100 (16-20)	Good
258 (21.34)	60-79 (12-15)	Moderate
42 (3.47)	<60 (<12)	Poor

Table 5 Levels of Preventive Behaviors Against the Spread of Zoonotic Diseases (n=1,209)

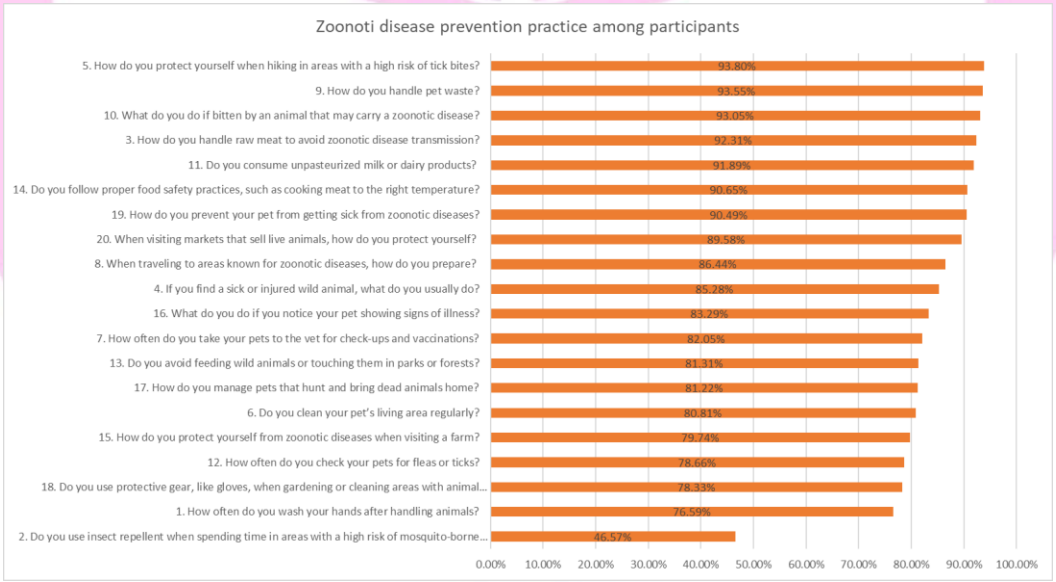
Number (%)	Percentage (Score)	Levels of Preventive Behaviors Against the Spread of Zoonotic Diseases
1,116 (92.31)	80-100 (48-60)	Good
80 (6.62)	60-79 (36-47)	Moderate
13 (1.08)	<60 (<36)	Poor

Table 6 Predictive Factors for Preventive Behaviors Against the Spread of Zoonotic Diseases (n=1209)

	B	Std. Error	Beta	t	Sig.
Gender	1.460	.315	.126	4.639	.000
Age	.373	.123	.099	3.033	.002
Edu	-.017	.234	-.002	-.074	.941
Knowledge	.614	.056	.295	10.884	.000



Graph 1 Questions and Number of Correct Responses Regarding Knowledge of Zoonotic Diseases Among Survey Participants (n=1,209)



Graph 2 Questions and Practices for Preventing the Spread of Zoonotic Diseases (n=1,209)