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ORIGINAL RESEARCH

Knowledge, Attitude, Practice, and Perceptions of Healthcare Professionals and Community Members Regarding Rabies Control; A Cross-sectional Study

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Abstract: **Introduction:** Despite effective vaccines and post-exposure prophylaxis (PEP), gaps in awareness and practices hinder Rabies control efforts. This study assessed knowledge, attitudes, practices, and perception of healthcare professionals and community members regarding rabies control. **Methods:** A cross-sectional study was conducted from May 2024 to April 2025 among community people who presented to emergency department (ED) with animal bite and health care professionals who were working in EDs of 4 Hospitals in Sari, Iran. Data were collected using validated questionnaires and analysed with descriptive and inferential statistics. The correlation between studied variables and knowledge, attitudes, practices, and perception of healthcare professionals and community members regarding rabies control were evaluated. **Results:** 766 participants (383 healthcare professionals, 383 community members) were included. Community knowledge was low, with only 20.1% aware that animal bites can transmit rabies, compared to 98.7% of healthcare workers. Awareness of wound washing with soap and water was inadequate (31.3% among community members; 61.1% among healthcare professionals). Misconceptions about rabies hosts were common. A minority in both groups still relied on traditional healers, delaying appropriate care. Education, pet ownership, and access to clinics were positively correlated with higher knowledge, attitude and practice (KAP) scores. **Conclusion:** The study found significant shortcomings among healthcare professionals as well as severe gaps in rabies-related knowledge and essential preventive behaviors, especially among community members. Inadequate wound-washing techniques and a lack of knowledge about the routes of transmission underscore the critical need for focused education and ongoing professional training to enhance rabies control.

Keywords: Attitude; Health personnel; Knowledge; Public health practice; Rabies

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1. Introduction

Rabies is a deadly zoonotic illness that is mainly transmitted by animal bites and spread by a neurotropic virus of the Lyssavirus genus. Even though it can be prevented with early immunization and proper wound care, rabies is still a serious public health concern in countries where it is common, such as Iran (1). Rabies is nearly invariably fatal once clinical symptoms appear, killing an estimated 59,000 individuals annually worldwide (2).

In Iran, rabies remains a major concern, with thousands of cases of animal bites reported annually. The northern and northeastern regions of Iran had the highest prevalence of animal bites, with over 260,000 incidents reported between March 2021 and March 2022, according to national registration statistics (3). Animal attacks increased from 4,472 in 2016 to 9,891 in 2021, according to a six-year study conducted in Guilan province (4). The nation's rabies prevention efforts continue to face significant challenges due to stray dog populations, a lack of widespread vaccination, and low public awareness (5).

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The World Health Organization (WHO) recommends mass dog vaccination, post-exposure prophylaxis (PEP), and wound washing as important rabies prevention strategies (6). However, researches conducted in Iran indicates that both the general public and medical professionals often do not have the necessary knowledge and practices regarding rabies and its prevention. For example, one study found that almost 70% of Mashhad's rural inhabitants knew little to nothing about rabies, and many of them depended on improper methods to deal with animal bites (7). Similarly, another study found that dog owners in the province of East Azerbaijan were not well-informed about zoonotic dangers (8). Rabies prevention is further hampered by misconceptions about wound care, immunization schedules, and dependence on traditional healers (9). In context of these gaps and differences, evaluating the knowledge, attitudes, practices, and perceptions of community members and medical professionals is important for developing successful rabies prevention plans in the country. Thus, the purpose of this study was to assess rabies-related knowledge, attitudes, and practices among healthcare personnel and community people attending emergency departments.

2. Methods

2.1. Study design and setting

A descriptive cross-sectional design was used in the present study, which was carried out in the emergency departments of medical facilities in Sari, Mazandaran Province, Iran. The population under research was divided into two groups. (1) Community people who accompanied the patient with animal bite to emergency departments, and (2) Health care professionals who were working in emergency departments. The period of data collection was May 2024 to April 2025.

The ethical permission was given by the ethics committee of Mazandaran University of Medical Sciences (IR.MAZUMS.IMAMHOSPITAL.REC.1402.17586) before starting the study. Each participant gave their written informed consent before data collection. Participants were given the questionnaires following eligibility screening, and they completed them anonymously while being observed over by the research staff.

2.2. Participants

The study participants were chosen using a multi-stage random cluster selection technique. The initial step involved classifying all of Sari City's hospitals into four geographic groupings. Then, two hospitals were chosen at random from each cluster. After this, eligible community people participants were selected at random from each hospital's admission records. The inclusion criteria for this group included: (i) willingness to provide informed consent, and (ii) visiting the emergency department along with patients of animal bite.

Healthcare workers from selected hospitals were recruited using a consecutive method. The inclusion criteria for recruiting healthcare professionals' group were: (i) consent to participate, and (ii) holding at least a bachelor's degree. The exclusion criteria for both groups were refusal to participate or incomplete questionnaires.

2.3. Data collection tools

Data were collected using structured questionnaires comprising three sections: 1) Sociodemographic characteristics including: age, gender, marital status, education, occupation, area of residence, history of medical care and animal bite education, job satisfaction, pet ownership, insurance status, smoking, alcohol use, and history of animal bites. 2) The knowledge, attitude, and practice (KAP) evaluation was performed using a modified version of the validated questionnaire developed by Sohel Rana et al. (10). It included questions about signs and symptoms, post-exposure prophylaxis, rabies awareness, and how to handle animal attacks. True/false scores were assigned to each item, and percentage scores were calculated from the responses. 3) A questionnaire related to perceptions was developed by the researcher to evaluate respondents' perception regarding rabies.

The researcher's questionnaire's content validity was evaluated using the content validity index (CVI), face validity, and content validity ratio (CVR). The items were assessed for clarity, simplicity, and relevance by ten academic experts in epidemiology and public health. Acceptable content validity was confirmed by the CVI value of 0.80. Cronbach's alpha coefficient was used to confirm reliability, and the results showed good reliability with an internal consistency score of 0.83.

2.4. Definitions

The sample size was calculated using Cochran's formula (=(N Z$\hat{2}$ p q)/(N d$\hat{2}$+Z$\hat{2}$ p q)).

Where: N = 102,806 (population size), Z = 1.96 (at 95% confidence level), p = 0.5, q = 0.5 (variance = 0.25), and d = 0.05 (margin of error).

The calculated sample size was 383 so total of 766 sample were recruited, with an equal number of patients and healthcare professionals. The SPSS version 22 was utilized for data entry and analysis. Sociodemographic characteristics and responses pertaining to community members' and healthcare professionals' knowledge, attitudes, behaviors, and perceptions of rabies were compiled using descriptive statistics such as frequency, percentage, mean, and standard deviation. Associations between independent variables and outcome variables (knowledge, attitudes, behaviors, perceptions) were evaluated using inferential statistics. The independent t-test was used for continuous data, and the chi-square test for categorical variables. The relationships between demographic characteristics and the mean scores of knowledges, attitude, practices, and perceptions were analyzed using Spearman's correlation coefficient. A p-value of less than 0.05 was deemed statistically significant.

3. Results

3.1. Socio-demographic characteristics of participants

The survey had 766 respondents in all, including 383 members of the community and 383 medical professionals. The average age of healthcare workers was 30.64 ± 5.36 years, whereas the average age of community people was 36.29 ± 9.81 years. In both groups, women represented more than half of the responders. In terms of education, 96.6% of healthcare professionals held a university degree, while 45.2% of community members did so. The percentage of community people who had a pet was greater (66.6%) than the healthcare workers (40.7%). Both groups of responders used Instagram as their primary information source. The majority of medical professionals (85.4%) said they had taken rabies-related training courses (Table 1).

3.2. Knowledge regarding rabies control

The findings regarding knowledge shows that only 20.1% of community people acknowledged that animal bites can spread disease, compared to 98.7% of healthcare professionals. Only a small percentage of participants recognized cats, bats, and monkeys as possible rabies hosts, but the majority recognized only humans and dogs. The majority of medical professionals (83.8%) and community people (67.9%) accurately stated that rabies is 100% fatal. Only 6.5% of community people reported scratches as a mode of transmission, compared to 49.1% of healthcare workers. Information came from a variety of sources, with healthcare professionals getting information from books and training, while community people relying more on social media and television (Table 2).

3.3. Attitudes towards rabies and it's prevention

Only 61.1% of medical professionals and 31.3% of community respondents agreed that cleaning with soap and water is the best course of action following an animal bite. Approximately two-thirds of both groups said governmental health centers offered rabies vaccinations. 58.5% of medical professionals and 50.4% of community people believed that stray dogs pose a serious risk of spreading rabies. It's interesting to note that 67.6% of community people considered dogs to be "friends," while 46.5% of medical professionals did the same (Table 2).

3.4. Practices regarding animal bite management

The majority, 93.2% of healthcare professionals were aware of bite categories, versus, only 50.7% of community people. 89% of medical professionals and slightly more than half of the community people (54.3%) were aware of proper animal bite management. Healthcare workers were more aware of the clinical signs and symptoms of human rabies (71.5%) than the community people (56.4%). Following an animal bite, the majority of community members (67.9%) and medical professionals (70%) advised immunization; yet, a small number still preferred traditional healers (10.4% vs. 3.4%). Notably, 71.3% of healthcare professionals favored culling rabid animals, while 83% of community respondents preferred treatment of infected animals (Table 2).

3.5. Perceptions of rabies prevention and control

A history of animal bites was reported by around one-fourth of community people (26.4%) and healthcare professionals (20.4%). Most of the participants in both groups felt that vaccination is the best way to avoid rabies. While a minority favored killing stray dogs, mass dog vaccination was the most commonly mentioned preventive measure. The majority of responders said that sterilization was the best way to control dog overpopulation. Healthcare personnel had a higher vaccination rate (69%), but community pet owners had a lower rate (36.2%) of vaccination (Table 2).

3.6. Correlational analysis among variables

Spearman's correlation in table 3 revealed that age was negatively correlated with practice scores in community people ($r = 0.123$, $p < 0.05$) and knowledge scores among healthcare professionals ($r = 0.167$, $p < 0.01$). Gender was significantly correlated with perceptions among both groups, with men showing higher perception scores ($r = 0.15$, $p < 0.01$). Higher education level was positively correlated with knowledge and perceptions in both groups. Pet ownership was significantly correlated with improved knowledge, attitude, and perception among both community people and healthcare professionals. Having a clinic nearby was significantly correlated with better knowledge and attitude among healthcare professionals.

4. Discussion

The current study evaluated the knowledge, attitudes, practices, and perceptions of healthcare workers and community people who visit emergency facilities in Sari, Iran, regarding rabies . The results showed significant gaps in knowledge and preventive practices, especially among community people.

The findings show that although the majority of healthcare professionals knew that animal bites might spread disease, only 20.1% of the community people had this information. Since community awareness is the first line of protection when seeking timely post-exposure prophylaxis (PEP), this significant gap highlights essential public health concern (11). The results are consistent with a previous study conducted in, India which found that about majority of rural residents knew very little about rabies (12). Additionally, neither group knew much about possible rabies hosts other than dogs, and only few recognized cats, bats, or monkeys as reservoirs. This is in line with research conducted in various parts of world, where there were widespread misunderstandings among the general population and medical professionals regarding the hosts of rabies transmission (13, 14).

In terms of attitudes, it was alarming to note that only one

third of community people and two thirds of healthcare professionals acknowledged washing with soap and water as the first line of treatment following an animal exposure. This is a basic WHO-recommended procedure that can considerably lower the viral load (15). There may be a lack of practical training because a sizable percentage of healthcare professionals did not give this step as top priority. This is consistent with a prior study's findings that a significant proportion of general population and practitioners were unaware of appropriate wound care procedures for dog bites (10, 16, 17). It is interesting to note that although most community people considered dogs to be "friends", medical professionals were more likely to believe that stray dogs pose a serious risk of spreading rabies and to advocate for the removal of diseased animals. The difference in opinion underscores the need for fair, compassionate population control measures like mass sterilization, which were supported by both groups, and reflects an ongoing sociocultural and ethical debate in Iran, as demonstrated by public rallies against the cruel killing of stray dogs (18-21).

The practice assessments also highlighted areas that require improvement. Even so, an extremely small but percentage of both groups recommended seeking advice from traditional healers following a bite, which is a risky practice that delays receiving the necessary medical attention. In Iran and other endemic nations, this dependence on traditional approaches has been shown to be a barrier to rabies prevention (22, 23). The correlational analysis in this study revealed significant information on the variables affecting KAP. The necessity for ongoing professional development is shown by the negative connection between healthcare workers' age and knowledge, which may indicate that recent graduates got more up-to-date training. Ownership of a pet is positively correlated with greater knowledge scores in both groups, supporting the notion that firsthand encounters with animals might heighten awareness (24).

This study's main strength lies in its comparative design, simultaneously assessing healthcare professionals and community members. This dual approach provides a comprehensive perspective on the gaps that exist at both clinical and public levels. The large sample size, calculated scientifically using Cochran's formula, ensured robust statistical power. The use of validated and reliable tools enhanced data quality, while the inclusion of multiple domains like knowledge, attitudes, practices, and perceptions offered a multidimensional understanding of rabies prevention.

The findings have important implications for public health practice and policy. Educational campaigns targeting the community should emphasize the necessity of wound washing, prompt vaccination, and recognition of rabies reservoirs. Healthcare workers would benefit from refresher training and integration of WHO recommendations into continuing education, particularly regarding wound management and PEP. Strengthening surveillance and documentation of bite cases will enhance monitoring and resource allocation. Humane dog population control strategies, particularly sterilization and mass vaccination, should be prioritized over culling to align with ethical standards and public expectations. Finally, given the reliance on Instagram and Telegram for information, leveraging social media as a platform for rabies education could significantly improve outreach and impact.

To strengthen rabies prevention and control, a multipronged approach is necessary: community education campaigns that emphasize practical preventive actions, continuous professional training for healthcare workers, and improved surveillance and documentation of animal bite cases. Humane strategies for dog population management, including mass vaccination and sterilization, should be scaled up to complement human-focused interventions. Moreover, harnessing the potential of widely used social media platforms can significantly enhance community outreach and awareness. By addressing these gaps through integrated, culturally sensitive, and evidence-based interventions, Iran can move closer to achieving the WHO "Zero by 30" target, ultimately reducing the rabies burden and preventing avoidable human deaths.

5. Limitations

The cross-sectional nature of the study prevents establishing causality between demographic characteristics and KAP outcomes. Self-reported data may have introduced social desirability bias, especially among healthcare workers. The study was restricted to Sari City, limiting generalizability to other regions of Iran with different socio-cultural dynamics. Recall bias could also have influenced responses regarding previous exposures or practices. Additionally, the study did not assess systemic barriers such as affordability and accessibility of vaccines, which are critical determinants of behaviour.

6. Conclusions

This study revealed significant differences in the knowledge, attitudes, practices, and perceptions of healthcare workers and community members visiting medical facilities about rabies. While healthcare personnel demonstrated improved understanding, substantial gaps persisted in essential areas such as wound cleansing, recognition of transmission channels, and adequate post-exposure management. Members of the community showed significantly lower levels of knowledge, frequent misunderstandings, and persistent reliance on traditional healers, all of which could postpone prompt prevention. Higher KAP scores were positively correlated with variables like education level, pet ownership, and access to medical facilities. In order to lower avoidable rabies-related morbidity and mortality, these findings emphasize the urgent need for focused community-based education, frequent refresher training for medical professionals, and improved implementation of WHO-recommended rabies prevention initiatives.

7. Declarations

7.1. Acknowledgments

None.

7.2. Authors' contributions

ZHM, IGKH, and MR planned the study with the assistance of FK. ZHM wrote the first draft, which was critically revised by SMH, and the other authors partook in subsequent edits of the manuscript. SKM, VP, & HK revised the manuscript. All authors approved the final version to be published and agreed to publication.

7.3. Funding

This study did not receive any funding.

7.4. Data availability

Data associated with this publication can be shared with a reasonable request to the corresponding author.

7.5. Use of artificial intelligence

No AI chatbots were used for any part of this study.

7.6. Ethical considerations

This study was approved by the Ethics Committee of Mazandaran University of Medical Sciences (Ethics code: IR.MAZUMS.IMAMHOSPITAL.REC.1402.17586). The study utilized retrospective, anonymized data from medical records. Patient confidentiality was strictly maintained throughout the research process, and the need for informed consent was waived by the ethics committee due to the retrospective nature of the study.

7.7. Competing interests

The authors declare that they have no competing interests.

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Table 1: Socio-demographic characteristics of the participants (N=766)

Variables	Community people (N = 383)	Healthcare professionals (N = 383)
Age (year)		
Mean ± SD	36.29 ± 9.81	30.64 ± 5.36
≤25	45 (11.7)	12 (3.1)
25-35	144 (37.6)	317 (82.8)
≥35	194 (50.7)	54 (14.1)
Gender		
Female	225 (58.7)	260 (67.9)
Male	158 (41.3)	123 (32.1)
Education		
Illiterate	7 (1.8)	0 (0)
Under high school diploma	54 (14.1)	0 (0)
High school diploma	149 (38.9)	13 (3.4)
University degree	173 (45.2)	370 (96.6)
Economic status		
Weak	26 (6.8)	81 (21.1)
Medium	239 (62.4)	194 (50.7)
Good	118 (30.8)	108 (28.2)
Household owning pets		
Yes	255 (66.6)	156 (40.7)
No	128 (33.4)	227 (59.3)
Clinic near home		
Yes	259 (67.6)	227 (59.3)
No	124 (32.4)	156 (40.7)
Media (Information)		
National media	123 (32.1)	68 (17.8)
Instagram	179 (46.7)	172 (44.9)
Telegram	81 (21.1)	143 (37.3)
Smoking		
Yes	172 (44.9)	143 (37.3)
No	211 (55.1)	240 (62.7)
Employment status		
Employee	125 (32.6)	327 (85.4)
Unemployed	174 (45.4)	56 (14.6)
Self Employed	84 (21.9)	0 (0)

Data are presented as mean ± standard deviation (SD) or frequency (%).

Table 2: Respondents' knowledge, attitude, practice, and perceptions of community members (A) and healthcare professionals (B) regarding rabies transmission and diagnosis (N=766)

Questions	A (N = 383)		B (N = 383)	
	n	%	n	%
Knowledge				
Do you know any disease caused by an animal's bite?				
Yes	77	20.1	378	98.7
No	306	79.9	5	1.3
Who can be infected with rabies?				
Human	160	41.77	177	46.2
Dog	129	33.68	167	43.6
Cat	79	20.62	0	0
Bat	6	1.57	17	4.4
Monkey	9	2.36	22	5.7
What is the fate of rabies?				
100% fatal	260	67.9	321	83.81
Not fatal	42	11	40	10.44
Cured automatically	11	2.9	22	5.75
Don't know	70	18.3	0	0
Which animal is responsible for rabies?				
Dog	257	67.1	243	63.4
Cat	109	28.5	80	20.9
Mongoose	11	2.9	21	5.5
Monkey	6	1.6	39	10.2
How is rabies transmitted?				
Bite	98	25.6	190	49.6
Scratch	25	6.5	188	49.1
Licking	243	63.4	5	1.3
Touching	17	4.4	0	0
How do you know about diseases, including rabies?				
Internet	118	30.8	93	24.3
Television	120	31.3	0	0
Book	12	3.1	204	53.3
Social media	133	34.7	86	22.5
Do you believe that rabies can be confirmed by laboratory test?				
Yes	234	61.1	272	71
No	149	38.9	111	29
Attitudes				
What measures do you think should be taken following an animal exposure?				
Wash with water	77	20.1	12	3.14
Wash with soap and water	120	31.3	234	61.09
Consult with local doctors	102	26.6	20	5.22
Consult with physicians and receive vaccine	84	21.9	117	30.55
Where is the rabies vaccine found in your area?				
Governmental health centers	253	66.1	233	60.8
Private clinic	61	15.9	13	3.4
Hospital	69	18	137	35.8
Is a stray dog a major problem for causing rabies?				
Yes	193	50.39	224	58.5
No	190	49.60	159	41.5
Dogs are our friend, what do you think?				
Agree	259	67.6	178	46.5
Disagree	124	32.4	205	53.5
Practices				
Do you know about the category of animal bites?				
Yes	194	50.7	357	93.2
No	189	49.3	26	6.8
Have you ever seen a rabies patient?				
Yes	183	47.8	280	73.1
No	200	52.2	103	26.9
Do you know how to properly manage an animal bite case?				
Yes	208	54.3	341	89
No	175	45.7	42	11

Table 2: Respondents' knowledge, attitude, practice, and perceptions of community members (A) and healthcare professionals (B) regarding rabies transmission and diagnosis (N=766)

Questions	A (N = 383)		B (N = 383)	
	n	%	n	%
Do you know about the clinical signs and symptoms of human rabies?				
Yes	216	56.4	274	71.5
No	167	43.6	109	28.5
What do you suggest if someone has been bitten by animals?				
Refer for vaccination	260	67.9	268	70
Refer to traditional healers	40	10.4	13	3.4
Refer for medicinal treatment	83	21.7	102	26.6
Have you ever seen rabid animals?				
Yes	227	59.3	297	77.5
No	156	40.7	86	22.5
Have you ever treated any suspected rabid animals?				
Yes	226	59	310	80.9
No	157	41	73	19.1
Have you ever taken pre-prophylaxis for rabies?				
Yes	245	64	247	64.5
No	138	36	136	35.5
Do you know about the clinical signs and symptoms of animal rabies?				
Yes	221	57.7	298	77.8
No	162	42.3	85	22.2
What do you suggest if you see an animal that is infected with rabies?				
Suggest treatment	318	83	110	28.7
Culling of the infected animals	65	17	273	71.3
Perceptions				
Have you ever been bitten by an animal?				
Yes	101	26.4	78	20.4
No	282	73.6	305	79.6
Do you believe that rabies can be prevented by a vaccine?				
Yes	266	69.5	370	96.6
No	117	30.5	13	3.4
What do you think is the best way to control rabies?				
Mass dog vaccination	280	73.1	314	81.98
Killing of stray dogs	56	14.6	45	11.7
Animal birth control	47	12.3	24	6.27
Do you have pets in your house?				
Yes	138	36	58	15.1
No	245	64	325	84.9
Have you ever vaccinated your pets for rabies?				
Yes	50	36.23	40	68.96
No	88	63.76	18	31.03
How often should a pet be vaccinated against rabies?				
Once vaccinated	258	67.4	283	73.89
Annually vaccinated	113	29.5	100	26.11
Non-vaccinated	12	3.1	0	0
Is it important to control the dog population?				
Yes	228	59.5	272	71
No	155	40.5	111	29
What method(s) is/are appropriate to control the dog population?				
Sterilization	212	55.4	238	62.14
Impounding	97	25.3	16	4.17
Sterilization and impounding	47	12.3	30	7.85
Culling	27	0.7	99	25.84
What do you do when an animal dies?				
Burying in the ground	264	68.9	314	82
Floating in the pond or river	18	4.7	9	2.34
Burn	101	26.4	60	15.66

Table 3: Correlations among study variables with knowledge, attitude, practice, and perceptions of community members (A) and healthcare professionals (B) regarding rabies control (n=766)

Variables	Practices		Knowledge		Attitude		Perceptions	
	A	B	A	B	A	B	A	B
Age	-0.123	-0.021	0.017	-0.167	0.006	-0.046	0.004	0.03
Gender	-0.059	0.055	-0.045	0.094	-0.001	0.002	0.15	0.11
Education level	0.012	0.029	0.119	0.195	0.029	-0.068	0.051	0.221
Employment	-0.041	-0.003	-0.095	0.028	-0.09	0.049	0.032	0.019
Household owning pets	0.096	0.014	0.253	0.144	0.174	-0.035	0.154	0.260
Clinic near home	-0.031	0.108	-0.090	0.156	-0.01	0.222	-0.073	0.007
Receiving information from media	0.029	0.107	0.056	-0.041	0.003	0.045	0.163	-0.087
Economic status	0.081	0.062	0.123	-0.076	0.064	-0.05	0.063	0.032
Smoking	-0.055	0.027	-0.209	-0.256	-0.006	-0.07	-0.1	-0.096