



Research article

Assessment of knowledge, attitude and practices of people toward Japanese Encephalitis in endemic areas of Nepal

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Abstract

Japanese encephalitis is a serious vector borne viral zoonotic disease, particularly in Asia and Northern Australia. In Nepal, JE cases were reported in 63 out of 75 districts up until the year 2005. The aim of this study was to assess the level of knowledge, attitude and practices (KAP) toward JE and associated factors. A structured questionnaire was used to gather information on the KAP of people in endemic areas. Accordingly, 397 respondents demonstrated a desirable attitude, while half of the population exhibited desirable knowledge and practices. Age was found to be a significant factor for knowledge, wherein the senior population had better awareness of the vectors of JE. Moreover, education and occupation were found to be significant factors for KAP scores with an increase in level of education leading to an increase in desirable characteristics. This study determined that the characteristics of the surrounding environment were prominent factors. A significant number of people were not aware of the JE vaccine even though the government has made it available to most of the population of Nepal. Thus, more effective awareness programs should be implemented to increase the KAP of the population with regard to JE.

Keywords: Knowledge, Attitude and Practices (KAP), Endemic Zone, Japanese Encephalitis

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INTRODUCTION

Japanese Encephalitis (JE) is one of the most common and serious vector-borne viral encephalitis diseases worldwide, particularly in Asia, many Western Pacific countries and northern Australia. It is a mosquito borne zoonotic disease caused by an airborne virus in the genus *Flavivirus* and family *Flaviviridae*. Disease transmission occurs via mosquito bites to a wide range of hosts including birds, equines, swine and humans. Birds act as natural reservoirs that do not display clinical signs, while pigs can act as amplifiers. This is often evidenced by the occurrence of stillborn or weak piglets (Pant, 2006; Shimizu et al., 1954; Wang and Liang, 2015). Humans and equines are considered dead end hosts with low titer values (Buescher and Scherer, 1959). The incubation period for the disease is 4-14 days (Morita et al., 2015), while more than 3 billion people live in known epidemic and/or endemic areas for JE. Importantly, there have been an estimated 30,000–50,000 cases of human JE and 10,000–15,000 human deaths annually (Campbell et al., 2011).

Since Japanese encephalitis is a vector borne disease that is similar to Dengue fever, the recent increases in JE cases in Nepal are likely partly due to global warming and the current trend toward urbanization with limited infrastructure preparedness. JE is a disease that has been associated with rural agricultural areas where mosquitos can live in close proximity to the primary vertebrate hosts. The main species of mosquitoes responsible for transmitting JE are *Culex gelidus* and *Culex tritaeniorhynchus*, and the presence of these vectors have been fully confirmed in Nepal (Longbottom et al., 2017). The first outbreak of JE in Nepal was reported in 1978 in the Terai District of Rupendehi. Since then, JE infections have been reported among a number of animal reservoirs and humans throughout the Terai region. Outbreaks of JE in the hill region were confirmed in 1997, and a study in 2006 reported on JE endemicity in the Kathmandu Valley. Epidemics of JE have been observed to be seasonal from July to October (Bhatta et al., 2008; Joshi, 1983; Wang and Liang, 2015; Bista and Shrestha, 2005). The southwestern and southeastern regions of Terai have been identified as endemic with a strong clustering of JE. Prior to 2005, the distribution of cases had shifted with many clusters found in the central hills. At that time, JE cases were reported in 63 out of 75 districts in Nepal (Kumar Pant et al., 2017). For the prevention of JE in humans, a mass immunization campaign has been organized by the Ministry of Health for the population of Nepal (Bhattachan et al., 2009).

An assessment of the knowledge, attitude and practices (KAP) is a qualitative method of surveying a given population. The outcomes can provide researchers with access to both qualitative and quantitative data. The results of a KAP assessment is representative of what is known, believed and acted upon by a specific population in relation to a particular topic. The results are revealing of what has been said by a participant in relation to their actual behavior.

The aim of this study was to assess the KAP score of Nepal people living in JE endemic areas. The data from this study will help to plan, implement and evaluate the current understanding and actions of participants toward JE. The results of our study can help researchers identify any gaps in knowledge, cultural practices or behavioral patterns that may exist, as well as to shed light on any other relevant factors. The outcomes can also help researchers identify

the factors that influence the behavior of a given population over a period of years. Moreover, the findings will allow researchers to identify the reasons for the attitude of the population and the reasons for certain practical behaviors. These kinds of surveys can be used to identify needs, problems and barriers in terms of program delivery, as well as to help researchers identify potential ways to improve the quality and accessibility of certain services.

MATERIALS AND METHODS

This study aims to assess the knowledge, attitude and practices (KAP) of people in endemic areas of Nepal toward Japanese encephalitis. This study was conducted from February to June, 2021 in 6 high endemic areas (Kathmandu, Bhaktapur, Chitwan, Gorkha, Baktapur and Kailali) and 6 low endemic areas (Solukhumbu, Sindhupalchowk, Dhading, Lamjung, Ruphendehi and Rolpa) of Nepal.

Development of the Questionnaire

The personal information of the participating subjects included age, gender, educational background and socioeconomic factors, as well as certain other relevant environmental factors that are related to JE.

The knowledge component of the questionnaire contained questions designed to assess the participants' knowledge of designated topics and inquired about their level of knowledge on Japanese encephalitis. The average value of the respondents' responses was calculated and if the average value of the segment of the responses was below 11 out of 22, it was considered an undesirable level of knowledge. If the average level was above or equal to 11, the participant was believed to possess a desirable level of knowledge.

The attitude component of the questionnaire was designed to assess the perspective of the participants, while the practice component contained questions pertaining to participants' day-to-day practices for certain scenarios regarding JE. The assessment of both the attitude and practice components was made with the use of the Likert scale. The average value of the coded responses of all participants was then calculated. If the average value of the participants' responses to a section of the questionnaire was below 3, the overall response was deemed to be undesirable. Alternatively, if the average value was above or equal to 3, the response was deemed desirable.

Validation of the Questionnaire

Index of item objective congruence (IOC) was employed to determine the validity of the questionnaire. Field trials were done in Kathmandu Valley involving 15 people of different educational levels, ages, sexes, etc. in order to test the validity of the questionnaire.

Population and target groups

The total population of Nepal is 29,294,013 based on the world meter elaboration of data compiled by the United Nations as of October 21, 2020. The target group for this study included people who live in high endemic and low endemic areas for JE in Nepal. Participants were above 16 and under 70

years of age and had signed a written informed consent form. A total number of 400 people were required for this study with a sample size calculation of 385 (50% in proportion, 95% CI and level of precision 5%). Two-hundred people in high endemic areas and 200 people in low endemic areas were given face-to-face interviews and asked to complete the written questionnaire.

Area selection and sampling plan

The selected districts in Nepal were categorized into high and low endemic areas according to the incident rate for Japanese encephalitis that had been established previously research (Impoinvil et al., 2011; Kumar Pant et al., 2017; Pant, 2006). The districts that showed a degree of incidence higher than 1.0755 were considered a high endemic areas. Conversely, the districts that showed a degree of incidence lower than 1.0755 were considered a low endemic areas. As Nepal is primarily comprised of three different geographic areas; mountains, hills, and terai areas, 6 districts from high endemic areas and 6 districts from low endemic areas were randomly selected. These districts covered all three geographic areas of Nepal. (Figure 1). At the village level, the questionnaire was distributed in a single village per district. The villages were selected based on those subjects defined by a variety of characteristics in terms of education, occupation, farm management, etc.

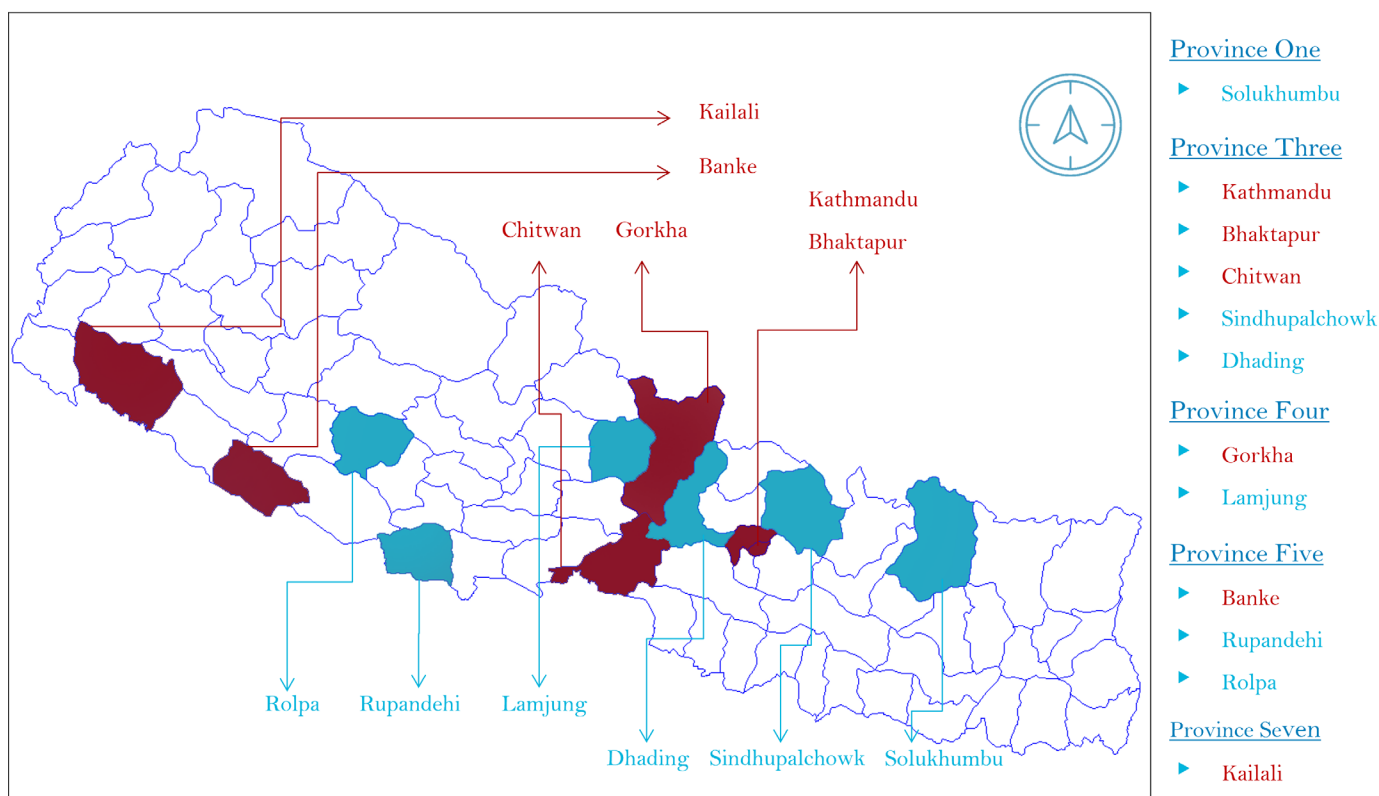


Figure 1 Geographic location of sampling sites of high and low endemic areas for Japanese Encephalitis.

Three hundred eighty-five respondents were required to establish an appropriate sample size (Cochran, 1977). With a large population, the designated proportion of the population would be equal to 50% at a 95% confidence interval, while a level of precision of 5% was used to calculate the appropriate total. The study plan was set up to collect questionnaires from a total of 400 villagers that were equally divided by location. Accordingly, 200 villagers from high endemic areas and 200 villagers from low endemic areas submitted completed questionnaires.

For the interviews conducted at the village level, households were randomly selected by applying the systematic random sampling method. Within a village, we selected the first house on a given street and then skipped three households in order to select the 4th household on that street. Face-to-face interviews were conducted among members of the target groups. These individuals were selected according to the following criteria; age above 16 and under 70 years of either gender who had already signed a written consent form.

Data collection

Surveys assessing KAP with regard to JE were carried out in twelve districts of Nepal through administration of the questionnaire. All research questions were developed based on the objectives and stated purpose of the study. After preparing the questionnaire, questions were then broken down into sub-questions in an appropriate and formal manner. Each question was checked to confirm that it would satisfy our objectives in the most precise manner possible, while questions that evoked unnecessary and/or sensitive data were eliminated. The questionnaire acquired background information on each respondent (e.g., age, education, occupation, environment) and the KAP score was assessed with regard to awareness of JE, relevant preventative measures and any proposed immunization campaigns. People of different professions, ages, education levels, etc. were interviewed and their responses to the questionnaire were studied. The questionnaires were designed to consider the following categories; a.) general information, b.) knowledge of disease, c.) attitude toward disease and d.) practices.

Data and statistical analysis

The database for this study was created using Microsoft Excel and data were analyzed using R studio (version 1.2.5001). Statistical analysis was determined by association between KAP scores, while relevant factors were measured by chi square with univariate analysis. A P-value of <0.05 was determined to be an associated factor.

Ethical Clearance

Ethical clearance for the questionnaire was granted by the Nepal Health Research Council, which is responsible for conducting and supporting research related to public health within the Republic of Nepal.

RESULTS

Demographic information

In total, 397 people were interviewed for this study including 208 (52.39%) people living in high endemic areas and 189 people (47.61%) living in low endemic areas. The gender of the subjects was proportionally balanced (58.43% male and 41.56% female). The average age of the respondents was 34 years with a variety of occupational backgrounds, i.e. farm work, service, business, unemployed, etc. Among all respondents, 15.86% were illiterate, while those possessing a school level certificate (31.73%) made up the highest proportion of the participating population. Demographic data are presented in Table 1.

Table 1 Demographic data of respondents (n=397)

Characteristics		Frequency	Percentage
Gender	Male	232	58.43
	Female	165	41.56
Age	16-30	189	47.60
	31-40	113	28.46
	40-70	95	23.92
Occupation	Farmer	87	21.91
	Service	96	24.18
	Business	86	21.66
	Other	61	15.36
	Unemployed	67	16.87
Education	Illiterate	63	15.86
	Literate	17	4.28
	School level certificate	126	31.73
	Intermediate	81	20.40
	Undergrad Degree or higher	110	27.70
Endemic area	High	208	52.39
	Low	189	47.61
Animals in neighborhood	Present	335	84.38
	Absent	62	15.62
Presence of mosquitos	Yes	318	80.10
	No	79	19.89
Drainage	Open	213	53.65
	Close	184	46.34
Ditches	Present	189	47.60
	Absent	208	52.39
Ponds	Present	158	39.79
	Absent	239	60.20

Knowledge

As revealed by the results of the survey, business personnel possessed lesser knowledge about the presence of JE in humans than people of other occupations. This is possibly due to fact that they have less involvement and interaction with the fields and shelters associated with farming practices ($P = 1.2506e^{-07}$). Farmers seemed to have better knowledge of the presence of JE in animals than other professions, and this was possibly due to the awareness programs that had been tailored to people in the agricultural field ($P = 1.59e^{-06}$). Respondents of both the intermediate group and educated people with bachelor's degrees or higher possessed very good knowledge on the presence of JE. This might have been a consequence of their education levels, wherein they could have been exposed to various exchanges of information and knowledge on diseases between peers ($P = 0.005$). With regard to the JE vector, elderly people had significantly greater knowledge than members of the other groups. This may have occurred because of a decreased level of awareness among younger generations, along with a decrease in the rate of disease over the previous years ($P = 0.012$). In terms of the development of a vaccine for JE, the gender of the participants was found to be a significant factor among younger people who were below 30 years old. These individuals seemed to have more knowledge than older people on vaccines, which may be due to the fact that they possess a broader base of knowledge and greater exposure to new methods and technologies than older people ($P = 0.016$). Accordingly, the farmers and people involved in other occupations seemed to have better knowledge of vaccines than people from the service industry ($P = 2.80626e^{-05}$). Farmers had better knowledge about prevention than individuals working in the service industry and business people, respectively ($P = 2.52507e^{-06}$). People in high endemic areas displayed a slightly lower proportion of knowledge of JE at 28.2% when compared with low endemic areas at 30.2% ($P = 0.0514$) (Table 2).

Table 2 Association between various factors and knowledge, attitude and practices (KAP) scores

Particular	Characteristics	Knowledge			Attitude			Practices		
		D%	UD%	P value	D%	UD%	P value	D%	UD%	P value
Endemic Zone	High	28.2	24.1	0.051	46.3	6.0	*0.026	31.2	21.1	*1.764e ⁻⁶⁸
	Low	30.2	17.3		45.0	2.5		21.1	9.3	
Education	Illiterate	12.3	3.5	*0.006	11.0	4.7	*3.320e ⁻⁰⁹	8.3	7.5	
	Literate	2.7	1.5		4.0	0.25		3.2	1.0	
Age	Up to SLC	15.6	16.1		30.2	1.5		19.8	11.8	*6.420e ⁻⁶⁵
	Intermediate	11.8	8.5		19.1	1.2		16.1	4.2	
	Undergrad Degree or higher	15.8	11.8		26.9	0.7		21.9	5.7	
	Below 30	25.4	22.1	0.136	43.5	4.0	0.829	31.7	15.8	
Gender	31-40	18.3	10.0		25.6	2.7		19.6	8.8	*2.750e ⁻⁶³
	Above 40	14.6	9.3		22.1	1.7		18.1	5.7	
	Male	36.5	21.9	0.051	54.1	4.2	0.296	37.7	20.6	*1.976e ⁻⁶⁵
Occupation	Female	21.9	19.6		37.2	4.2		31.7	9.8	
	Farmer	19.1	2.7	*2.861e ⁻¹⁰	15.6	1.2	*1.558e ⁻⁰⁶	13.3	3.5	
	Service	12.8	11.3		19.8	2.0		18.6	3.2	
	Business	8.8	12.8		23.6	0.5		18.8	5.2	*1.976e ⁻⁶⁵
	Others	10.3	5.0		20.9	0.75		12.3	9.3	
		7.3	9.5			4.0		9.0		

Attitude

Various factors such as age, gender, education, occupation and endemic zone were considered in the responses of participants in terms of their attitude. It was found that the attitude of participants toward a willingness to be vaccinated was significant for most people of all educational backgrounds. A willingness to be vaccinated gradually increased in conjunction with the education level of those participants ($P = 8.6071 \times 10^{-6}$), which might be due to how their educational background influenced their critical thinking and provided them with knowledge on the benefits of vaccinations. According to the responses, it was found that people from both high and low endemic zones exhibited an affinity to build their animal shelters away from their living quarters and to keep those shelters clean. However, people in low endemic zones had a slightly more positive attitude ($P = 0.0014$), which might have been because there was greater awareness among people living in these endemic zones. These people may have also learnt of the benefits of living in clean housing areas from previous incidences of breakouts of vector borne diseases. Participants were also asked if they had agreed to build their animal shelters farther away from their homes, for which people living in low endemic areas seemed to have better attitudes than those living in high endemic areas ($P = 0.0007$). This might have been the reason that they experienced a low number of JE cases in those areas. Farmers showed a very positive attitude toward cleaning their animal shelters, which was higher than that of people involved in the service industry ($P = 7.783 \times 10^{-5}$). As farming is their main occupation, these individuals typically maintain a proper schedule for the cleaning of their animal shelters, and they are also more aware of the benefits of cleaning these shelters than people of other occupations. People living in low endemic area seemed to have a more positive attitude about cleaning their animal shelters than people living in high endemic areas. ($P = 0.0014$), which might be the reason they were able to control the mosquito vector that transmits the disease (Table 2).

Practice

People have developed many orthodox practices over the years by experimenting with various methods to protect against transmission of vector diseases. In this regard, their practices have influenced the way researchers and scientists analyze mosquito breeding habits and disease transmission cycles. Accordingly, greater numbers of illiterate people seem to keep their animals outside when compared to literate people, which can expose them to potential vector interactions. With an increase in education levels, people seemed to provide better indoor housing for animals with mosquito nets ($P = 1.647 \times 10^{-13}$). This is likely due to increases in their awareness levels, exposure to better practices, a greater ability and affordability to obtain required resources, along with heightened critical thinking skills that go along with increased education levels.

One problematic general practice was the way in which people of various occupational backgrounds brought their animals to open water bodies for the purpose of bathing and drinking. This greatly exposed animals, as well as humans, to various vectors as open water bodies are breeding grounds for disease carrying vectors. In this context, more farmers seemed to send their animals to water bodies to drink and bathe when compared to individuals of

other occupations. It is known that mosquitos can more easily breed and multiply near natural water bodies. These mosquitos may then bite an already infected animal and continue to transmit JE to other healthy animals and humans.

Farmers tend to use open-source water bodies more than the people in the service industry and other occupations ($P = 9.0082e^{-05}$). Considering the sanitation of animal shelters, female participants seemed to be more concerned with this than their male counterparts ($P = 0.0044$). Females are often more involved in cleaning and other household activities than males. Hence, they are more culturally bound to participate in sanitation tasks and tend to exhibit greater knowledge and ability on this matter.

DISCUSSION

Nepal is venerable to JE and other such vector borne diseases due to environmental conditions such as the presence of animals in human habitations, the presence of water bodies at short intervals and the prominence of migratory birds (Ghimire and Dhakal, 2015). Our survey findings indicate a significant need for improvement in terms of the knowledge of people through awareness programs. Knowledge of JE is lacking in both high and low endemic areas, while practices and attitude were found to be desirable due to certain traditional practices developed over the years. This is in concordance to the result of KAP study of JE in health care workers in India which indicated that knowledge was not optimized, and attitudes were exhibited positive towards JE (Ahmad et al., 2015).

The practices were developed and adopted in response to relevant environmental conditions, which then helped to prevent the spread of JE in those areas. Drainage system is one of those environmental conditions. Drainage systems should be properly managed through personal, local and governmental efforts. Importantly, most farms have open drainage systems that are breeding grounds for various vectors such as mosquitoes. It is imperative that we make people aware of preventive measures for JE as it will not only help to prevent transmissions but will also combat other vector borne diseases such as dengue, malaria, West Nile virus, etc. In low endemic areas, many farms do not have proper drainage systems and may have ponds nearby; however, due to improved practices, cases of JE have been decreasing in such areas. This is likely a consequence of their past experiences wherein they had suffered some degree of transmission and sought out potential solutions. These people exhibited a highly desirable attitude that would enable them to embrace better practices and to better position themselves for knowledge acquisition.

In general, socio cultural and economic practices seemed to increase the risk of transmission of diseases. Most of the people in rural areas of a country like Nepal are not aware of the availability of a vaccine for JE even though the government has attempted to offer it throughout most of the country. In similar scenario in China, it was found that vaccine status associated with knowledge of the disease and vaccine (Zhang et al., 2011).

More awareness on JE is required in both high and low endemic zones. Although cases may currently be decreasing, they might increase again if there

exists a lack of awareness and knowledge on this matter. The implementation of effective education campaigns can amplify the knowledge of the populous and introduce new and improved practices to the community. Moreover, these campaigns can help to bring much needed equipment to indigenous people living in high endemic zones and other high-risk areas. These campaigns have been deemed to be very effective due to the desirable attitude exhibited by the people that have been exposed to them. One of the important determinants of campaign success is the potential sources of public communication. There was a study of KAP among pig farmers in two districts of Nepal; Kathmandu and Morang (Chapagain et al., 2019) indicated that media and other pig farming friends were the major source of information regarding JE. Media sources like radio, television thus had the potential source of awareness generation to the pig farmers. However, the factors e.g. education level as well as gender should be taken under consideration for providing the communication materials before conducting educational campaigns. The KAP study of rabies in Thailand was found that wired broadcasting had greater public communication and participatory activities had better practice to improve KAP in community (Kiratitana-olan et al., 2021).

Local and central governments should focus on drafting rules and regulations to achieve desirable living environments that are free from vectors. They should also provide vector friendly amenities such as ponds, ditches and effective drainage systems to these farmers and strictly implement the access to and use of these resources. Most importantly, significant budget and necessary manpower should be made available to rural populations by the government and NGOs.

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AUTHOR CONTRIBUTIONS

Sajana Thapa : Methodology, Investigation, Data analysis, Writing-original draft

Anucha Sirimalaisuwan : Conceptualization, Methodology, Data analysis

Kannika Na Lampang : Methodology, Data analysis

Veerarak Panyapornwittaya : Data and statistical analysis

Warangkhan Chaisowwong: Conceptualization, Methodology, Data analysis, Writing-review & editing

CONFLICT OF INTEREST

The authors declare that they hold no conflicts of interest

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