KNOWLEDGE REGARDING JAPANESE ENCEPHALITIS AMONG PIG FARMERS OF KATHMANDU AND MORANG DISTRICTS OF NEPAL

A. Chapagain*[1], S. Singh[2], and D.B. Thapa[2]
[1]Paklihawa Campus, Institute of Agriculture and Animal Science
[2]Agriculture and Forestry University, Nepal
*arjun@iaas.edu.np

ABSTRACT

A study was carried out from January to December 2012 among pig farming communities of Kathmandu and Morang districts of Nepal to determine knowledge regarding Japanese encephalitis (JE) disease. In this comparative study, 100 pig farmers were surveyed in each district Japanese encephalitis virus (JEV) infection. The research observation revealed that the pig farming communities in both districts were poor, illiterate, having no training, highly dependent on pig farming occupation and some were landless. Comparatively, Kathmandu pig farmers had better education, training on pig farming and income status but less land ownership than Morang pig farmers. Male and female respondents were equal in Kathmandu and nearly equal in case of Morang district. There was significant difference ($P<0.05$) regarding knowledge of JE in two districts. In Kathmandu, 42% pig farmers were aware of JE while in Morang only 25% were having knowledge of it. Study district, literacy status and gender of pig farmers were significantly associated ($P<0.05$) with JE awareness. Literate farmers (41.5%) were more aware than illiterate (24.5%) and males (43.5%) were much aware than females (21.7%). There was also significant difference ($P<0.05$) between pig as vector for zoonotic disease and knowledge regarding JE.

Key words: Japanese encephalitis, Japanese encephalitis virus, pigs

INTRODUCTION

Japanese encephalitis (JE) is a mosquito borne zoonotic disease. It is caused by an arbovirus of Flaviviridae family (Lindenbach and Rice, 2001). First clinical identification was made in 1871 in Japan and previously this disease was known as "summer encephalitis" (Mackenzie *et al.*, 2007). The virus responsible for Japanese encephalitis B (JEB) was re-isolated in 1933 and ultimately characterized in 1934, when it was experimentally inoculated into monkey brain and successfully reproduced the disease (Jani, 2009). The ability of this virus to infect pigs, bovines, dogs and sheep was found in 1954 (Pond *et al.*, 1954). It is now well established that this virus exists in enzootic cycle between mosquitoes and pigs or mosquitoes and ardeid bird's (Gubler, 2007). *Culex tritaeniorhynchus* is the predominant mosquito vector of JE (Philip Samuel *et al.,* 2000) that becomes active during dawn and dusk (Baik and Joo, 1991) and has average flight range of 1.5 Km (Henrich *et al.,* 2003).

The first epidemic of JEV in Nepal was reported in 1978 from a southern Rupandehi district (Joshi, 1983). In Nepal, JE has been endemic in southern region since 1980s. Morang district has long history of JE since the late 1980's. Suddenly, JE cases reported from Kathmandu valley in 1997 and in subsequent years became endemic (Patridge *et al.,* 2007; Pant, 2009 and Impoinvil *et al.,* 2011). It is now well known that JE is firmly established in Morang and Kathmandu districts both with several cases being admitted to different area hospitals each year.

It is now well known that JE is firmly established in Morang and Kathmandu districts both with several cases being admitted to different area hospitals each year. Pig farming is also increasing not only in these two districts but all over the country due to of its lucrative profit, requiring comparatively

small investment, quick return providing nature and being a highly prioritized sector by government as means of poverty alleviation through cooperative approach. Total pig population was 723613 in 1996/97 which is increased by 47% in 13 years and reached to 1064858 by 2009/10. According to the record of 2009/10, the number of pigs in Morang district was 49276 and in Kathmandu it was 9480 (MoAC, 2010).

Knowledge is the factor which increases sensitivity towards the disease and makes people use prevention practices regularly. This study tried to find out the detailed knowledge regarding JE among the pig farming and future extension education opportunities in these communities. Further, it aimed to find out whether there exists regional variation between Kathmandu pig farming community and Morang pig farming community in terms of knowledge, exposure to risk factors and the prevention practices used regarding Japanese encephalitis. Morang district is facing JE outbreak since long while it is comparatively new to Kathmandu district. However, Kathmandu being the capital of the country the people here are more likely to be exposed to information sources which could make them aware of JE and other diseases. Considering these contrasting factors it will be interesting to see how the knowledge and other practices that differ in these two regions.

MATERIAL AND METHODS

This study was carried out from January 2012 to December 2012 in two JE endemic districts of Nepal namely, Kathmandu and Morang districts. Kathmandu district is the central hilly district and Morang district is eastern terai district. The Morang district is the one where JE has been endemic for more than 30 years while Kathmandu district is newly endemic for JE. Within Kathmandu district four sites were included under this study. Kathmandu is the capital city of the country which is likely to have more access of health facilities and information sources than the Morang district. However, being exposed to JE for longer duration Morang can have better understanding of this disease. Thus the comparative study of these two districts if supposed to be logical and interesting.

Community selection

These communities in Kathmandu valley and Morang district pig farming communities were selected for this study. These areas were selected based on the discussion with the local district governmental officials and field level veterinarians.

Sampling procedure

Farm count in the study area

Total pig farms in the four study sites were counted by visiting those areas under the guidance of community leaders and local para-veterinarians. Sample size was then calculated compromised to 100 pig farm families in each district by random proportional sampling method.

Sample size determination

Cochran's equation was used for sample size determination,

Equation 1: $$n_0 = \frac{Z^2 pq}{e^2}$$

Where, n_0 is the sample size, Z^2 is the value of Z at 95% level of confidence, p is the prevalence, q is 1-p and e is the desired level of precision. By taking prevalence of JE in pigs to be 50%, the total sample size became 385. But, for finite population, sample size can be determined by,

Equation 2: $$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

Where, n is the sample to be selected from each study site, n_0 is the number of farms in each site and N is the sample size as determined by equation 1.

Due to time and monetary constraints, proportionality to sample size method was used, as explained in equation 3, for each site and the total number of pig farms were reduced to 100.

Equation 3: $$n = \frac{n1 - 100}{N}$$

n = sample to be taken from each site
n_1 = sample number for each site obtained from equation 2
N = total sample number obtained from equation 2

For this study, total pig farms were 180 in Kathmandu study area and from equation 2, the sample size became 161 and by equation 3 it was reduced to the required 100 sample size scientifically.

Table 1: Distribution of pig farmers in Kathmandu study area

Site	Number of pig farms	From equation 2	From equation 3
Balaju	32	30	19
Jadibuti-Manahara	62	54	33
Gokarna	35	32	20
Gothatar	51	45	28
Total	180	161	100

Sampling of pig farmers in Morang district

The same procedure used in Kathmandu was followed in Morang district as well in sample size determination. The total pig farmers surveyed were 100 in this district as well. The number of pig farmers selected from Urlabari was 28; from Biratnagar was 37 and from Madhumalla was 35.

Survey to compare knowledge

A set of questionnaire was prepared first including both closed and open type. There were 6 main parts to the questionnaire; (1) farmer attributes such as gender, education, income, training etc. (2) farm attributes such as the number and breed of pigs raised, management, source and marketing of pigs etc.; (3) knowledge about JE and what can be done to prevent. The questionnaire was pre-tested for clarity and feasibility on a sample of 20 farms in a region outside of the study area (Lalitpur district) and the semi-structured questionnaire was finalized and then only used for survey in the Kathmandu and Morang districts.

Statistical analysis

Data collected were entered into SPSS version 16. Figures were made using MS-Excel-2010. The frequencies were expressed in percentage, fractions and displayed through bar diagrams, pie charts or line graphs. Descriptive statistics was used for analysis and expression of data. Chi square test was used to determine the association or non-association of variables and p value less than 0.05 was taken as significant for the study.

RESULT AND DISCUSSION

Comparison of socio-demographic features

Male and Female Respondents

In this study two districts Kathmandu and Morang were selected. In Kathmandu 50% were male and 50% rest were female respondents. In Morang district male were higher in number than females. Males were 58% and females were 42%.

Table 2: Respondents' distribution from different study areas in Kathmandu district

Study site	Gender of farmer		Total
	Male	Female	
Balaju	12	7	19
Gokarna	10	10	20
Jadibuti-Manahara	15	18	33
Gothatar	13	15	28
Total	50	50	100

Table 3: Respondents' distribution from different study areas in Morang district

Study site	Gender of farmer		Total
	Male	Female	
Urlabari	10	18	28
Biratnagar	27	10	37
Madhumalla	21	14	35
Total	58	42	100

Education level

The education level of pig farmers was also compared in two districts. There was significant difference in two districts regarding the illiteracy status of pig farmers ($p<0.05$). In Kathmandu, 39% farmers were illiterate while in Morang more than half (55%) were illiterate.

Occupation

In Kathmandu for 73% of pig farmers, pig raising was the sole source of income while rest 27% had other source of income as well. In Morang only 18% pig farmers had pig farming as the sole source of income. The rest 82% pig farmers had other source of income as well. The other secondary occupations of pig farmers of both districts are shown as below in figures.

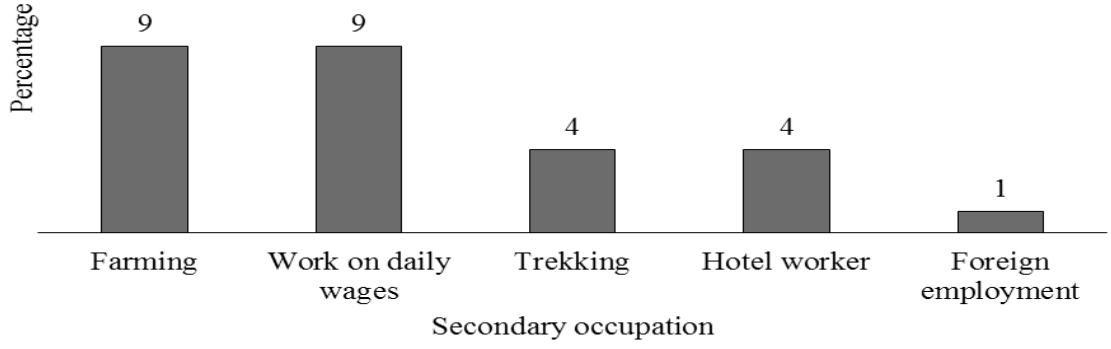

Figure 3. Secondary source of income for pig farmers in Kathmandu district

Figure 4: Secondary source of income for pig farmers in Morang district.

Land ownership

In Kathmandu only 15% of pig farmers had their own land for pig farming and other 85% were raising pigs in leasehold land. In Morang however, 65% pig farmers had their own land for pig raising purpose and rest 35% were raising pigs in other's land.

Income status of pig farmers

In Kathmandu 30% pig farmers had monthly income more than 10,000 NRS and other 70% equal to or less than that. In Morang, the income status was even less and only 5% had income more than 10,000 NRS per month.

Time period of raising pigs

In Kathmandu, 27% of pig farmers were raising pigs for less than 3 years and 73% were raising pigs for more than 3 years. In Morang district even more 84% farmers were raising pigs for more than 3 years and only 16% less than that.

Farmers receiving training

In Kathmandu 16% of pig farmers had training on pig farming and in Morang only 1% had taken some form of training. In Kathmandu governmental offices stood first in providing training (11/16) followed by farmer group (3/16) and NGO/INGO (2/16). In Morang only one pig farmer had training and it was organized by NGO/INGO.

When asked about the reason for not taking training the answers were similar. In Kathmandu out of 84 pig farmers who had not taken training, 56% said they didn't know training was available, 42% said they didn't know where to go for training while 2% said they couldn't afford training. In Morang where 99% had not taken training, 57% said they didn't know training was available, 32% said they didn't know where to go for training and 11% said they couldn't afford training.

Table 4. Comparison of socio-demographic features in Kathmandu and Morang districts

Parameters	Class	Kathmandu	Morang	P value
Sex of respondent	Male	50	58	0.160
	Female	50	42	
Literacy	Illiterate	39	55	0.017
	Literate	61	45	
Monthly income	≤ 10000 NRS	70	95	<0.001
	> 10000 NRS	30	5	
Pig farming as sole occupation		73	18	<0.001
Land ownership for pig farming		15	65	<0.001
Time period of raising pigs	≤ 3 years	27	16	0.042
	> 3 years	73	84	

Knowledge about Japanese encephalitis

In Kathmandu district, 42% (42/100) pig farmers had heard about JE while in Morang only 25% (25/100) had heard about it.

Figure 5: Farmers who had heard about JE

Source of information of JE

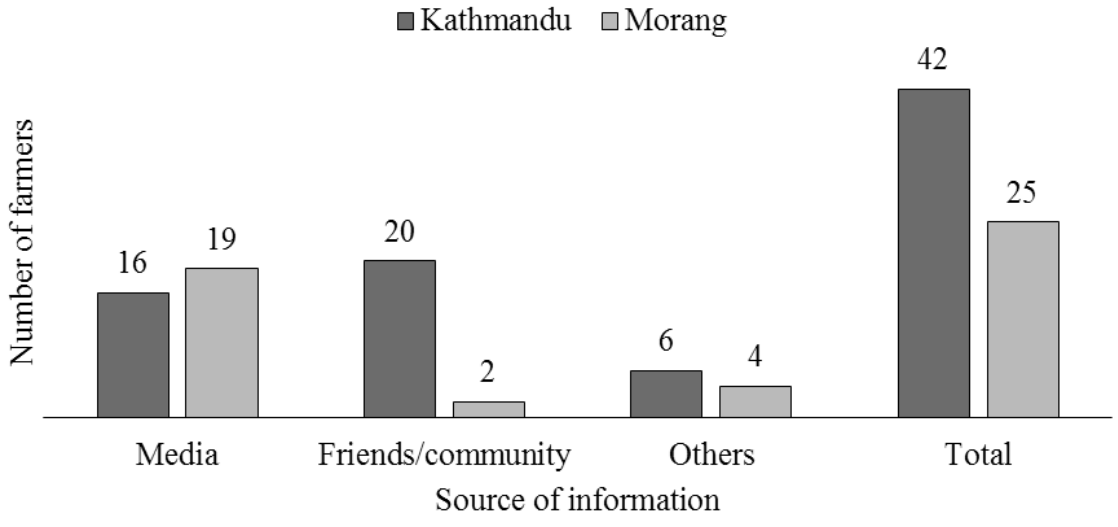

Figure 6: Source of information about JE

Comparison of knowledge about JE facts

In Kathmandu 72% pig farmers knew they can get disease from pigs. In Morang 39% of pig farmers knew this fact and there was significant difference in these two districts regarding bv awareness regarding pig borne zoonoses ($p<0.001$). In Kathmandu more pig farmers were aware than farmers of Morang district. In Kathmandu 42% pig farmers had heard about JE while in Morang only 25% had heard about it. Similar study in Rupandehi and Kapilvastu district by Khanal (2012) also showed similar low level of knowledge among pig farmers regarding JE. In that study also 100 pig farmers from Rupandehi and 100 from Kapilvastu were surveyed. It showed only 38% pig farmers of Rupandehi and 15% of pig farmers of Kapilvastu knew about JE.

Table 5: Pig farmer's knowledge about JE facts.

JE facts		Kathmandu (N=100)	Morang (N=100)
Know what problem it causes in human	Yes	33	13
	No	67	87
Know what problem it causes in pig	Yes	7	8
	No	93	92
Know how it spreads	Yes	20	13
	No	80	87
Know it is vaccine preventable in pig	Yes	11	3
	No	89	97
Know it is vaccine preventable in human	Yes	19	9
	No	81	91

Knowledge about pig borne zoonoses

When asked about whether they knew they can get disease from pigs or not, 72% pig farmers in Kathmandu and 39% farmers in Morang said they knew it. In Kathmandu 14 pig farmers could name any disease they share with pigs. 6 people named swine flu, 7 people named Japanese encephalitis and

1 named neurocysticercosis. In Morang, only 5 people could name any disease they share with pigs. 2 farmers named swine flu, 2 others said Japanese encephalitis and 1 other said neurocysticercosis disease.

Table 6: Comparison of knowledge of pig borne zoonoses and JE in Kathmandu and Morang districts

Parameters	Kathmandu	Morang	P value
Knew can get disease from pigs	72	39	<0.001
Heard about JE	42	25	0.008

Similar study in Rupandehi and Kapilvastu district by Khanal (2012) also showed similar low level of knowledge among pig farmers regarding JE. In that study also 100 pig farmers from Rupandehi and 100 from Kapilvastu were surveyed. It showed only 38% pig farmers of Rupandehi and 15% of pig farmers of Kapilvastu knew about JE. In their research Thakur *et al.* (2012) found only 10% of pig owners of Sindhupalchowk, Kavrepalanchowk, Dolakha and Solukhumbu having heard about JEV where only 1% knew how it transmits. Our study population knew more than this study group. Sindhupalchowk, Kavrepalanchowk, Dolakha and Solukhumbu are high altitude zone and JE is comparatively newer disease to these areas. JE has been reported since long in our study districts which might be the reason for some higher awareness in these areas. The awareness level in Kathmandu was higher than that of previous report by USAID which was 32% among general pubic while the awareness level in Morang was lower than that being only 25%. The research of USAID also showed that the awareness on JE is less compared to another mosquito borne disease, malaria. 77% were aware of malaria while only 32% were aware of JE among 1800 respondents (Houston and Chhetry, 2003).

Relation of knowledge and other socio-demographic features

Study heard about JE while in Morang only 25% had heard about it. Gender was also found to be significantly associated with JE knowledge ($p<0.05$). More males were aware than females district was the one factor responsible in variation of JE knowledge ($p<0.05$). In Kathmandu more pig farmers were aware than farmers of Morang district. In Kathmandu 42% pig farmers had. 43.5% (47 out of 108) males had heard about JE while only 21.7% (20 out of 92) of females had heard about it.

Literacy status of pig farmers had significant association with having heard about JE ($p<0.05$). 41.5% (44 out of 106) of literate farmers had heard about JE while only 24.5% (23 out of 94) illiterate pig farmers had heard about JE. People who knew they can get diseases from pigs appeared to know more about JE and this was significantly different as compared to those who didn't know they can get diseases from pigs ($p<0.05$). 48.6% (54 out of 111) who knew they can get diseases from pigs appeared to know about JE but among those who didn't know they can get disease from pigs only 14.6% (13 out of 89) knew about JE.

Table 7: Association of various variables with knowledge

Variables tested	Chi-squared value	p value
Study district and heard about JE or not	6.486	0.008
Gender and heard about JE or not	10.578	0.001
Time period of raising pig and heard about JE or not	2.808	0.069
Literacy and heard about JE or not	6.494	0.008
Training on pig farming and heard about JE or not	3.153	0.069
Know people can get disease from pigs and heard about JE or not	25.695	<0.001

Human and pig health disorders

None of the families were diagnosed with JE. In past year severe headache, high fever, unconsciousness, neck rigidity and convulsion were faced by some farm families. In Kathmandu the family reporting severe headache, high fever, unconsciousness, neck rigidity and convulsion were 12, 8, 2, 1 and 1 respectively. In Morang, the farm families reporting severe headache, high fever, unconsciousness, neck rigidity, convulsion and paralysis are 7, 14, 3, 1, 2 and 2 respectively.

Regarding pig health disorders that can be comparable to JE signs and symptoms abortion, false pregnancy, weak piglets, convulsion, hydrocephalus and swollen testicles records were evaluated. In Kathmandu, farmers reporting abortion, false pregnancy, weak piglets, convulsion, hydrocephalus and swollen testicles are 36, 12, 36, 20, 2 and 2 respectively. In Morang, farmers reporting abortion, false pregnancy, weak piglets, convulsion, hydrocephalus and swollen testicles in pigs are 8, 5, 5, 5, 1 and 1.

Table 8: Human health disorders reporting farm families in Kathmandu and Morang

Symptoms	Kathmandu	Morang
High fever	8	14
Severe headache	12	7
Unconsciousness	2	3
Neck rigidity	1	1
Convulsion	1	2
Paralysis	-	2

Table 9: Pig health disorders reporting farm families of Kathmandu and Morang

Symptoms	Kathmandu	Morang
Abortion	36	8
False pregnancy	12	5
Weak piglets	36	5
Convulsion	20	5
Hydrocephalus	2	1
Swollen testicles	2	1

CONCLUSION

The awareness level regarding Japanese encephalitis was poor in Kathmandu and Morang districts. This opens up an opportunity for future extension education regarding health issues to these groups of people using field veterinarians and/or the leaders of pig farming community. Pig farmers of Kathmandu were more aware than Morang pig farmers. Media and other pig farming friends were the major source of information regarding JE. Media sources like radio, television thus can be the potential source of awareness generation to the pig farmers. The pig farming community is illiterate, landless and poor. Thus there is need of providing adequate training on pig farming, providing financial assistance and support for commercialization of farms, settling the land issues and improving their income by ensuring markets for the products. Then only proper prevention and control of diseases like JE is possible in context like Kathmandu and Morang districts.

In case of pigs also awareness on importance of vaccine was lower. Only 35% in Kathmandu and 13% in Morang said vaccine is essential for pigs. Though 87% pig farmers of Kathmandu were vaccinating their pigs for at least one disease only 13% doing so in Morang. There was no vaccination against JE. Considering the trusted source of immunization decision among pig farmers this study found that they trust on field veterinarians working on the area and/or the other pig farmers having similar experiences. This indicates if any further health related information and immunization awareness are to be delivered to these farmers then the field veterinarians can be a better means.

ACKNOWLEDGEMENT

The authors are highly thankful to the IAAS, National Zoonosis and Food Hygiene Research Centre (NZFHRC) and Pig Farmers of both districts for all their support and help during the research.

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