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Knowledge, Attitude, Epidemiological Risk Factors and Prevention Practices of Japanese Encephalitis in Community Members of Kathmandu and Morang Districts, Nepal

By A. Chapagain, P. Ghimire & M. P. Gupta
Tribhuvan University,Nepal

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Abstract- A research was conducted among communities' members of Kathmandu and Morang districts to study knowledge, attitude, epidemiological risk factors, and prevention practices of Japanese Encephalitis (JE) based on a questionnaire survey. In this study, 100 pig farmers were surveyed from each district to assess the knowledge, attitude, epidemiological risk factors and prevention practices for Japanese encephalitis virus (JEV) infection. In Kathmandu, 42% pig farmers were aware of JE while in Morang only 25% were having knowing of it; the finding was significantly different ($P<0.05$) concerning district, literacy, and gender of pig farmers. 87% pig farmers of Kathmandu and 13% of Morang were using the vaccine for other diseases in pigs there was no practice of vaccination against JE. Pig farmers were using mosquito bite prevention practices. Despite some differences, pig farmers were found to be exposed to multiple JE risk factors, having a low level of awareness, and not using adequate prevention practices. There was no uptake of JE vaccine among pig farmers of both districts. For prevention and control of JE, there is need of public awareness, vaccination to human and pig against JE, provision of using insecticide treated-mosquito nets, management of pig farms and scientific rice field irrigation management to curve over JE.

Keywords: japanese encephalitis, japanese encephalitis virus, insecticide treated nets, vaccination, communities member, questionnaire, mosquito bite.

I. Introduction

Japanese encephalitis (JE) is a mosquito-borne zoonotic disease. The disease was been caused by an arbovirus of the 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). In 1933, the virus responsible for Japanese Encephalitis B (JEB) was re-isolated and ultimately characterized in 1934 when it had been experimentally inoculated into the monkey brain and successfully reproduced the disease (Jani, 2009). It is the single largest cause of viral encephalitis in the world (Kinchi *et al.,* 2010), with annual case reports ranging from 30,000-50,000 (Solomon, 2006) but, estimations are even higher (Tsai, 2000).

For JEV transmission, ardeid wading birds are the primary maintenance hosts, pigs are the main amplifying hosts, and *Culex* mosquitoes are the primary mosquito vectors for transmission (Igarashi, 2002). In Nepal, ducks also have been incriminated as the potential risk factor for JEV transmission (Joshi *et al.,* 2004 and Pant, 2006). The disease now has been firmly established in Morang and Kathmandu districts both with several cases being admitted to different area hospitals each year. Pig farming as lucrative business has been increasing not only in these two districts but all over the country due to, requiring a comparatively small investment, quick return providing nature and being a highly prioritized sector by the government as means of poverty alleviation through a cooperative approach. Most of these farms however, are maintained under unsanitary and unhygienic practices. Since pig develops prolonged viraemia after JEV infection, pig rearing in presence of other risk factors such as wild birds, ducks, mosquito vectors, rice field and standing water sources may be a high risk occupation in JE endemic area of Nepal (Chapagain *et al.,* 2018).

This study tries to find out the socio-demographic features of pig farming community, exposure to epidemiological risk factors for JE, knowledge level, and prevention practices against JE, and future extension education opportunities in these communities. Further, the main purpose of this study was to find out whether there exists regional variation in knowledge, epidemiological risk factors, and prevention practices regarding the Japanese encephalitis among the community members of pig farmers of Kathmandu and Morang districts.

II. Materials and Methods

This study was carried out in two JE endemic districts, Kathmandu and Morang districts of Nepal. The areas on the study districts were selected in

Author α: Corresponding author: Faculty, Institute of Agriculture and Animal Science,Tribhuvan University, Paklihawa Campus, Rupandehi, Nepal. e-mail: chapagain.arjun@gmail.com
Author σ: Nursing Instructors, Bharatpur Hospital Nursing Campus, Chitwan, Nepal. e-mail: puspaghmr88@gmail.com
Author ρ: Faculty, Faculty of Animal Science, Veterinary Science and Fisheries, Agriculture and Forestry University, Rampur, Chitwan. e-mail: mohangupta63@yahoo.com

correspondence with the local district government officials, and field level veterinarians of the respective districts.

a) Sampling procedure

i. *Sampling of pig farmers in study districts for questionnaire*

Farm count in each district

Total pig farms of both districts were counted by visiting those areas under the guidance of community leaders and local para-veterinarians, and sites were selected for each district. Sample size was then calculated by random proportional sampling method comprised of 100 pig farm families in each district.

The pig farmers in Kathmandu valley consists of Balaju, Jatibuti-Manahara, Gokarna, and Gothatar, and was 19, 33, 20, and 28 respectively. Similarly, in Morang district the sites consist of Urlabari, Biratnagar, and Madhumalla, and were 28, 37, and 35 respectively.

ii. *Farm selection for questionnaire survey*

The Simple random sampling procedures were performed for the selection of farms from each study site. For this, the complete list of pig farmers of each was prepared, and the lottery was done separately to select the desired number of pig farms for each. The Questionnaire was, and administered to assess the knowledge, attitude, exposure to the epidemiological risk factor, and prevention practices followed by community member of pig farmers. The questionnaire was pre-tested in a region outside of the study area, and the semi-structured questionnaire was finally prepared, and used for survey in the study districts.

b) Statistical analysis

Data collected were analyzed by Chi-square test using descriptive statistics of SPSS version 16. The p-value less than 0.05 were taken as significant for the association or non-association of the variables.

III. Result and Discussion

a) Comparison of socio-demographic features

i. *Gender Respondents*

In this study, two districts, Kathmandu, and Morang were selected. In Kathmandu, the male and female respondents' were equal in number. In Morang, district, male was higher 58% in number than females 42%. However, statistically, there were no significant differences in sex of respondents in two districts ($p>0.05$).

Table 1: Distribution of respondents' from 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 2: Distribution of respondents' from 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

ii. *Education level*

There was a significant difference in two regarding the illiteracy status of pig farmers ($p<0.05$). In Kathmandu, 39% of farmers were illiterate while in Morang more than half (55%) were illiterate. Six of % pig farmers in Kathmandu had college-level education while only 1% had that much in Morang district. Kathmandu is the capital of the country, which might be the reason for the higher literacy of pig farmers compared to the Morang district.

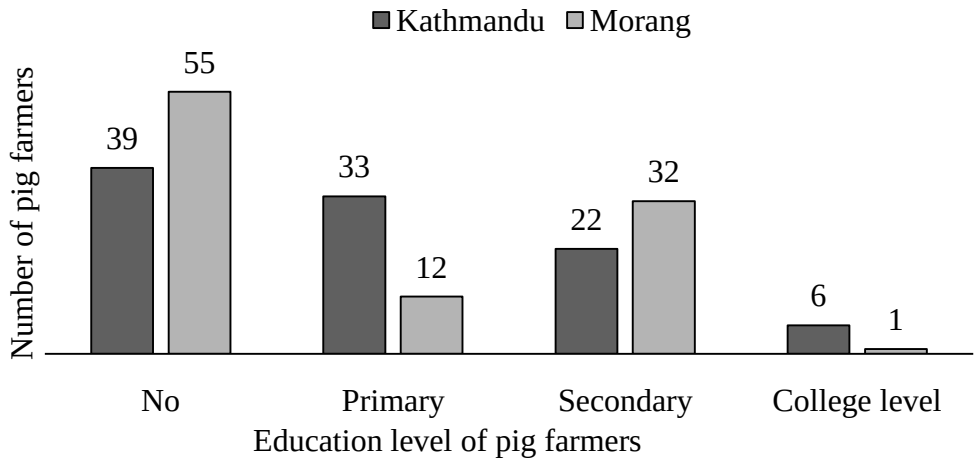


Figure 1: The Education level of pig farmers in Kathmandu and Morang districts

b) Farmers receiving training

In Kathmandu, 16% of pig farmers had the training as compared to Morang, which had value of 1%. 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 the training, and NGO/INGO being the one who provide training.

There was no significant difference in reasons behind the not taking training in both districts. The major of them responded with didn't know where to go for training followed by didn't know where training was available, and can't afford training.

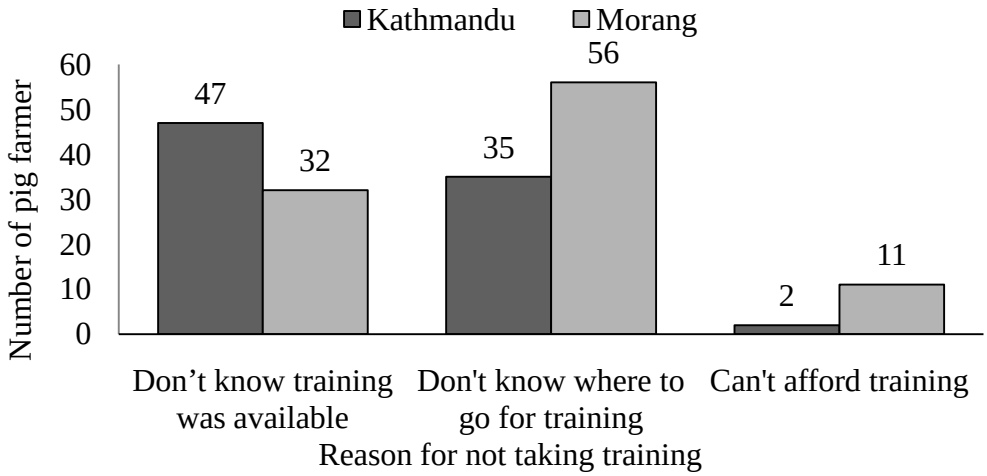


Figure 2: Reason for not taking training

Table 3: Socio-demographic features in Kathmandu and Morang districts

Parameters	Class	Kathmandu	Morang	P value
Gender	Male	50	58	0.160
	Female	50	42	
Education	Illiterate	39	55	0.017
	Literate	61	45	
Income (monthly)	≤ 10000 NRS	70	95	<0.001
	> 10000 NRS	30	5	
Sole occupation as pig farming		73	18	<0.001
Own land for pig farming		15	65	<0.001
Time lapse since raising pigs	≤ 3 years	27	16	0.042
	> 3 years	73	84	

c) *Knowledge of Japanese encephalitis among pig farmers*

In Kathmandu district, the number of pig farmers who had heard about JE was higher than Morang, and were 42% (42/100), and 25% (25/100) respectively. There was variation in their knowledge about other facts related to JE. Thirty-three farmers in Kathmandu and 13 in Morang knew what problem it causes in human, 7 in Kathmandu and 8 in Morang knew what problem it causes in pigs. Twenty people in Kathmandu and 13 in Morang knew how it transmits. Eleven in Kathmandu and 3 in Morang knew it is vaccine preventable in pig while 19 people in Kathmandu and 9 in Morang knew it is vaccine preventable in human beings.

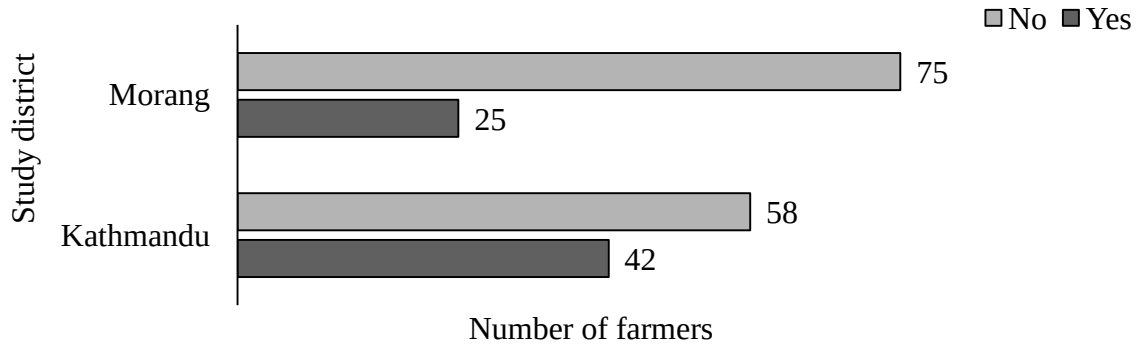


Figure 3: Farmers who had heard about JE

In Kathmandu district, pig farming community people were found to be the source of information for JE. Out of 42 pig farmers who had heard about JE in Kathmandu, 20 said pig farmers and pig farming community as the source of information, 16 said media while 6 said other sources. In Morang, stood first were media, 19 people out of 25 said it as the source of JE knowledge followed by friends and community by two people and other sectors by 4. Other sources included academic study, trainings, and health sector (Figure 4).

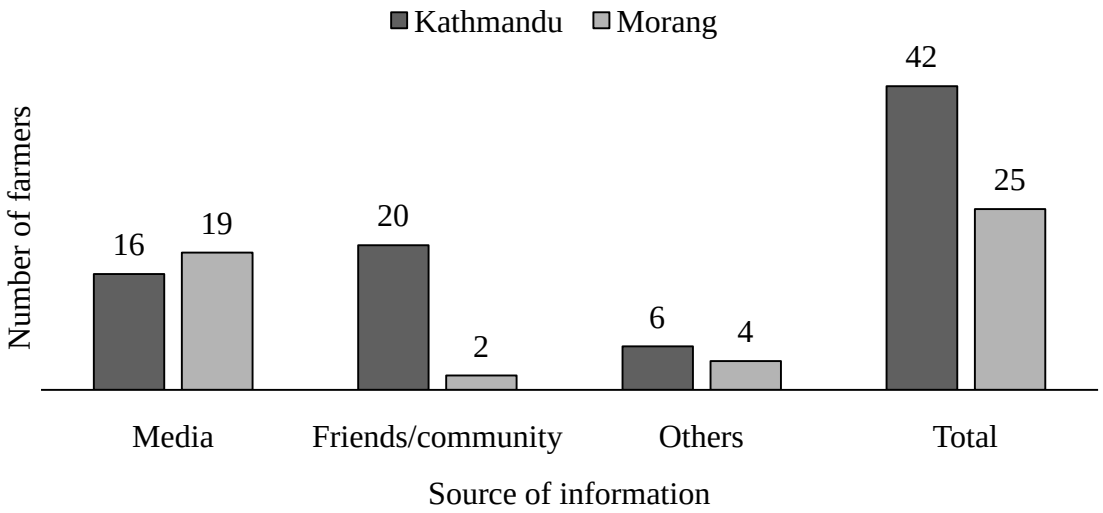


Figure 4: Source of information about JE

d) *Knowledge about JE facts in study districts*

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

Table 4: Pig farmer's knowledge regarding JE facts

JE facts		Kathmandu (N=100)	Morang (N=100)
Knowledge on problems in human	Yes	33	13
	No	67	87
Knowledge in problem in pig	Yes	7	8
	No	93	92
Knowledge on how it spreads	Yes	20	13
	No	80	87
Knowledge on vaccine for prevention in pig	Yes	11	3
	No	89	97
Knowledge on vaccine for prevention in human	Yes	19	9
	No	81	91

e) *Relationship between knowledge, and other socio-demographic features among farmers of study districts*

In Morang, only 25% of farmers had heard about JE. There was a significant difference in Gender associated with JE knowledge ($p<0.05$). More males were aware about JE knowledge than females in the study districts, and were the factor responsible in the variation of JE knowledge. In Kathmandu, 47 out of 108 (42%) of pig farmers males had heard about JE while only 20 out of 92 (21.7%) of females had heard about it ($P<0.05$).

Literacy status and heard about JE had a significant association ($p<0.05$) among the pig farmers. Forty four 44 out of 106 (41.5%) of literate farmers had heard about JE while only 23 out of 94 (24.5%) illiterate pig farmers had heard about JE.

Table 5: 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

f) *Exposure to epidemiological risk factors*

i. *Wild bird exposure in a farm, duck farming and exposure to the mosquito bite*

In both districts, pig farmers had encountered wild birds in their farm periphery. These birds were there to take feeds allocated for pigs. The various kinds of birds had been reported including crane, cattle egrets, Mynah, crow, etc.

Table 6: Various types of birds encountered around pig farm by pig farmers in Kathmandu

Type of birds	Kathmandu (percentage)	Morang (percentage)
Crow	50	21
Mynah	4	13
Crane	3	2
Many kind of birds	40	35
Don't Know	3	29
Total	100	100

In Kathmandu, 39% of pig farmers had duck farming while the rest 61% had ducks within 1 Km distance from the farm. In Morang district, 14% of pig farmers had duck farming, and 78% of all (78/100) had ducks within 1 Km distance. In Kathmandu and Morang all pig farmers had encountered mosquitoes in a pig farm and in and around their house. 68% of them reported they had observed mosquitoes biting pigs in Kathmandu while 37% reported mosquito bites in pigs.

g) *Closeness to pig shed, rice field, and water sources*

Regarding closeness to pig from human dwelling all houses were within 20 meter distance from pig pens in Kathmandu district and within 500 meter in Morang. For 95% of households in Kathmandu, the rice fields were within 1 Kilometer distance, and for 99% the standing water bodies were within 1 Kilometer. In Morang, 88% of households were within 1 Kilometer from rice fields, and 91% within 1 Kilometer distance

from water sources that can form potential mosquito breeding sites.

Table 7: Comparison of closeness to the pig farm, rice fields and standing water bodies from human dwelling in Kathmandu and Morang districts

Parameters		Kathmandu	Morang	P value
Closeness to pig farm	≤ 500 mtr	100	100	-
	> 500 mtr	-	-	
Closeness to rice field	≤ 1 Km	95	88	
	> 1 Km	5	12	0.063
Closeness to large standing water bodies	≤ 1 Km	99	91	0.009
	> 1 Km	1	9	

h) Preventive measures against mosquito bites

When considered for the use of mosquito bite prevention techniques in human, use of window screen, use of repellents, use of mosquito nets, improving drainage, use of mosquito coils, staying indoor (inside) at dawn, and dusk and wearing clothes that cover full body had been evaluated. In Kathmandu maximum, 69% of pig farmers were using mosquito coils followed by practice of using net by 41. In Kathmandu, 11% of farmers were using window screen, 25% using repellants, 39% using the of staying indoors at dawn or dusk, 40% used to wear clothes that cover full body, and 38% were practicing improved drainage. In Morang, improved drainage was being practiced by many (71%) followed by the practice of a mosquito net (51%). In Morang district, 8% were using window screen, 8% using repellants, 49% using a mosquito coil, 22% practiced staying indoors at dawn or dusk to avoid mosquito bites, and 22% wore clothes that covers the full body.

Table 8 : Mosquito bite prevention methods used in Kathmandu and Morang districts

Mosquito bite prevention methods for human	Kathmandu	Morang
Use window screen	11	8
Use repellants	25	8
Use mosquito coil	69	49
Stay indoors at dawn/dusk	39	22
Wear clothes that covers full body	40	22
Improve drainage	38	71
Use mosquito net	41	51

In Kathmandu, 17 pig farmers were using mosquito avoiding practices in pig farms as well. These include spraying chemicals (10/17), maintaining cleanliness (1/17), lightning fire, and smoking (5/17) and using repellents (1/17). In Morang, 19 pig farmers were practicing mosquito avoiding techniques in a farm as well, which included spraying chemicals (12/19), lighting fire and smoking (5/19) and maintaining cleanliness (2/19).

Table 9: Mosquito avoiding practices used by pig farmers in Kathmandu and Morang

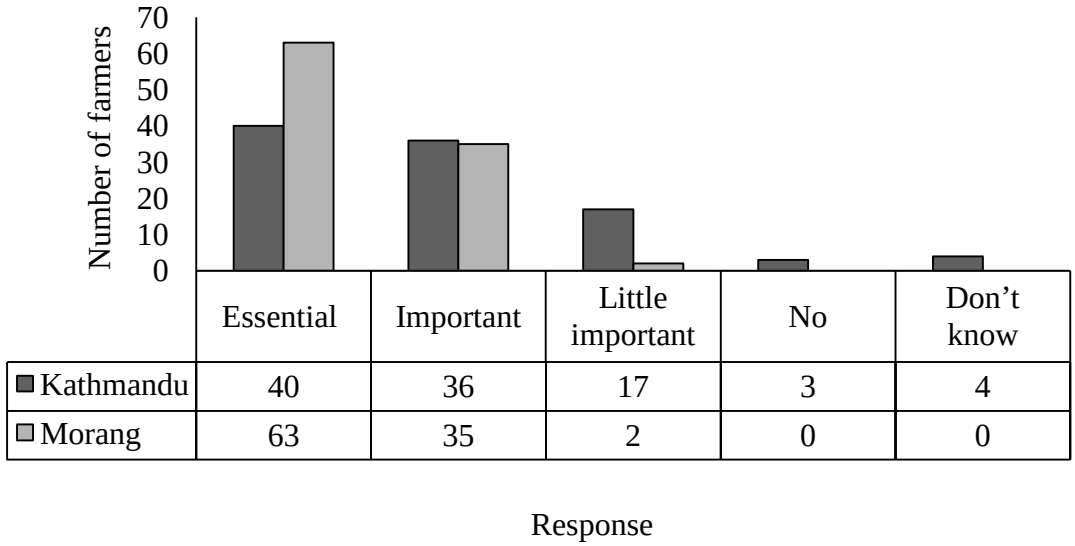
Mosquito bite prevention methods for pigs	Kathmandu (n=17)	Morang (n=19)
Spraying chemicals	10	12
Maintaining cleanliness of farm	1	2
Lightning fire and smoking	5	5
Using repellants	1	-

i) Vaccination to human and pig

i. *Human vaccination*

In Kathmandu district, 77 farmers had heard about the vaccine. Among them, 46 remembered they had vaccinated against at least any vaccine. In Morang district, 97 farmers had heard about the vaccine. However, only 20 could remember at least any vaccine being used by themselves. None of them had vaccinated themselves against JE.

When asked how important vaccines are to keep themselves healthy three said no, 17 said little important, 36 said important, 40 said essential, and four said they didn't know in Kathmandu. However, in Morang, 63 farmers said it's, 35 said important, and two said little.



	Essential	Important	Little important	No	Don't know
Kathmandu	40	36	17	3	4
Morang	63	35	2	0	0

Figure 5: Importance of vaccine for themselves as perceived by farmers

Among Kathmandu farmers, when asked where they prefer to go for vaccination 55 of them said government health center, 21 said private health clinic and 24 said vaccination campaign run by the government. In Morang, 84 of them said government health center, 14 said the vaccination campaigns by government and 2 said the private health center.

ii. *Pig vaccination*

Out of 100 pig farmers in Kathmandu, five said vaccines are not for pigs, 12 a little, 44 said important, 35 said essential, and four didn't know. In Morang district, two said not, 43 said a little important, 40 said important, 13 essential and 2 said they don't know (Figure 6).

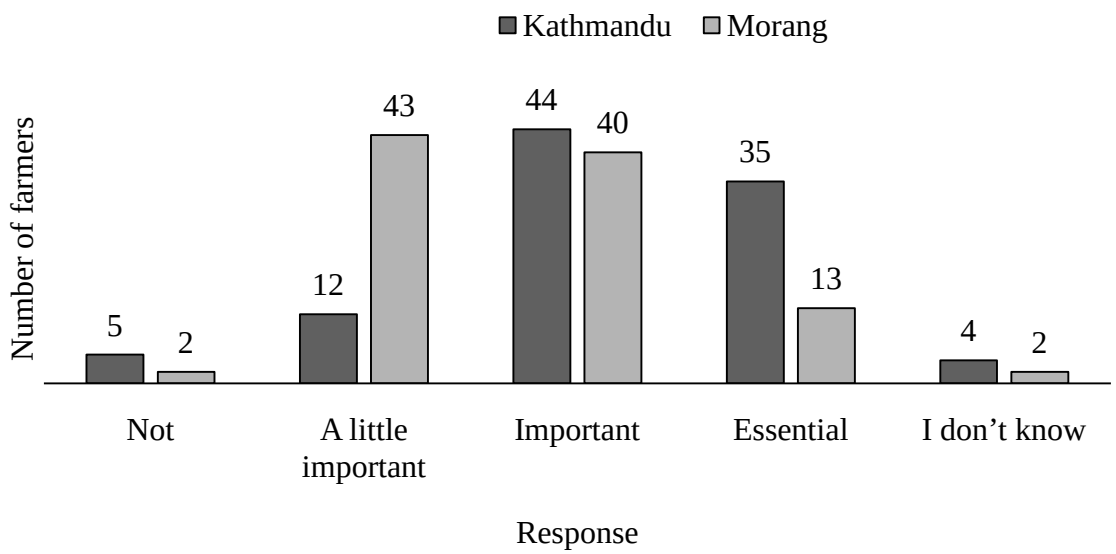


Figure 6: Importance of vaccination to pig as perceived by pig farmers

In Kathmandu, 87% of pig farmers were vaccinating pigs against at least one disease while in Morang, only 13% vaccinating against at least one. Para-veterinarians vaccinated pigs mostly in both districts while in some farm, the farmers vaccinated themselves as well (Figure 7). When asked about whom they trust in immunization of pigs or who recommended vaccination areas, they said the veterinarians or para-veterinarians being the most trustable source.

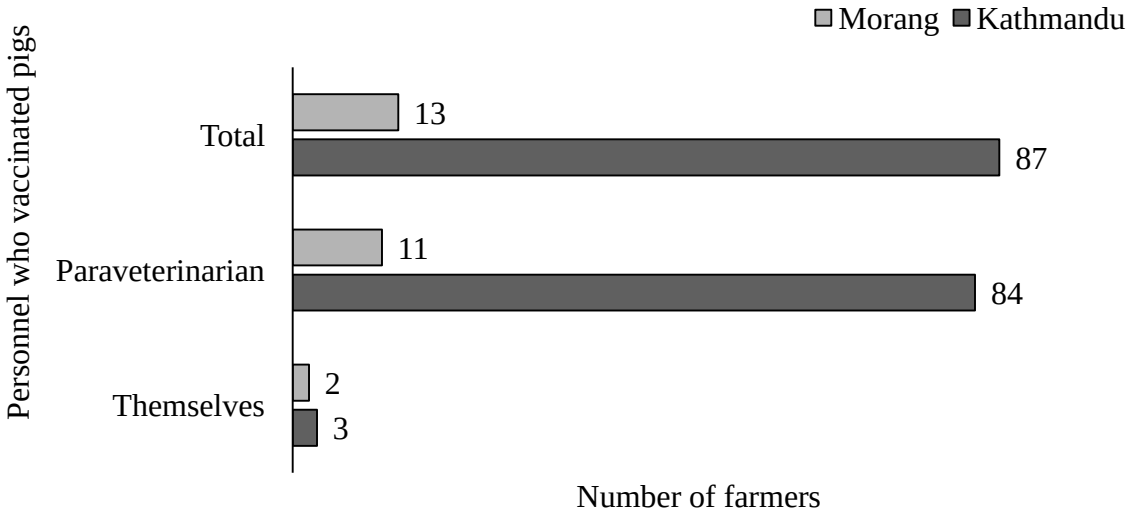


Figure 7: Who vaccinated pigs?

In Kathmandu, thirteen percent (13/100) pig farmers had not vaccinated pigs. When asked for the reason, seven said they didn't know pigs need vaccine, and six said they had no problem in pigs. In Morang, 87% (87/100) pig farmers had not the pigs. 39/87 didn't know pigs need, 42/87 had no problems in pig so not, 4/87 said they couldn't afford vaccine, and remaining two said they didn't think vaccine works (Figure 8).

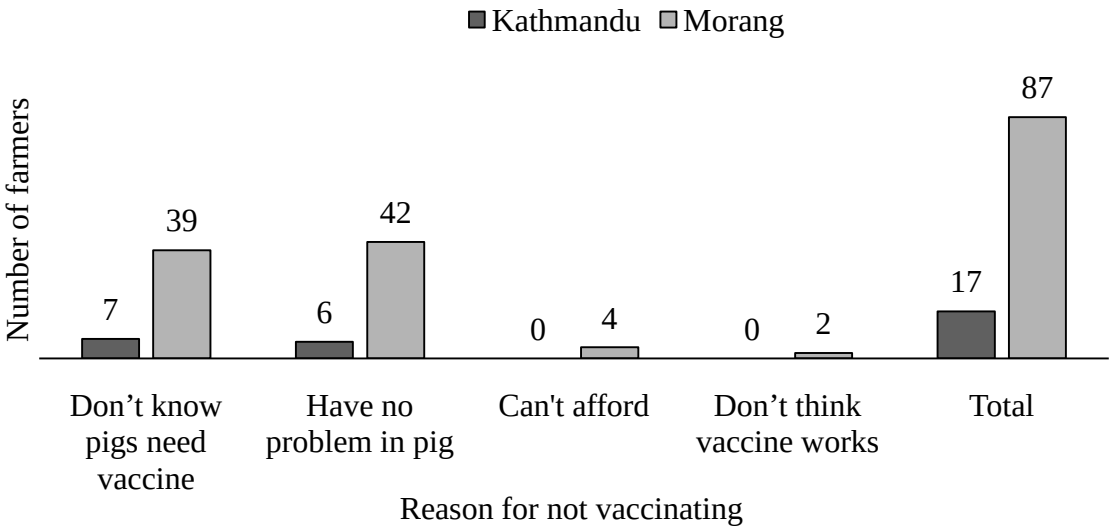


Figure 8: Reason for not vaccinating pigs

IV. Conclusions

Pig farmers in both study districts were exposed to multiple JE risk factors. The pig pens are very close to human dwellings. Human houses have a close distance to mosquito breeding sites like rice fields. Pig farming community people were frequently exposed to wild birds, ducks, and mosquito bites. Though some differences exist between Kathmandu and Morang study areas, the risk of JE is higher in both districts. Prevention practices are mainly mosquito bite prevention and immunization. We found a low level of mosquito bite avoiding practices was being used by the pig farmers in both. Use of bed nets, use of mosquito coils, etc. were very limiting and not adequate. There is a need to make the community people aware of the need and importance of using mosquito avoiding practices like using bed nets. Insecticide-treated-nets should be made available to all to prevent vector-borne diseases like JE. Immunization against JE was also not found in pig farmers as well as in pigs they raise. The vaccination campaigns run by governments should be in reach of all, including the poor pig farmers. Government as well as non-government sectors should think over the need of immunization of pigs against JE and should make necessary arrangements for this.

The awareness level for Japanese Encephalitis was not adequate in both districts. Regional variations were found towards knowledge of JE. Awareness level were more in Pig farmers of Kathmandu than pig farmers of Morang The effect of being located in the capital have been seen here. Awareness varied with the sex of respondent as well, where more males were aware compared to females. Further, the literacy rate also determined for JE. The relationship of literacy status with JE awareness showed that could have been improved with improving literacy status of the farmer. This could suggests that there is a need for strengthening literacy status, whether through formal or informal education. Training and awareness generation campaigns can also have a potential impact on making pig farmers aware of diseases like JE and need of such programs in JE endemic areas is felt after the findings of this study. Media and friends involved in pig farming were being the source of information for JE. Medias like radio, television thus could be the potential sources for generating awareness to the pig farmers. However, the illiteracy rate as well as gender differences in knowledge should be taken under consideration before using printed materials as the means of extension education or before conducting educational campaigns. Many cases of JE might have been gone unnoticed. So there is need for strengthening the laboratory facilities as well in regional and peripheral levels.

The pig farming communities in both districts were illiterate, landless, and poor. They neither have commercialized pig farming, nor do they have a good secondary occupation. They were unlikely to invest much, and adopt the necessary adjustments on the farm like the use of bio-security measures. Further, the income they are getting from pig farming also doesn't allow them to invest much on-farm improvements, on human and pig immunization or other issues of JE prevention and control. Thus, this study shows there is a need for providing proper training on pig farming, providing financial assistance regarding support and commercialization of farms, providing the land for farming and improving income of the farmers by ensuring markets for the finished products. Then only best way to prevent and control JE in the context of Nepal is to vaccinate the pigs and Humans.

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