

Seroepidemiological study to identify the risk factors for Porcine Reproductive and Respiratory Syndrome (PRRS) in Myanmar

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Abstract

Porcine Reproductive and Respiratory Syndrome (PRRS) is a highly contagious viral disease which has a significant impact on the economy and livestock productivity. This study aimed to understand the PRRS outbreak situation and disease prevalence within the suspected outbreak areas during this two-year period and the associated risk factors affecting the disease occurrence in Myanmar. A cross-sectional study was conducted in Mandalay region, the first reported outbreak area in the past two year, and its surrounding regions. Data collection by simple random sampling approach and was conducted in thirteen villages within three administrative regions of Myanmar: Mandalay, Yangon, and Sagaing regions. Questionnaire interview was taken to 114 small-scale pig farmers by structural questionnaire form to collect the information of the disease, and the blood collection was taken to establish serological testing to understand the prevalence of the disease. From the results, it was noted that the seroprevalence of PRRS was diverse between different townships ranging from 0% to 41%. From this study, it was noted that sanitation, poor biosecurity practice, and animal movement were the observed potential risk factors in this study. By identifying the potential risk factors of PRRS occurrence, the findings from this study will help to develop the proper Porcine Reproductive and Respiratory Syndrome (PRRS) control strategy in Myanmar.

Keywords: *Porcine Reproductive and Respiratory Syndrome (PRRS), prevalence, outbreak, township*

Introduction

Porcine Reproductive and Respiratory Syndrome (PRRS), the viral disease affecting domestic pigs, was first recognized approximately 35 years ago in North America (1) and Central Europe (2); this disease now occurs worldwide and causes considerable economic losses in the swine industry (3, 4). The causal agent is a positive-stranded RNA virus which was designated PRRS virus, belongs to the family *Arteriviridae* (5). During the outbreak, the clinical conditions found out in pigs were high fever (41°C), high illness rate with the morbidity rate of (50%-100%), and high mortality rate of (20%-100%) for pigs of all ages (6,7). By collecting and detecting the samples from different provinces of China between 2006 and 2009, it was confirmed that HP-PRRSVs was the causative agent of the new outbreaks (6,7).

In this study, backyard farming was targeted to collect sample and information because there is no medium and big commercial pig farm around the Mandalay area (8). This study aims to understand the risk factors of PRRS regarding the spread and intend to make a recommendation for the prevention and control of PRRS among the small scale farmers (backyard farmers) in future.

Materials and methods

Sample size calculation

Sample size calculation was based on the information about the existing survey data of overall seroprevalence of 60.67% (95% CI: 49.75–70.87%) at Mandalay area (8)⁶⁶(FAO 2012) (8) and sensitivity and specificity of IDEXX ELISA which was mentioned as 100% and 99.5% respectively (9-11)⁷⁷(Collins and Dee *et al.* 1996, Christopher-Hennings and Faaberg *et al.* 2002, Cho and Dee *et al.* 2006) (9-11). Sample size calculation was designed by using the survey tool box. In the survey tool box ready programme, the parameter used to calculate the sample size were the sensitivity, specificity of the test and existing prevalence of the study area. The reference values of sensitivity and specificity were taken from the published articles, and the existing prevalence (expected prevalence) was taken from the previous survey which is done by the LBVD-staff.

Serosurveillance activity and data collection

The surveillance activity was conducted in three regions, seven districts, thirteen townships, thirty-one villages, four wards, and seven slaughterhouses. The total samples collected from targeted study area were 331 serum samples.

A cross-sectional serosurveillance study was conducted in 13 townships located in the Mandalay area and others from suspected outbreak areas. The areas included in this study were six districts: Mandalay; Sagaing; Sintkaing; Yangon (Eastern); Kalay and Tamu where an outbreak investigation study was conducted from the last two districts (Kalay and Tamu) by staff of Epidemiology Unit, LBVD, to broaden the knowledge of the disease condition in Myanmar, to scrutinise for more detail disease condition in the country. The questionnaire included questions regarding the history of backyard farm, experiences of farmers, farm condition, and the attitude of respondents on PRRS, management

system and the influences of the previous PRRS outbreak on the pig production were investigated. The epidemiological surveys were conducted three times in this study. The very first time of pre-survey activity was performed in May, and then, questionnaire surveillance activity was taken there. Subsequently, the special active surveillance activities including questionnaire interview, taking expert opinions, exploring the animal movement and husbandry system in the targeted study areas were taken once in June and again in August.

Statistical analysis

Then, all the collected information taken from the farmers rearing the pigs were entered into the Microsoft Excel Sheet, and data validation and data recoding were done. And then data validation was done by EpiInfo and Epidemiological programme and 95% confident interval were also calculated for the seroprevalence of individual and township level. The statistical association between the seropositive and the potential risk factor were also calculated by constructing the two-by-two table. Chi-square and *p*-value calculation were added to identify the level of risk between the positivity and the factors. The Hosmer-Lemeshow statistic demonstrated that the model fitted the data well ($\chi^2=10.05$, $df=7$, $p=0.185$).

Results

A total of 331 sample from collected from 13 townships and a total of 114 respondents were interviewed. In this study, the overall prevalence of the disease in the study area was found out that 41.09% (35.74-46.60) with 95% CI. From the questionnaire interview, a total of 266 variables were carried out, and among them, 29 variables were significant for the occurrence of disease.

Results from the serological surveillance

A total serum and sera of 331 samples were collected. The majority of farmers possessed less than ten pigs in a herd. It was noted that the highest seroprevalence was Sintkaing township and the lowest was in Dataroo and Tamu township. And overall prevalence was 41.1% (95% CI 35.7-46.6) with 95% CI. The detail results of 331 samples were tabulated in Table 3.

Results from the questionnaire interview

A total of 114 respondents were interviewed from thirteen townships. A total of 82.2% of respondents had personal experience in the raising pig in the study area, and no one had learned the systematic pig husbandry because in this study, all of the respondents have only practiced in backyard farm and the majority of the respondent said the pig production was not the main business of their life. Their main businesses were agriculture. The average family members of the respondent were three. Pork has been the main dish for their meal. The main source of buying the pork was from the market. They dressed their meat near the backyard farm.

From the survey, it was noted that common feedstuffs given to the pigs feed waste (also called hotel sar in Myanmar) which were taken from restaurants, tea shops, monasteries, hotels,

and surroundings. Giving drinking water to the pigs was rare and only usually supported the feed mixed with water was common in the husbandry system. As a second priority, the wheat bran, rice bran, sesame cakes were provided to the pigs as a feedstuff, and in some household, the fish paste was added to the feed to enhance the appetite of the pigs. The most common raising system in the farms with rearing only one to two pigs was tethering, and temporary housing with partial covering of roof and wall were common in farms with rearing more than three pigs.

Identification of associated risk factors

The following risk factors including having more than 3 years personal experience of pig production (OR 0.4; 0.2-0.7), cut the meat only in the kitchen (OR 0.5; 0.3-0.9); buying pigs from middle man (OR 0.3; 0.2-0.6); buying the pigs to rear only in the summer (OR 0.3; 0.1-0.7); selling the pigs only during the rainy season (OR 0.4; 0.1-0.9); selling the sows than other ages (OR 0.3; 0.1-0.8); selling the boars than other ages (OR 0.5; 0.2-1.0); practicing good sanitation in the pig farm (OR 0.4; 0.2-0.7); 2-4 months of age of pigs (OR 0.5; 0.3-0.8) and rearing only 1-30 pigs in the pig farm (OR 0.3; 0.1-0.9) were negatively associated with the occurrence of PRRS. Other factors including cutting the meat near the pig farm (OR 2.4; 1.4-4.1); cooking the meat near the pig farm (OR 4.3; 1.8-10.1); buying the pigs to rear from other farm (OR 2.5; 1.4-4.2); buying the pigs only in winter (OR 3.0; 1.1-8.3); cleansing the pigs only once a month (OR 3.9; 1.0-15.1); cleansing the pigs only once a week (OR 7.3; 2.0-26.0); cleansing the pigs only with water (OR 1.9; 1.2-3.2); getting the water from well (OR 1.8; 1.0-3.1); bad sanitation in the pig farm (OR 2.7; 1.4-5.3); animal import near the pig farm (OR 4.7; 1.9-11.7); animal export near the pig farm (OR 2.4; 1.4-4.3); rearing dogs near the pig farm (OR 3.0; 1.7-5.3); keeping the pigs with free-range (OR 1.8; 1.0-3.3) and rearing a total number of 1-2 pigs in the farms (OR 2.1; 1.2-3.6) were suggested to be risk factors for the disease occurrence.

A total of 29 variables with *p*-values <0.05 were offered to the multivariable logistic regression model. Variables had to have a *p* < 0.043 to remain in the final model. Farmers who purchased pigs from other farm were 2.8 (95%CI: 1.2-6.2) times more likely to report PRRS than those purchased from other sources. Pigs cleaned only once a week was 6.4 times (95%CI: 1.5-27.3) more likely to get the infection than the pig cleaned daily. Practicing good sanitation in the pig farm had less chance (95%CI: 0.4; 0.2-0.7). It was concluded that animal import near the pig farm was 5.6 times (95%CI: 1.5-20.4); rearing dogs near the pig farm was 2.7 times (95%CI: 1.3-6.0). Pig age of 2-3 months old were 0.3 times (95%CI: 0.1-0.9) less chance of getting PRRS infection than other ages. And, it was found that the farms rearing only 1-2 pigs were 4.6 times (95%CI: 2.0-10.6) likely to get the infection than others. Pig farms of farm owners who suffered the economic losses due to PRRS infection thought PRRS as a severe disease were 2.7 times (95%CI: 1.0-7.2) than the farmers who were not suffered from the severe disease condition in their farms.

Discussion

PRRS is an easily transmitted infectious disease of pigs affecting the pig industry worldwide (12). The key to success in handling animal disease epidemics is early detection. Surveillance is defined as the systemic routine collection, collation, and analysis of data related to animal health and the timely dissemination of information to those who need to know so that action can be taken (13). With surveillance, early detection of emerging diseases or monitoring of any change in the status of existing disease can be achieved by closely investigating an animal population. Furthermore, knowledge on the sources of disease and the risk of disease transmission can be determined so that effective disease control strategies can be implemented.

It can be suggested from this study that the disease has been known to become an endemic disease in our country. The reported risk factors enhancing the occurrence of PRRS are aerosol spread within 20km, via semen and live animals, animal products and by-products, equipment and personnel, vectors and so on (14). Not surprisingly, the animal movement like animal import near the pig farms was more likely to infection. Dogs, with the behaviour of bringing disposable carcass even with or without infection, were also noted as the associated risk factor for the disease. Like the findings from the developing countries in Asia, it was noted that sanitation, human and animal movement and management practice were the potential risk factor for the disease occurrence in Myanmar. It was also concluded that practicing good sanitation in the pig farm and younger age groups of 2-3 months old were less likely to become infected with the disease and the factors were figured as protective factors (15).

In this study, it was noted that the PRRS has now become endemic not only in the study area but also assumed to be endemic all over the country. The severity of the disease is not the very high introduction of the country compared with the previous study. That is the reason the farmer had no attention to the PRRS outbreak. Even though the identified risk factors were identified in this study, it means to be omit confounding factors because some association did not improve the association between the linkage and biological meaning. To give the proper recommendation to prevent the other outbreaks, very feasible recommendation and instruction should be introduced such as not allowing free-roaming and self-supported.

The present study somehow identified the potential risk factors of PRRS and the disease situation in Myanmar. However, these results are not very encouraging to shape the complete figure of the PRRS situation for the whole country. Another limitation of this study is that unable to identify the changes of disease situation over time is an unavoidable issue as the current study was cross-sectional study. In addition to this, underestimation or overestimation on the interpretation of results could be another factor. As a livestock production based study, confounding factors are the other unavoidable factor in the interpretation process. These results, therefore,

need to be interpreted with caution. In the future investigation, identification of the changes of the disease situation over time and prediction of future disease possibility were strongly recommended.

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