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A Retrospective Study of Q Fever for Epidemiological Aspects in Korea, 2006-2010

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This study focuses on a quantitative analysis of the retrospective study of Q fever for epidemiological aspects in Korea during the period from 2006 to 2010. There were a total of 64 cases with an average prevalence rate of 0.26 per 100,000 populations. Significantly more males were infected by Q fever than females (85.9% versus 14.1%) ($p<0.01$), and a higher incidence of Q fever were observed in those age more than 40 years old (71.9%) ($p<0.01$), and the occupations most infected were farmers (10.9%). Moreover, the seasonal pattern of outbreaks revealed that most outbreaks occurred in the early spring throughout the beginning of summer, and that significant more outbreaks occurred in the northwestern parts (42.2%) than other areas in the Korean peninsula ($p<0.01$). Furthermore, the number of cases of Q fever was significantly higher in rural areas (65.6%) than in urban (34.4%), ($p<0.01$). In conclusion, Q fever in Korea is a new emerging zoonosis, a serious concerned to the public health. Therefore, the development a health education system for Q fever prevention and improvement of the living environment will aid in reducing from animal reservoirs.

Key words: Q fever, epidemic aspects, risk factor, Korean.

Q fever (or Coxiellosis) is a zoonosis that occurs in most countries [10]. In humans, infection generally occurs through air-borne transmission from animal reservoirs, especially from domestic ruminants, but other domestic and wildlife animals can be involved. The causal agent is the rickettsia, *Coxiella burnetii*[2,10]. Q fever was first recognized as a human disease in Australia in 1935 and in the United States in the early 1940's [2]. In the case of Korea, the *C. burnetii* strain was first detected for isolation and cultivation from raw milk of dairy cows in 1993 [7,11]. Notwithstanding, the first reported case of Q fever in humans was in 2006 [7,9]. Therefore, Q fever was legally designated as a communicable disease prevention act (category IV) by the Korea Center for Disease Control and Prevention (KCDC) in 2006 [7]. Because Q fever is rarely a notifiable disease, the incidence of human Q fever cannot be assessed in most countries. Current epidemiological studies indicate, however, that Q fever should be considered public health problems in many countries, including France, United Kingdom, Italy, Spain, Germany, Israel, Greece and Canada, as well as in many countries where Q fever is prevalent but unrecognized because of poor surveillance of the disease[9]. However, recently, Q fever has been reported in almost every country, except New Zealand[3]. In Korea, there is a little information concerning the epidemiological

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aspects of *C. burnetii* infection in either animals or humans. A few cases of Q fever in humans have been reported[5,6,7].

Coxiella burnetii, the causative agent of Q fever, is of considerable concern to all us and the veterinary profession is deeply involved in and is playing a most important part for public health services studying it.

MATERIALS AND METHODS

It is our intention to study on the retrospective study of Q fever for epidemiological aspects related risk factors in Korea from 2006 to 2010 under the seven headings: prevalence rate (PR), epidemic aspects including cases related to gender, age, occupational risks distribution, and related risk factors such as the seasonality, geography and habitat of those who have Q fever.

In this present descriptive study, we investigated the epidemiological aspects and related risk factors of Q fever in Korea for a total of 64 cases of Q fever from 2006 to 2010. We utilized the raw data from the national notifiable disease surveillance system (website) of the Korea Center for Disease Control and Prevention (KCDC), 2006-2010[8] in the National Institute of Health (NIH), the Ministry of Health and Welfare, Republic of Korea.

In this study, the PR of Q fever cases per 100,000 populations was estimated by the criteria World Health Organization (WHO) established, and the upper and lower limits of the 95% confidence interval (CI) were calculated. Statistically significant differences between the epidemiological aspects and risk factors were determined using the Chi-square test or the paired *t*-test used, and the data analyses were carried out using the statistical systems of the software, Microsoft Excel 2007; and the results were considered to be statistically significant were set at $p<0.05$ and $P<0.01$.

RESULTS AND DISCUSSION

Once a neglected a zoonosis of Q fever for many years, Q fever is now ubiquitous in the Korean peninsula. In humans, *C. burnetii* infection may be asymptomatic, acute, or chronic. Acute Q fever may manifest as pneumonia, hepatitis, or both. Chronic Q fever is rare, with endocarditis being the most common complication[3,6,9]. As shown in Table 1, the epidemiological aspects of Q fever cases in Korea from 2006 to 2010 were analyzed by association with PR, cases of gender, age, and occupational risks of the individual. There were a total of 64 Q fever patients with an average PR each year of 0.26 (95% CI: 0.19-0.32) per 100,000 populations from 2006 to 2010. A case reported in Korea stated that the overall seroprevalence of *C. burnetii* in dairy cattle was 25.6% of the positive serum samples. By contrast, only 1.5% of healthy people in a rural area were seropositive[6]. However, it is not officially reported. In Korea, the number of Q fever cases were rapidly increased after the first official report in 2006; a total of 64 cases were reported between 2006 and 2010. Moreover, Q fever infection of humans usually occurs by inhalation of these organisms from air that contains airborne barnyard dust contaminated by dried placental, birth fluids, and excreta of infected animals[2,10]. Differences between male and female individuals in response to infectious diseases are an overlooked public health aspect. In the cases of Q fever in Korea, a significantly higher number of males was infected rate of 85.9% (55/64) than females of 14.1% (9/64), ($p<0.01$). These remarkable differences in gender distribution are believed to be due to differences between males and females in the items utilized in their jobs such as among livestock handling and works in the ranches and in the rural[1,2,7,10,11]. The distribution of Q fever cases by age was as follows: for the age groups of under 39 and over 40 years old the percentages were 28.1% (18/64) and 71.9% (46/64), respectively, and a higher incidence of Q fever was observed in those aged more than over 40 years old group, which clearly shows a significantly higher incidence of Q fever in the elderly ($p<0.01$). Thus the higher incidence of the cases of Q fever in the elderly groups of farmers and related various jobs may have been caused by increased risk of infection due to their engagements in the ranches doing activities for livestock works in the rural, which were person to Q fever outbreaks [1,2,6,7,10,11,12].

Moreover, in the case of Korea, there is a tendency for most young people to move to cities for work, whereas, the elderly people work a farming and livestock workers on their own land. The distribution of a total of 64 Q fever cases by occupational risk was as follows: farmers (10.9%), blue-collar jobs (7.8%), white-collar jobs (4.7%),

labors (7.8%), specialists (4.7%), students (1.6%), Jobless (3.1%), and others of various jobs (59.4%), respectively. These data also indicate that a high incidence of Q fever and thus, an increased risk for infection, occurs in farmers and related labors who reside or spend time near ranches and livestock rearing facilities[2,6,7].

Table 2 shows the epidemiological relative risk factors of Q fever cases that occurred in Korea between 2006 and 2010; these factors were analyzed by association with the seasonality, geography, and habitat of each individual. The estimation of the seasonal pattern of incidence rate in percentage of Q fever patients, in the order of spring, summer, autumn and winter were 31.3%, 25.0%, 18.9% and 25.0%, respectively. The cases occurred predominantly during January in mid-winter and June in the beginning of summer each year (68.8% total cases). Although cases of Q fever can occur during any month of the year, most cases report onset of patients during the early spring throughout the beginning of summer in Korea. These increases coincide with increasing in farming activity for the ranches, and with the birthing season for a number of domestic animal species[2,7,9,10]. A summary of incidence cases of Q fever that in relation to geography reveals that significantly more outbreaks occurred in the northwestern part (42.2%) than in other areas in the Korean peninsula ($p<0.01$). It was long believed that Q fever was most frequently reported in areas where the ranching are locally practiced may demonstrate increased incidence[2,6,7,10]. Moreover, the distribution of Q fever cases was significantly higher in rural areas (65.5%) than in urban areas (34.4%) ($p<0.01$).

Q fever is global in distribution with cases reported sporadically or occasionally outbreaks. However, because Q fever may resemble other diseases, be mild, or even cause no symptoms in some people, cases of human Q fever are likely under-recognized in the elsewhere. A reported case in the United States that around 3% of the healthy population and 10-20% of persons in high-risk occupations (veterinarians, farmers, etc.) have antibodies to *C. burnetii*, suggesting exposure (CDC.,2011). On other hand, a reported in Korea, the blood samples collected from 1,634 ruminants

Table 1. Epidemiological aspects of Q fever patients in Korea, 2006-2010

Item	No. of Cases (%)	95% CI#
Total No. of Patients	64	
Prevalence rate/100,000	0.26	0.19-0.32
Gender of patients		
Male	55 (85.9)**	77.4-94.4
Female	9 (14.1)	5.6-22.6
Total	64	
Age		
<39	18 (28.1)	17.1-39.1
>40	46 (71.9)**	60.9-82.1
Total	64	
Occupational risks		
Farmers	7 (10.9)	3.3-18.6
Blue-collar jobs	5 (7.8)	1.2-14.4
White-collar Jobs	3 (4.7)	-
Labors	5 (7.8)	6.57-14.4
Specialists	3 (4.7)	-
Students	1 (1.6)	-
Jobless	2 (3.1)	-
Other jobs	38 (59.4)	-
Total	64	

Remarks; Chi-square analysis indicated a significant difference from the total value.
*$p<0.05$, **$p<0.01$. # 95% CI: Confidence interval of 95% of rate.

were analyzed with CHEKIT Q fever ELISA kit. Thirteen of 1,000 (1.3%) cattle, 10 of 604 (1.7%) wapiti, and negative of 30 sika deer had antibodies agent *C. burnetii*. Moreover, the risk factors of Q fever infection in Korea, because some of the Koreans habitually consume raw meat and drink deer blood[4]. Therefore, Q fever is mainly concerned with the livestock ranches, and infection by unprotected contact was its major rout of transmission.

Finally, the most effective way of controlling Q fever is to reduce human exposure to infected livestock and their excrements. Moreover, safety measures such as commendation calls for a comprehensive preventive strategy against Q fever infection, including health education and promotion, and vaccination in the most endemic areas are required for public safety.

In conclusion, Q fever in Korea is a new emerging zoonosis, a serious concerned to the public health. This study provides a quantitative analysis of the epidemiological aspects and risk factors of Q fever in Korea to shed insight on how to more effectively plain future strategies. It is hoped that this information will be a useful reference in the further studies of Q fever for the public health service.

Table 2. Epidemiological aspects of Q fever patients in Korea, 2006-2010

Item	No. of Cases (%)	95% CI#
Total No. of Patients	64	
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Remarks; Chi-square analysis indicated a significant difference from the total value.
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