

ORIGINAL ARTICLE

Predictors of hepatitis A vaccine coverage among university students in Korea

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Abstract

Aim: To investigate the status of hepatitis A vaccination, knowledge, and health beliefs among university students in Korea and identify factors influencing their hepatitis A vaccination rate.

Methods: A self-reporting survey was conducted with 367 university students in Korea via descriptive survey. Data were collected on demographics, status of hepatitis A vaccination, knowledge, and health beliefs.

Results: The hepatitis A vaccination rate was 23.4%. The hepatitis A vaccination rate was significantly higher in those who had a general awareness about the hepatitis A (odds ratio [OR] = 3.56, $P = 0.003$), those with some overseas travel experience (OR = 2.64, $P = 0.025$), those perceiving the benefits of hepatitis A vaccination (OR = 1.66, $P = 0.023$), and those perceiving barriers (inversed) to hepatitis A vaccination (OR = 1.95, $P = 0.011$).

Conclusion: To promote hepatitis A vaccination among university students, information and education should be provided to improve their health beliefs. In addition, this demographic should be a major target population for hepatitis A vaccination. This study's results suggest that the development of national promotional campaigns and hepatitis A vaccination programs based on predictors of the vaccination rate are needed.

Key words: hepatitis A, knowledge, university, vaccination.

INTRODUCTION

Hepatitis A, a liver disease caused by the hepatitis A virus (HAV), shows an epidemical characteristic of presenting sporadic and cyclic recurrences across the world, with approximately 1.4 million new cases reported each year (World Health Organization, 2014). The HAV can survive for several months in an ordinary environment within its only natural host, humans, and is transmitted not only through the oral–fecal route but also through sexual intercourse (Korea Centers for Disease Control & Prevention, 2009; 2012; World Health Organization, 2014).

Because most people in Korea acquired asymptomatic natural immunity to the virus during their childhood in the mid-1990s, almost all Korean adults have natural immunity; as a result, hepatitis A has faded away from public consciousness. Recently, however, the Korean Center for Disease Control and Prevention reported increasing incidences of hepatitis A in the last decade, particularly among those in their 20s and 30s, with 79% of all reported cases belonging to these age groups (Heo *et al.*, 2013; Korea Centers for Disease Control & Prevention, 2009; 2012).

Hepatitis A vaccination is highly effective, showing an antibody seroconversion rate of 97–100% 4 weeks after the first vaccination and 100% immediately after the second vaccination. The use of this vaccine in Korea started in late 1997, but it is not yet included as part of the national immunization program. Accordingly, those individuals in their 20s and 30s born before 1997 who did not receive this vaccination and/or failed to acquire

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natural immunity from improvements in the general environment are likely to be at high risk of hepatitis A (Heo *et al.*, 2013; Korea Centers for Disease Control & Prevention, 2009). In the USA, hepatitis A vaccination has been part of a national immunization policy since 2006 (Advisory Committee on Immunization Practices, Fiore, Wasley, & Bell, 2006), but in Korea, it remains only a recommendation. The government recommends the vaccine for young children without antibodies against the HAV, high-risk adults, and those in their 20s and 30s without a vaccination or hepatitis A history, with a specification that those under 30 years should be vaccinated without an antibody test (Korea Centers for Disease Control & Prevention, 2009).

The rate of antibody possession for Koreans between 10 and 29 years of age is approximately 10%, with those between the ages of 21 and 30 years reporting 14%. In addition, 35% of all hepatitis A patients in Korea are university students (Korea Centers for Disease Control & Prevention, 2009). University life provides opportunities for students to become independent of their parents and manage their own lives and health. Schools and the armed services are typically collective and social in nature, exposing newly independent young adults to a spectrum of unhealthy lifestyles (Oh & Park, 2011). Hepatitis A occurs with severe symptoms, particularly in adults, and is a highly infectious disease requiring emergency medical care or hospitalization. Therefore, national education and publicity programs for hepatitis A prevention and vaccination are crucial for young individuals entering adulthood (Korea Centers for Disease Control & Prevention, 2009).

Health beliefs reflect an individual's personal beliefs that lead him or her to behave in a specific manner to prevent illness. These can be measured by perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, and cues to action (Rosenstock, 1974). Health beliefs affect attitudes and behaviors toward vaccination (Oh & Park, 2011; Rhodes & Hergenrath, 2003; Rosenstock, 1974), and have been verified to be an important predictor of hepatitis A vaccination (Oh & Park, 2011; Rhodes & Hergenrath, 2003).

Previous studies of hepatitis A in Korea have focused mainly on the antibody possession rate in the country or among individuals (Kim *et al.*, 2007; Lee *et al.*, 2009) or on the vaccination status and factors related to preventive health behaviors of middle school or university students (Heo *et al.*, 2013; Oh & Park, 2011). In other countries, studies have focused on the level of knowledge about hepatitis A, the level of immunity within a

group, and the viability of improving knowledge levels, suggesting that knowledge of the virus is a variable with a significant positive effect on the vaccination rate (Nyamathi *et al.*, 2010; Soto-Salgado *et al.*, 2011). Additional predictors verified to be significant variables include sociodemographic characteristics such as type of residence, family history, overseas travel experiences, and education (Heo *et al.*, 2013; Oh & Park, 2011; Seo *et al.*, 2013; Soto-Salgado *et al.*, 2011).

Accordingly, it is important to grasp the status of hepatitis A vaccination among Korean university students who tend to experience collective lifestyles and who show a high incidence of hepatitis A and a low antibody possession rate in comparison with their counterparts in other countries. It is especially necessary to survey their knowledge of hepatitis A and their health beliefs during the formation of health promotion habits, and to identify factors influencing their decisions on hepatitis A vaccination. This study provides a survey of university students concerning their hepatitis A vaccination rates, knowledge of hepatitis A, and health beliefs, and identifies factors influencing their choice to vaccinate. The results are expected to provide a foundation for developing promotional campaigns on hepatitis A prevention among university students and effective educational programs at the national level.

METHODS

Design and sample

This study utilized a descriptive survey to understand the status of hepatitis A vaccination among Korean university students in an urban area and to determine factors influencing their hepatitis A vaccination.

The subjects were selected by convenience sampling from natural and non-natural science college students at a university in Korea. The sample size for the logistic regression analysis was determined using G* Power version 3.1.3 (Faul, Erdfelder, Lang, & Buchner, 2007). The estimation of the sample size was based on health beliefs, one of the major variables among risk factors found to influence hepatitis A vaccination during a published work review and showing the lowest odds ratio (OR) (Oh & Park, 2011). At least 159 subjects are required when the OR is assumed to be 2.15; the significance level (*P*-value), 0.05; and the power, 0.95. Based on this and considering the vaccination rate, the questionnaire was distributed to 400 students, and 380 responses were obtained (95.0%). Those responses with

missing data were excluded, producing a total of 367 responses for the final analysis.

Measures

The measures included sex, age, majors, and type of residence as sociodemographic characteristics, all of which have been verified by previous studies of characteristics and risk factors of hepatitis A vaccination as being significant variables for vaccination (Heo *et al.*, 2013; Oh & Park, 2011; Seo *et al.*, 2013; Soto-Salgado *et al.*, 2011). In addition, seven items for factors related to hepatitis A vaccination were included HAV vaccination rate (Oh & Park, 2011; Seo *et al.*, 2013), general awareness about hepatitis A vaccination (Oh & Park, 2011), possession of a HAV antibody (Heo *et al.*, 2013; Oh & Park, 2011; Soto-Salgado *et al.*, 2011), family history of HAV infection and liver disease, overseas travel experiences (Oh & Park, 2011; Seo *et al.*, 2013), HAV education experiences (Oh & Park, 2011), and intention to get vaccinated for hepatitis A (Oh & Park, 2011; Seo *et al.*, 2013).

Health beliefs about hepatitis A vaccination were surveyed using a tool developed from the health belief model that was revised and supplemented by Oh and Park (2011). This tool focused on the health belief model's subfactors: perceived susceptibility, perceived severity, perceived benefits, and perceived barriers (Rosenstock, 1974); it was revised for the Korean sample and hepatitis A. The content validity of the revised inventory was tested by two nursing professors and one gastroenterologist. The tool consisted of 10 items, including two for perceived susceptibility (the possibility of HAV infection and the fear of HAV infection), two for perceived severity (psychological severity from diseases and the severity of effects of an aggravated disease on one's future), two for perceived benefits of vaccination (effectiveness in preventing HAV infection, essential requirement vaccination), and four for perceived barriers (the high cost of vaccination, side-effects of vaccination, the pain of vaccination, and the inconvenience of injections at two different intervals). Perceived barriers were measured as the inverse transform. Each item was measured using a 4 point Likert-type scale ranging from "strongly disagree" (1) to "strongly agree" (4); the higher the score, the stronger the health belief. Cronbach's alpha for overall health beliefs was 0.94; that for perceived susceptibility, 0.85; that for perceived severity, 0.84; that for perceived benefits, 0.90; and that for perceived barriers, 0.90.

The inventory for surveying knowledge of hepatitis A was developed by referencing the questionnaire in Oh

and Park (2011), who surveyed college students' knowledge of hepatitis A and recommendations of the Advisory Committee on Immunization Practices (Advisory Committee on Immunization Practices *et al.*, 2006; Oh & Park, 2011). The content validity of the developed inventory was tested by two nursing professors and one gastroenterologist. This inventory consisted of 16 items: three for characteristics of the HAV, four for the transmission route, three for symptoms of hepatitis A infection, two for diagnosis and treatment methods, and five for prevention and vaccination. For each item, the correct answer was assigned a value of 1, whereas the incorrect one was given a value of 0. Total scores ranged 0–16, with a higher the score reflecting a greater the knowledge base. The reliability of the inventory was measured using Cronbach's alpha (0.91).

Procedures/ethical considerations

The university departments were visited from November to December 2013, during which the research objectives were explained and the questionnaire was distributed. It was clarified that participation in the research was entirely voluntary, that no responses were required, and that personal data would not be used for any purpose other than the research objectives. When a respondent consented to participate in the study, he or she was asked to sign a written consent form attached to the front of the questionnaire and then complete it. The responses were collected by the researcher at the end of the survey session. Ethical approval to conduct the study was obtained from the ethics board of the authors' affiliated university.

Data analysis

Collected data were analyzed using SPSS version 21.0 for Windows (SPSS, Chicago, IL, USA). The status of hepatitis A vaccination and sociodemographic characteristics were analyzed using frequency and percentages. A comparison between the vaccinated and non-vaccinated groups was made through a bivariate simple logistic regression analysis using each explanatory variable, and the OR and its 95% confidence interval (CI) were calculated to determine predictors of hepatitis A vaccination. A multiple logistic regression analysis was conducted using the Enter method with variables showing a significant difference between the vaccinated and non-vaccinated groups as explanatory variables and with the presence of hepatitis A vaccination as a response variable. In the logistic regression analysis, the level of significance was 0.05, and the OR and its 95% CI were calculated for each factor.

RESULTS

Sociodemographic characteristics and hepatitis A vaccination-related characteristics

Among the 367 subjects, 73.3% were women, and the mean age was 19.45 ± 1.50 years. In addition, 73.3% of all respondents were natural science students. Further, 63.8% lived with their family members, 27.0% in dormitories, and 9.3% in boarding houses.

The hepatitis A vaccination rate was 23.4%, and 76.6% had a general awareness about the vaccination. In addition, 9.0% indicated they had a hepatitis A antibody, while 79.0% answered that they did not know. Further, 1.4% reported a family history of hepatitis A infection, 7.9% reported a family history of other liver-related diseases, 7.9% had some overseas travel experience, and 95.1% had no HAV education. Among non-vaccinated students, 89.3% intended to get vaccinated in the near future.

The mean score for overall health beliefs about hepatitis A was 2.37 ± 0.25 (range, 1–4), that for perceived susceptibility to HAV infection was 1.65 ± 0.59 , that for the perceived severity of HAV infection was 2.28 ± 0.65 , that for perceived benefits of hepatitis A vaccination was 2.79 ± 0.64 , and that for perceived barriers to hepatitis A vaccination was 2.57 ± 0.54 . The mean score for knowledge of hepatitis A was 0.31 ± 0.30 (range, 0–1) (Table 1).

Comparison between vaccinated and non-vaccinated groups

The hepatitis A vaccination rate was higher in men than in women ($OR = 1.80$, $P = 0.026$) and higher in those who had heard about hepatitis A than those who had not ($OR = 4.41$, $P < 0.001$). In addition, the vaccination rate was higher in those with some overseas travel experience than in those without ($OR = 2.54$, $P < 0.001$), those perceiving benefits of hepatitis A vaccination ($OR = 1.73$, $P = 0.009$), those perceiving barriers (inversed) to vaccination ($OR = 1.79$, $P = 0.011$), and those with a knowledge of hepatitis A ($OR = 3.26$, $P = 0.004$) (Table 2).

Predictors of hepatitis A vaccination

To find predictors of hepatitis A vaccination, a multiple logistic regression analysis was conducted using significant factors (sex, general awareness of hepatitis A, overseas travel experiences, perceived benefits of hepatitis A vaccination, perceived barriers to hepatitis A vaccination, and knowledge about hepatitis A) for a comparison

between the vaccinated ($n = 86$) and non-vaccinated ($n = 381$) groups as independent variables. According to the results, the hepatitis A vaccination rate was higher in those aware of the HAV than those not ($OR = 3.56$, $P = 0.003$), those with some overseas travel experience ($OR = 2.64$, $P = 0.025$), those perceiving benefits of hepatitis A vaccination ($OR = 1.66$, $P = 0.023$), and those perceiving barriers (inversed) to hepatitis A vaccination ($OR = 1.95$, $P = 0.011$) (Table 3).

DISCUSSION

According to the self-reported data, 9.0% of all respondents between the ages of 17 and 26 years (average, 19) had a HAV antibody. According to a 2009 national survey of young individuals in Korea between the ages of 10 and 19 years, their antibody possession rate was approximately 10% (Korea Centers for Disease Control & Prevention, 2009). Because this is consistent with the rate found in this study, the results of this study were considered reliable, although the respondents were selected by convenience sampling. However, a large majority (79%) of the respondents did not know whether they had any hepatitis A antibody. Therefore, the antibody possession rate may increase through an accurate antibody test. Nevertheless, the possession rate did not show a noticeable increase after 4 years, suggesting weak immunity to the HAV among young individuals between the ages of 10 and 29 years.

The hepatitis A vaccination rate was 23.4%, which is much higher than that in a previous study of students from a specific region of Korea (10.5%), but because 50% of the respondents were unsure of their vaccination status, an accurate comparison between these two rates is difficult (Oh & Park, 2011). Use of the hepatitis A vaccine began in late 1997 but was not part of the national immunization program and therefore not financially supported by the Korean government. Accordingly, those 16 years of age or older who were born earlier than 1997 and those in their 20s and 30s who failed to acquire natural immunity from improved environmental conditions can be considered high-risk groups for hepatitis A infection; in consideration of these statistics, it is unsurprising that 35% of hepatitis A patients in Korea have been reported to be university students (Heo *et al.*, 2013; Korea Centers for Disease Control & Prevention, 2009; 2012; Lee *et al.*, 2009). In the USA, the hepatitis A vaccine has been administered to all eligible children since 2006, 11 years after the effectiveness of the vaccine was verified. As a result, the incidence of hepatitis A in the USA has decreased to its

Table 1 Sociodemographic and hepatitis A vaccination characteristics ($n = 367$)

Characteristics	Categories	N (%)
Sociodemographic characteristics		
Sex	Female	269 (73.3)
	Male	98 (26.7)
Age in years, mean \pm SD (range)	19.45 \pm 1.50 (17.00–26.00)	
Major	Natural science	269 (73.3)
	Non-natural science	98 (26.7)
Types of residence	Boarding house	34 (9.3)
	Living with family	234 (63.8)
	Dormitory	99 (27.0)
Hepatitis A vaccination-related characteristics		
Hepatitis A vaccination	No	281 (76.6)
	Yes	86 (23.4)
Awareness of hepatitis A	No	86 (23.4)
	Yes	281 (76.6)
Possession of the HAV antibody	No	44 (12.0)
	Yes	33 (9.0)
	Do not know	290 (79.0)
Family history of HAV infection	No	362 (98.6)
	Yes	5 (1.4)
Family history of hepatic disease	No	338 (92.1)
	Yes	29 (7.9)
Overseas travel experience	No	338 (92.1)
	Yes	29 (7.9)
HAV education experience	No	349 (95.1)
	Yes	18 (4.9)
Intention to have hepatitis A vaccination [†]	No	30 (10.7)
	Yes	251 (89.3)
Related factors		
Health beliefs related to hepatitis A (mean \pm SD, range)	2.37 \pm 0.25 (1–4)	
Perceived susceptibility to HAV infection (mean \pm SD, range)	1.65 \pm 0.59 (1–4)	
Perceived severity of HAV infection (mean \pm SD, range)	2.28 \pm 0.65 (1–4)	
Perceived benefits of hepatitis A vaccination (mean \pm SD, range)	2.79 \pm 0.64 (1–4)	
Perceived barriers to hepatitis A vaccination (mean \pm SD, range) [‡]	2.57 \pm 0.54 (1–4)	
Knowledge about hepatitis A (mean \pm SD, range)	0.31 \pm 0.30 (0–1)	

[†]The case of no hepatitis A vaccination experience. [‡]Inverse transform. HAV, hepatitis A virus; SD, standard deviation.

lowest level in the history of the country (Daniels, Grytdal, Wasley, & Centers for Disease Control and Prevention, 2009). To reach a similar level in Korea, it is necessary to select groups with low HAV immunity first and make strategic efforts to give them vaccination and financial support (Jacobs, Saab, & Meyerhoff, 2003).

Most of the respondents had never heard of hepatitis A (76.6%) or received HAV-related education (95.1%), making it necessary to provide hepatitis A education to college students, who generally are self-managing their health for the first time. Along with low levels of education, the respondents' score for knowledge was 0.31 ± 0.30 (31/100), which is lower than that reported for Turkish nursing students (71%) and Puerto Rican

adults (43.5%), suggesting a low level of HAV knowledge among Korean college students (Soto-Salgado *et al.*, 2011; Yamazhan *et al.*, 2011). Such differences may come from characteristics of the respondents or the country. According to the results of the bivariate analysis, the vaccination rate was 3.26 times higher for those respondents who demonstrated a knowledge of hepatitis A, but the logistic regression results did not support knowledge as a significant predictor. Nevertheless, because disease knowledge sometimes affects health behaviors directly related to disease prevention and management (Soto-Salgado *et al.*, 2011), efforts should be made to improve basic knowledge of hepatitis A to increase vaccination rates.

Table 2 Comparison of vaccinated and non-vaccinated groups based on a simple logistic regression analysis ($n = 367$)

	Vaccination	Non-vaccination		
Variables	N (%)	N (%)	OR (95% CI)	P
Sociodemographic characteristics				
Sex				
Female	55 (64.0)	214 (76.2)	1.00 (reference)	
Male	31 (36.1)	67 (23.8)	1.80 (1.07–3.02)	0.026
Age (in years)	19.4 ± 1.5	19.5 ± 1.5	0.97 (0.82–1.14)	0.701
Major				
Natural science	65 (75.6)	204 (72.6)	1.00 (reference)	
Non-natural science	21 (24.4)	77 (27.4)	1.17 (0.70–2.04)	0.574
Type of residence				
Boarding house	21 (24.4)	78 (27.8)	1.00 (reference)	
Living with family members	56 (65.1)	178 (63.3)	1.08 (0.65–1.79)	0.765
Dormitory	9 (10.5)	25 (8.9)	1.20 (0.54–2.64)	0.661
Hepatitis A vaccination characteristics				
Awareness of hepatitis A				
No	7 (8.1)	79 (28.1)	1.00 (reference)	
Yes	79 (91.9)	202 (71.9)	4.41 (1.95–9.98)	<0.001
Family history of hepatitis A infection				
No	85 (98.8)	277 (98.6)	1.00 (reference)	
Yes	1 (1.2)	4 (1.4)	0.82 (0.09–7.39)	0.855
Family history of hepatic disease				
No	78 (90.7)	260 (92.5)	1.00 (reference)	
Yes	8 (9.3)	21 (7.5)	1.27 (0.54–2.98)	0.583
Overseas travel experience				
No	72 (83.7)	266 (94.7)	1.00 (reference)	
Yes	14 (16.3)	15 (5.3)	3.45 (1.59–7.47)	0.002
Hepatitis A education experience				
No	79 (91.9)	270 (96.1)	1.00 (reference)	
Yes	7 (8.1)	11 (3.9)	2.18 (0.82–5.80)	0.120
Related factors				
Health beliefs related to hepatitis A	2.39 ± 0.31	2.29 ± 0.30		
Perceived susceptibility to HAV infection	1.61 ± 0.57	1.67 ± 0.59	0.83 (0.55–0.26)	0.385
Perceived severity of HAV infection	2.39 ± 0.66	2.25 ± 0.64	1.40 (0.96–2.04)	0.077
Perceived benefits of hepatitis A vaccination	2.95 ± 0.66	2.74 ± 0.63	1.73 (1.15–2.60)	0.009
Perceived barriers to hepatitis A vaccination [†]	2.70 ± 0.51	2.53 ± 0.55	1.79 (1.14–2.80)	0.011
Knowledge about hepatitis A	0.39 ± 0.30	0.29 ± 0.29	3.26 (1.46–7.30)	0.004

[†]Inverse transform. CI, confidence interval; HAV, hepatitis A virus; OR, odds ratio.

The mean score for health beliefs when considering hepatitis A was 2.37 ± 0.25 (59/100), and perceived benefits of and barriers (inversed) to hepatitis A vaccination were significant predictors of the vaccination rate based on both bivariate and logistic regression analysis results. This is consistent with the findings of previous studies that suggest health beliefs as a significant predictor of vaccination (Oh & Park, 2011; Rhodes & Hergenrath, 2003). In an analysis of predictors of hepatitis A vaccination among Korean children, previous research found the mother's health beliefs to be a significant variable (OR = 2.15, CI = 1.34–3.36) with a

mean score of 67 of 100 (Oh & Park, 2011), and other studies have reported a relationship between homosexual men's HAV vaccination and their health beliefs (Rhodes & Hergenrath, 2003). Accordingly, improvements in perceived benefits and barriers are expected to increase hepatitis A vaccination rates. Therefore, there should be strategic approaches to increasing perceived susceptibility, severity, and benefits, and reducing perceived barriers for subfactors of health beliefs (Rhodes & Hergenrath, 2003).

In addition to knowledge and perceived benefits and barriers, significant differences in sex, prior awareness of

Table 3 Factors influencing HAV vaccination based on a multiple logistic regression analysis ($n = 367$)

Variables	OR (95% CI)	P
Sex (male = 1)	1.69 (0.96–2.99)	0.070
Awareness of hepatitis A (yes = 1)	3.56 (1.53–8.32)	0.003
Overseas travel experience (yes = 1)	2.64 (1.13–6.14)	0.025
Perceived benefits of hepatitis A vaccination	1.66 (1.07–2.67)	0.023
Perceived barriers to hepatitis A vaccination [†]	1.95 (1.16–3.25)	0.011
Knowledge about hepatitis A	1.98 (0.82–4.80)	0.129

[†]Inverse transform. CI, confidence interval; HAV, hepatitis A virus; OR, odds ratio.

hepatitis A, and overseas travel experiences were observed between the vaccinated and non-vaccinated groups. In fact, the incidence of hepatitis A vaccination was higher in those respondents with a family history of hepatitis A (OR = 6.32) and those with some overseas travel experience (OR = 19.93) (Seo *et al.*, 2013), providing partial support for the results of this study. The difference between men and women is consistent with the findings of a study considering the vaccination rate in Koreans according to sex, in which the hepatitis A vaccination rate for high school students between the ages of 14 and 17 years was higher in males ($P = 0.013$) (Heo *et al.*, 2013), and with those of another study showing the antibody possession rate for all age groups to be higher in males (Cho & Kim, 2013). The results suggest a need for differentiated strategies to increase the hepatitis A vaccination rate among women. This study has a limitation in that the number of males was relatively small in comparison with that of females. Therefore, future research should consider sex of participants.

In the logistic regression analysis of predictors of hepatitis A vaccination, the hepatitis A vaccination rate was significantly higher in those with prior general awareness about the hepatitis A vaccination, those with some overseas travel experience, those perceiving benefits of hepatitis A vaccination, and those perceiving barriers (inversed) to HAV vaccination. In addition, prior general awareness about the hepatitis A vaccination was a significant predictor of HAV vaccination, suggesting a need for staged strategies for systematic campaigns to improve awareness of the disease.

To find factors influencing hepatitis A vaccination, knowledge levels and health beliefs as well as sociodemographic variables were considered, and according to the results, health beliefs were a particularly significant predictor. Because university students are beginning to

self-manage their lives and health while entering a collective living environment within military or dormitory systems, they require improved health beliefs about disease prevention (Oh & Park, 2011).

Due to modern Korea's national characteristics, university students are currently experiencing a relatively high incidence of hepatitis A infection and reporting a low rate of antibody possession. Accordingly, university students are a major target population for hepatitis A vaccination (Jacobs *et al.*, 2003). This suggests a need for the development of national vaccination programs and general HAV awareness and education based on all predictors of the vaccination rate and directed at this population.

LIMITATIONS

This study has some limitations. First, the survey relied on self-reported data instead of a blind review of vaccination records; future research should include a confirmation process requiring an immunoassay test (Chen & Cantrell, 2006). Second, the respondents were university students from a specific area. Future research should expand the area for a larger sample and include equal numbers of male and female respondents.

CONCLUSIONS

This study examines the status of hepatitis A vaccination among university students, a population with a high incidence of hepatitis A infection and a low antibody possession rate because of its characteristics. The study also identifies factors influencing the vaccination rate.

The hepatitis A vaccination rate for the respondents was 23.4%, the antibody possession rate 9.0%, the mean score for health beliefs 2.37 (range, 1–4), and the mean score for knowledge 0.31 (range, 0–1). According to the logistic regression analysis, the following factors improved the vaccination rate: prior awareness of the HAV, overseas travel experiences, perceiving benefits of hepatitis A vaccination, and perceived barriers to hepatitis A vaccination.

These results suggest a need for developing strategies to effectively increase the hepatitis A vaccination rate in Korea and help them improve their health beliefs about hepatitis A vaccination. Because hepatitis A vaccination is currently excluded from the national immunization program, there is a need to develop and apply systematic awareness and education programs to increase people's recognition of the infection.

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DISCLOSURE

No conflict of interest has been declared by the authors.

AUTHOR CONTRIBUTIONS

J. S. C. designed the study, analyzed the data and interpreted the findings, and drafted and submitted the manuscript. S. M. P. supervised the study, conducted individual interviews, and interpreted the findings, and provided guidance.

REFERENCES

- Advisory Committee on Immunization Practices, Fiore, A. E., Wasley, A. & Bell, B. P. (2006). Prevention of Hepatitis A through active or passive immunization: Recommendations of the Advisory Committee on Immunization Practices. *Morbidity and Mortality Weekly Report Recommendations and Reports*, 55 (RR-7), 1–23.
- Chen, H. & Cantrell, C. R. (2006). Prevalence and factors associated with self-reported vaccination rates among US adults at high risk of vaccine-preventable hepatitis. *Current Medical Research and Opinion*, 22, 2489–2496.
- Cho, S. E. & Kim, Y. D. (2013). Seroepidemiology of hepatitis A in South Korea: A nationwide study by the Eone reference laboratory. *Journal of Epidemiology*, 23, 270–274.
- Daniels, D., Grytdal, S., Wasley, A. & Centers for Disease Control and Prevention. (2009). Surveillance for acute viral hepatitis – United States, 2007. *Morbidity and Mortality Weekly Report. Surveillance Summaries*, 58, 1–27.
- Faul, F., Erdfelder, E., Lang, A.-G. & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39, 175–191.
- Heo, J. Y., Song, J. Y., Noh, J. Y., Seo, Y. B., Kim, I. S., Choi, W. S. *et al.* (2013). Low level of immunity against hepatitis A among Korean adolescents: Vaccination rate and related factors. *American Journal of Infection Control*, 41, e97–e100.
- Jacobs, R. J., Saab, S. & Meyerhoff, A. S. (2003). The cost effectiveness of hepatitis immunization for US college students. *Journal of American College Health*, 51, 227–236.
- Kim, D. H., Park, K. J., Kim, S. H., Cho, S. B., Lee, W. S., Park, C. H. *et al.* (2007). Clinical characteristics of patients with acute hepatitis A in Gwangju-Chonnam province for recent 10 years. *The Korean Journal of Medicine*, 72, 131–137.
- Korea Centers for Disease Control & Prevention. (2009). Management and prevention guidelines of hepatitis A. [Cited 3 Apr 2012.] Available from URL: <http://www.mw.go.kr/front/index.jsp>
- Korea Centers for Disease Control & Prevention. (2012). Hepatitis A. [Cited 18 Aug 2012.] Available from URL: <http://www.cdc.go.kr/CDC/contents/CdcKrContentView.jsp?menuIds=HOME001-MNU1132-MNU1147-MNU0746-MNU0750&cid=18008>
- Lee, A., Lim, H. S., Nam, C. M., Song, S. M., Yoon, H. R. & Lee, K. R. (2009). An epidemiology analysis of hepatitis A virus serologic markers during the recent four years in Korea. *Korean Journal of Laboratory Medicine*, 29, 563–569.
- Nyamathi, A., Tyler, D., Sinha, K., Marfisee, M., Cohen, A. & Greengold, B. (2010). Predictors of hepatitis knowledge improvement among methadone maintained clients enrolled in a hepatitis intervention program. *Journal of Community Health*, 35, 423–432.
- Oh, H. Y. & Park, J. Y. (2011). Immunization, knowledge, and preventive health behaviors to hepatitis A in university students. *Korean Journal of Health Education and Promotion*, 28, 83–95.
- Rhodes, S. D. & Hergenrather, K. C. (2003). Using an integrated approach to understand vaccination behavior among young men who have sex with men: Stages of change, the health belief model, and self-efficacy. *Journal of Community Health*, 28, 347–362.
- Rosenstock, I. M. (1974). Historical origins of the health belief model. *Health Education Monographs*, 2, 328–335.
- Seo, J. Y., Choi, B. Y., Ki, M., Jang, H. L., Park, H. S., Son, H. J. *et al.* (2013). Risk factors for acute hepatitis A infection in Korea in 2007 and 2009: A case-control study. *Journal of Korean Medical Science*, 28, 908–914.
- Soto-Salgado, M., Suárez, E., Ortiz, A. P., Adrovet, S., Marrero, E., Meléndez, M. *et al.* (2011). Knowledge of viral hepatitis among Puerto Rican adults: Implications for prevention. *Journal of Community Health*, 36, 565–573.
- World Health Organization. (2014). Hepatitis A. [Cited 24 Mar 2014.] Available from URL: <http://www.who.int/csr/disease/hepatitis/whocdscsredc2007/en/index4.html#worldwide>
- Yamazhan, T., Durusoy, R., Tasbakan, M. I., Tokem, Y., Pullukcu, H., Sipahi, O. R. *et al.* (2011). Nursing students' immunisation status and knowledge about viral hepatitis in Turkey: A multi-centre cross-sectional study. *International Nursing Review*, 58, 181–185.