

Influenza Vaccination Coverage and Its Associated Factors among North Korean Defectors Living in the Republic of Korea

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This study aimed to examine influenza vaccination coverage of North Korean defectors (NKD) in the Republic of Korea (Korea) and explore the factors affected the vaccination coverage. Total 378 NKD were analyzed. Four Korean control subjects were randomly matched by age and gender from the Korea National Health and Nutrition Examination Survey V (n = 1,500). The adjusted vaccination coverage revealed no statistical difference between the defectors group and indigenous group (29.1% vs. 29.5%, $P = 0.915$). In the aged under 50 group, the vaccination coverage of NKD was higher than that of Korean natives (37.8% vs. 25.8%, $P = 0.016$). However in the aged 50 yr and over group, the vaccination coverage of North Korean defectors was lower than that of the natives (28.0% vs. 37.6%, $P = 0.189$). Even the gap was wider in the aged 65 yr and over group (36.4% vs. 77.8%, $P = 0.007$). Gender and medical check-up experience within 2 yr showed association with the vaccination coverage of NKD. Influenza vaccination coverage of aged defectors' group (aged 50 yr and over) was lower than indigenous people though overall vaccination coverage was similar. Further efforts to increase influenza vaccination coverage of this group are needed.

Keywords: Refugees; Influenza, Human; Vaccination; Korea; Healthcare Disparities

INTRODUCTION

After the fall of communism in Eastern Europe in the late 1980s and dissolution of the Soviet Union in 1991, North Korea had economic difficulties. Add to that, there was a great flood in 1995 and it caused the Great Famine that is called 'March of hardship'. Millions people died from starvation or hunger-related illness during the period (1). Since then many North Koreans escaped to the Republic of Korea (Korea). Because it is impossible to across the border between North Korea and the Republic of Korea, they pass through or illegally stay in other countries such as China, Thailand, and Laos before entering into Korea. Despite of these difficulties, the number of North Korean defectors has increased steadily and about 27,000 people (about 0.05% of Korean population) had settled in Korea by June, 2014 (2).

North Korean defectors experienced many health problems such as insufficient nutrition, trauma, and being exposed to infectious diseases when they lived in North Korea and other countries. It made their physical and mental health condition worse and the health problems have given them a hard time in settling in Korea (3, 4). Immediately after entering Korea, the defectors

get medical examinations and treatments for confirmed diseases. Following the medical screening, all the defectors are admitted to designated accommodations that are run by the Korean Government. There they undergo identity investigations and education about Korean society for a certain period. During this period, they can receive free medical services and have essential health education to understand the health system and assist their use of health service in Korea. For the children and adolescents under 20 yr, catch-up vaccinations are provided according to individual's age. The defectors can receive financial and medical support according to 'Medical Care Assistance Act' up to the first 5 yr. Despite the support, however, it is known the defectors still experience difficulties in adjusting to Korean health system and managing their health problems (5).

As emphasized at Sixty-first World Health Assembly in 2008, promoting migrant-sensitive health policies is important to provide appropriate health care for migrants and improve their health (6). It is because health of each migrant affects not only quality of individual life but also health status of their new communities. In this aspect, communicable diseases should be considered as one of the most important health problems of migrant

health care since its influence on communities have greater impacts compared to non-communicable diseases. As North Korean defectors account for considerable part of Korea community, there were several studies of them regarding mental health, however little is known about the unmet need for communicable diseases of the defectors. Therefore we chose influenza as it is one of the most important communicable diseases (3, 4).

Seasonal influenza is known as a vaccine-preventable viral disease. It usually causes mild and self-limited illness, but it also has high potential to cause high morbidity and mortality especially in the high risk groups such as the very young, the elderly and persons with underlying chronic health conditions (7, 8). It affects 5%-30% of the population globally and is associated with 500,000 deaths per year worldwide (9, 10). As these deaths could be prevented with using of existing safe and highly effective vaccines, especially in people at high risk, World Health Organization (WHO) recommended to increase influenza vaccination coverage of the elderly and persons with underlying diseases of at least 75% by 2010 (11). Since 2012, Korea Centers for Disease Control and Prevention (KCDC) has recommended influenza vaccination as high priority for all adults aged over 50 yr, individuals under this age with specific chronic conditions, and people in special conditions (health care workers, pregnant women) (12). In Korea, people can get influenza vaccination at hospitals and public health centers. At the moment of our investigation, the elderly (aged 65 yr and over) and chronic disease patients could get vaccination free of charge at public health centers. Some public health centers provided influenza vaccine to vulnerable groups such as North Korean defectors, beneficiaries of the National Basic Livelihood, and men of national merit, regardless of their age.

The first object of our study was to identify the self-reported influenza vaccination coverage of North Korean defectors, and compare with Korean natives' through the fifth Korean National Health and Nutrition Examination Survey (KNHANES V). The second aim was to identify factors associated with the coverage of vaccination to improve them and promotes health status of North Korean defectors.

This is the first report about influenza vaccination coverage and the related factors influencing the vaccination of North Korean defectors.

MATERIALS AND METHODS

Materials

This study has used a case control study design to compare influenza vaccination coverage in North Korean defectors and Korean natives, and a cross-sectional analysis of the North Korean defectors to identify predictors of the vaccination coverage. The data were a part of a survey that was performed by North

Korean Refugees Foundation to study actual condition of North Korean defectors who had settled in Korea. We were provided this data after deleting personal information from the Foundation. The survey was conducted from August through December, 2012. There were about 24,000 North Korean defectors in Korea at that moment, and they selected 430 people by snow-ball sampling technique with considering sex and age structure of the population. Among them, 409 people answered but 20 respondents who were under 19 yr old and 11 respondents who incompletely answered the questionnaire were excluded. Thus, 378 participants were analyzed in this research. The surveyors met each subject and explained the purpose of the study and received the consent form from each survey. The subjects filled out the questionnaire personally, with the assist from the surveyors.

Through the survey, the following information was collected: age, gender, marital status, education level in North Korea, duration of stay in other countries (the period from escaping North Korea to entering Korea), number of escape attempts, duration after the entry into Korea, medical check-up experience within 2 yr. To investigate self-reported influenza vaccination coverage, we adopted the question from KNHANES V: "Did you get an influenza vaccination during last year?" Respondents of the survey answered the question based on their memory. There were three options for answering the question: 'yes', 'no' or 'don't know' and we treated 'don't know' as a missing value when we analyze the vaccination coverage proportion.

To compare the coverage of influenza vaccination with Korean natives, we selected controls from KNHANES V samples. The KNHANES started in 1998 and the survey was conducted five times. The KNHANES V that we used started in 2010 and was completed in 2012. A stratified multi-stage clustered probability design was done to select a representative sample of civilian, non-institutionalized Korean adults age 19 yr and over (13). The surveys were reported each year and we used the data from 2012 that was performed at the same period of the survey of North Korean defectors were carried out. Four control subjects with the same gender and age were matched to each North Korean defector, and total of 1,500 control subjects were enrolled.

Statistical analysis

STATA 12.1 (StataCorp, College Station, TX, USA) was used to perform control sampling, data extraction and analysis. Firstly, we calculated and compared the adjusted proportion of influenza vaccination according to their native country (North Korean defectors and Korean natives). And we divided subjects into two groups by age: '19-49', '50 and over', then we analyzed the adjusted vaccination coverage and assessed the difference according to age group between two groups. Secondly, univariate logistic regression analyses and multivariate logistic regression analyses were conducted to determine which variables

were significantly associated with influenza vaccination coverage. In multivariate analysis, each variable was adjusted for variables with $P < 0.100$ in univariate analyses. P values less than 0.05 were considered significant and 95 percent confidence intervals (CI) were calculated to show the strength of association.

Ethics statement

The institutional review board at the Seoul National University Hospital exempted review of this data since it was a secondary analysis of de-identified data (IRB No. 1503-019-654).

RESULTS

Demographic and health-related characteristics

Table 1 shows the demographic and health-related characteristics of the study population. The mean age of the North Korean defectors was 40.3 yr (SD = 10.8) with 25.1% of men and 74.9% of women. The marital status and the education level were significantly different between the defectors group and Korean natives group ($P < 0.001$).

Table 1. Demographic and health-related characteristics of North Korean defectors and age, sex matched Korean natives

Characteristic	North Korean defectors, No. (%) (n = 378)	Korean natives, No. (%) (n = 1,500)	P value
Age, yr, mean \pm SD	40.3 \pm 10.8	40.3 \pm 10.9	0.9967
19-29	61 (16.1)	244 (16.3)	
30-39	120 (31.8)	476 (31.7)	
40-49	127 (33.6)	500 (33.3)	
50-59	47 (12.4)	188 (12.5)	
≥ 60	23 (6.1)	92 (6.1)	
Gender			1.000
Men	95 (25.1)	380 (25.3)	
Women	283 (74.9)	1,120 (74.7)	
Marital status			< 0.001
Married or Living together	198 (53.4)	1,097 (73.4)	
Single	173 (46.6)	398 (26.6)	
Education			< 0.001
< High school	288 (77.8)	180 (13.3)	
\geq High school	82 (22.2)	1,173 (86.7)	
Duration of stay abroad (yr)			
< 1	123 (33.0)	NA	
1-3	132 (35.4)	NA	
4-6	84 (22.5)	NA	
≥ 7	34 (9.1)	NA	
Escape attempts (No.)			
1	275 (80.2)	NA	
≥ 2	68 (19.8)	NA	
Duration after entrance (yr)			
≤ 2	67 (18.2)	NA	
3-5	134 (36.4)	NA	
6-8	110 (29.8)	NA	
≥ 9	57 (15.5)	NA	
Medical check-up (within 2 yr)			0.099
Yes	150 (60.7)	745 (55.1)	
No	97 (39.3)	608 (45.0)	

NA, not applicable.

Adjusted influenza vaccination coverage between North Korean defectors and Korean controls

After adjustment for education level and marriage status, the influenza vaccination coverage showed no statistically significant difference between North Korean defectors and Korean natives (29.1% vs. 29.5%, $P = 0.915$). The predominance was different, however, by different age group. In the younger age group (aged 19 to 49 yr), the defectors reported higher vaccination coverage than Korean natives (37.8% vs. 25.8%, $P = 0.016$). However, in the older age group (aged 50 yr and over), the vaccination coverage of North Korean defectors was notably lower than that of the natives (28.0% vs. 37.6%, $P = 0.189$) (Fig. 1). We performed a sensitivity analysis for this age group. In aged 50 to 64 group, the vaccination coverage of the defectors and the control group were 27.5% and 29.3% respectively ($P = 0.800$), and in aged 65 yr and over group, the trend became more distinctive (36.4% vs. 77.8%, $P = 0.007$). When we treated respondents who answered 'don't know' as who did not have vaccination, trends of statistical results were same but attenuated (data not shown).

Factors associated with influenza vaccination coverage in North Korean defectors and Korean natives

Female North Korean defectors recorded higher influenza vaccination coverage than that of male (OR, 2.42; 95% CI; 1.30-4.49). The defectors who had not got medical check-up within 2 yr were less likely to receive influenza vaccination (OR, 0.51; 95% CI; 0.27-0.97). On the contrary to Korean control group, marital status did not affect the vaccination coverage of the defectors group. And factors related with escape and settlement were not associated with the vaccination coverage. In multivariate logistic regression analysis, adjusted for gender and history of medical check-up within 2 yr, the vaccination coverage among the

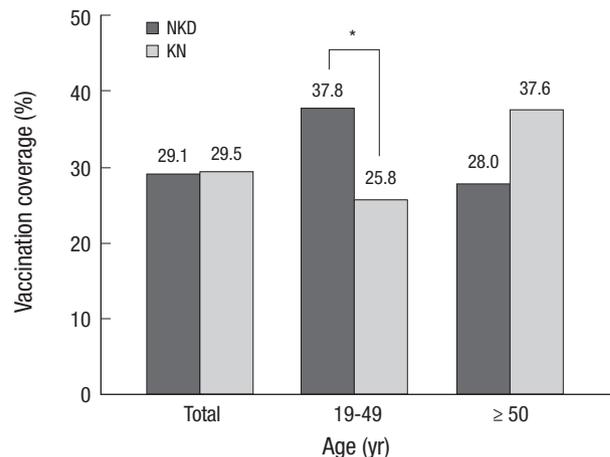


Fig. 1. Adjusted proportion for influenza vaccination of NKD in the Republic of Korea and age, sex matched KN. The vaccination coverage of aged group 19 to 49 yr is higher in NKD, however in the older group, NKD shows lower vaccination coverage. * $P < 0.001$. NKD, North Korean defectors; KN, Korean natives.

Table 2. Variables associated with influenza vaccination coverage of North Korean defectors and age, sex matched Korean natives in univariate and multivariate analyses

Variables	North Korean defectors		Korean natives	
	OR (95% CI)	Adjusted OR (95% CI)*	OR (95% CI)	Adjusted OR (95% CI)†
Gender				
Male				
Female	2.42 (1.30-4.49) [‡]	2.57 (1.22-5.44) [‡]	1.32 (0.99-1.75)	1.29 (0.96-1.73)
Age (yr)				
< 50				
50-64	0.76 (0.39-1.48)	0.46 (0.16-1.32)	1.13 (0.82-1.57)	0.96 (0.66-1.41)
≥ 65	1.15 (0.33-4.03)	1.20 (0.25-5.66)	9.59 (4.69-19.62) [‡]	8.37 (3.81-18.40) [‡]
Marital status				
Married or living together				
Single	1.13 (0.70-1.80)	0.81 (0.43-1.52)	0.63 (0.48-0.84) [‡]	0.66 (0.49-0.88) [‡]
Education				
< High school				
≥ High school	1.02 (0.59-1.77)	1.79 (0.91-3.53)	0.56 (0.40-0.77) [‡]	0.90 (0.59-1.37)
Medical check-up (within 2 yr)				
Yes				
No	0.51 (0.27-0.97) [‡]	0.61 (0.31-1.17)	0.70 (0.55-0.89) [‡]	0.75 (0.58-0.96) [‡]
Escape attempts (No.)				
1				
≥ 2	1.16 (0.63-2.15)	1.60 (0.77-3.35)	NA	NA
Duration of stay abroad (yr)				
< 1				
≥ 2	0.94 (0.57-1.56)	1.00 (0.52-1.93)	NA	NA
Duration after entrance (yr)				
≤ 5				
> 5	0.72 (0.45-1.15)	0.85 (0.46-1.57)	NA	NA

*Adjusted for variables with $P < 0.100$ in univariate analyses (gender and medical check-up within 2 yr); †Adjusted for variables with $P < 0.100$ in univariate analyses (gender, age, marital status, education and medical check-up within 2 yr); ‡ $P < 0.05$. OR, odds ratio; CI, confidence interval.

defectors was related only to gender (adjusted OR, 2.57; 95% CI; 1.22-5.44) (Table 2).

DISCUSSION

The objectives of this study were to identify how many respondents were vaccinated for influenza, and to explore the socio-economic factors which contribute to the vaccination coverage. The demographic data of our study showed the women outnumber men about 3 to 1 and it reflected the structure of North Korean defector population. Many women living in the border area of North Korea with China are engaged in commerce with China, so it is relatively easier than men to cross the border. Some women are trafficked to China and they escape to Korea several years later. Thus, North Korean defector women are predominant in Korea.

The adjusted vaccination coverage revealed no statistical difference between the defectors and indigenous group. This result was not consistent to the results of other studies about vaccination coverage of immigrants (14, 15). Previous studies explained that immigrants tend to be vaccinated less frequently because of access barriers, lower education level, health care provider's unconscious bias (16). North Korean defectors, however, have several advantages compared to other immigrants. They have less language barrier problem relatively compared to other migrants. All of the defectors are medical beneficiaries for

the first 5 yr and there are several medical treatment support systems for the defectors in local governments. In addition, there are 30 supportive centers for North Korean defectors in whole Korea which can help them use health care service. For these reasons, access to health care could be better for the defectors than other immigrants and these are possibly associated with no difference of vaccine uptake compared to indigenous people. It might be able to explain the reason why the coverage of defectors in the aged under 50 group was higher. Woman defectors are more likely to get vaccinated than men, and this might be because that social concern is concentrated on woman defectors' group as they are outnumbered and considered to be relative vulnerable group. This shows that more attention and vaccination guide to the male defectors are required. In Korean control group, marital status was one of variables that affect the vaccination coverage and this could be due to the effect of family support (17, 18). The trend was also similar in the defectors group but not statistically significant, maybe due to the small size of the study sample. Respondents who received no medical examination within 2 yr have less experience of the vaccination. Therefore, strategies are needed to enable easier access to preventive medicine for North Korean defectors.

Previous studies documented higher influenza vaccination coverage in older age group (usually defined as 65 yr and above). The elderly have chronic diseases and meet health providers more frequently so the coverage is higher than the younger group

(8, 10, 14, 19). However the trend was different in our study, especially in the defector's group. Though it was not statistically significant, the vaccination coverage of people aged 50 to 64 in the defectors was lower than the group of indigenous people (27.5% vs. 29.3%). Even the difference was more significant in aged 65 and older while the number of respondents was small (36.4% vs. 77.8%). In this age group, natives also get vaccination free of charge and public health centers do several preventive health services for the elderly. Therefore, healthcare access barrier of both groups may have decreased which resulted in relatively higher barrier for the elderly defectors.

Above all, the vaccination coverage of the elderly defectors was lower than the goal that WHO suggested in 2003 (11). This is an important problem because this age group is vulnerable to influenza virus and many countries are giving effort to achieve higher coverage level of this high risk population (10, 15). Result of previous surveys that investigated barriers to influenza immunization show that the most frequent reason for not having vaccination was the belief that healthy people do not need vaccination. Secondly, people concerned short supply of vaccine and its side effects. Thus, for improving immunization rates, it is important to educate the public to give correct information and reduce misunderstandings (10, 20). The importance of the role of the health care workers is constantly emphasized from previous literatures. The key factor promoting vaccination was the advice from a family doctor or nurse (10). If health care workers who regularly meet high risk group are well informed about the influenza immunization and the disease, they can give information and recommend vaccination more actively (21). In the UK, they achieved the highest elderly vaccination rates in Europe (> 70%) and one of the most important factor that attributed to the result was financial incentives to general practitioner. Several studies performed in Spain also showed positive impact of financial incentive to physicians (14, 22, 23). North Korean defectors usually go to municipal hospitals or public health centers, so health care workers in those hospitals or centers are needed to be educated and there should be considerations of policy providing incentives to the health care workers.

Specific immunization policies for the defectors, especially for the elderly, are also necessary. According to PROMOVAX project (promote vaccinations among migrant populations in Europe), some European countries have policies or activities to promote immunization of migrants and immunization outreach program. Germany supports the migrants at the federal level; and several initiatives by charities take care of illegal immigrants. They also have several regional projects which also include outreach services for immunization. In Norway, the reception/asylum centers and the health stations have main responsibility of providing information about the Norwegian system of infection control and vaccination to migrants. Greece also has immunization outreach programs organized by KEELPNO (Hellenic

center of disease control) and non-governmental organizations (24). Some regional public health centers and police stations in Korea have already carried out vaccination outreach programs for North Korean defectors and nationwide expansion of those programs should be considered, especially for the elderly.

Our study has some limitations which should be considered. First, we were provided data that had selected participants by snowball sampling method which is one of the non-probabilistic sampling. Therefore it was hard to randomize and they might not represent the population as a whole. North Korean defectors are scattered all over the country and some of them want to conceal their identity so it was hard to recruit participants and thus we inevitably used non-probabilistic sampling. The technique is used often in the research about North Korean defectors for those reasons (25, 26). Second, we used unproven self-reported information on influenza vaccination that could have potential error. However, self-report of influenza vaccination status has been validated to be highly sensitive and defines a high level of agreement (27). Third, the number of the elderly was small. However this reflects the age structure of the population, even though we examined about 1.5% of whole North Korean defectors (2). Fourth, we did not ask about medical history of chronic disease that might affect vaccination coverage. Chronic diseases are more likely to correlate with the elderly. Therefore it might be hard to find the effect of the disease history on the vaccination coverage because of the small number of the old respondents. Further studies are needed to identify effect of chronic disease history on preventive health care of North Korean defectors.

In this study, we found that influenza vaccination coverage of aged defectors' group (aged 50 yr and over) was lower than indigenous people though overall vaccination coverage was similar. Further efforts to increase influenza vaccination coverage of this group are required and more studies about unmet health needs of North Korean defectors should be performed to promote their health.

DISCLOSURE

The authors have no conflicts of interest to disclose.

AUTHOR CONTRIBUTION

Conception and coordination of the study: Park SM, Lee HW, Lee JS. Design of ethical issues: Park SM, Lee HW, Lee JS, Song IG. Acquisition and cleansing of data: Lee HW, Lee JS. Data review: Song IG, Lee HW, Park SM. Statistical analysis: Song IG, Kim MS. Manuscript preparation: Song IG, Lee HW, Kim MS, Park SM. Manuscript approval: all authors.

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