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Characteristics of influenza vaccination coverage in adults with chronic disease: 2008-2010 Community Healthy Survey

국내 만성질환자에서의 독감예방접종과 관련 특성

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양 혜 정

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Abstract

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Background: Influenza vaccination is known to be the most effective and preventive way against annual influenza infection. Those with chronic medical conditions have higher chance of morbidity and mortality from annual flu infection, hence grouped as risk populations. However, the vaccine receipt rate in adults with chronic disease are not identified in Korea. To explore seasonal influenza vaccine coverage in chronic patient groups and associated factors, this study examined vaccine coverage rate and characteristics regarding influenza vaccine uptake in chronic disease groups.

Methods: A sample of 680,202 subjects were collected from the 2008-2010 Community Health Survey. Samples were divided by people with/without chronic disease. Then samples were divided by vaccinated/unvaccinated groups within chronic disease group. Multiple logistic regression was conducted to identify socio-economic, health behavior factors associated with self-reported influenza vaccinations in chronic disease group.

Results: Overall, influenza vaccine coverage was 58.6%, and 24-44% under 65 years old in adults with chronic disease which do not meet the recommended vaccine receipt. People with older age, female, lower education, having a spouse, lower income, service/manual workers, involving in healthier behavior such as not smoking, not drinking, walking regularly, having biennial health check-up, and receiving pandemic influenza(H1N1) vaccine had higher seasonal influenza vaccine uptake level.

Conclusion: This study shows that adults aged 19-64 with chronic medical conditions have lower receiving rate than WHO recommendation, while people 65 years or older show constantly higher vaccine receipt due to the free immunization program.

Key words: influenza, vaccination coverage, chronic disease, community health survey, Korea

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Chapter 1. Introduction

1-1. Background

Seasonal influenza is a contagious viral respiratory illness which outbreaks during winter-spring months of the year (Lau, 2013). Influenza is known to cause severe hospitalizations and complications, affecting all age groups, which results in mild or serious illness and complications, even to death. At the global level, influenza epidemics cause 10 to 20% of population infected, 3 to 5 million severe cases of illness and about 0.25-0.5 million deaths each year (WHO, 2009). While most people have mild illness with no need of medical care or antiviral drugs and recover in two weeks, some people are more likely to have complications from flu (CDC, 2013). It is known that severity from influenza not only depends on viral type but also age and the presence of co-morbid conditions (Mallia, 2007), therefore, WHO has set people with chronic conditions, pregnant women, elderly, and infants from six months to two years as risk groups and recommends an annual vaccination targeting 90% of coverage by 2020. Particularly, people having one or more chronic diseases which are by far the leading cause of mortality in the world, representing 63% of all deaths is constantly increasing especially countries undergone rapid urbanization. With increasing prevalence of chronic diseases, adults with chronic medical conditions are at a higher risk for severe complications due to influenza (Blank, 2009), diseases including asthma, neurological conditions, chronic lung disease, heart disease, endocrine disorders, kidney disorders, liver disorders, metabolic disorders and AIDS or cancer patients (CDC, 2013). Because these risk groups have weakened immune system and

organs due to disease or long-term medication, hospitalization in high risk groups are 5 to 30 times higher, chance of complications in flu season is more severe (Neuzil, 1999). It is also known that chronically ill patients have a higher use of medication and healthcare utilization when infected (Mallia, 2007).

Influenza vaccination has been the main strategy for prevention and control of influenza for the past 60 years (Osterholm, 2012). As a consequence of antigenic drift of influenza virus, influenza vaccines are to be produced according to the prediction of dominant viral type every year (Puig-Barbera, 2012) but does not always match with circulating influenza viruses thereby reducing the benefits of vaccination showing 60% effective in healthy adults, but only 48% effective among those with high risk conditions (Herrera, 2006). While the efficacy of vaccine remains controversial, it is still considered the single most effective tool to prevent influenza (Stafford, 2012) because antibodies made in response to the vaccine can provide cross-protection against different but related influenza viruses (CDC, 2013). Moreover, vaccination is cost-effective for reducing morbidity and mortality (Lu, 2008) and is known to offer much of the protection in risk groups reducing hospitalizations 25-39% and mortality 39-75% (WHO, 2005). Indeed, it is proven in many studies that seasonal vaccination is effective in preventing hospitalizations in adults (Bupig-Barbera, 2012), in diabetics (Lau, 2013), patients with cardiac disease and stroke (Nichol, 2003), reducing morbidity and mortality in chronic kidney disease patients (Kausz, 2004), in women with chronic conditions (Neuzil, 1999), and COPD patients (Mallia, 2007). Although annual vaccination is the most effective way to prevent the infection and following complications in all subgroups regarding age and health conditions, the vaccine coverage rates have been at suboptimal levels in most countries (Yoo, 2011).

In Korea, number of patients during flu season is approximately 1.6 million, with an annual medical cost expenditure over 4 million dollars according to Korea Health Statistics. Having no specific influenza vaccination goals towards the entire Korean population, Korea Centers for Disease Control and Prevention(KCDC) surveil to cover 64% of high-risk groups which is close to an herd immunity threshold(66%) considering the basic reproduction rate of annual flu is 3 (Lee, 2008). Influenza vaccination coverage rate is relatively high in elderly(age≥ 65 years) showing above 74% every year, however, the annual average is 30% of coverage, and even lower in people under 65 years old. According to KCDC, national vaccine coverage is in plateau from 2008 to 2011 around 30% of vaccination uptake rate, considerably lower than herd immunity threshold.

With rapid urbanization, Korea has a serious and increasing prevalence of chronic diseases which also are the main causes of deaths (Statistics Korea, 2010). Prevalence of cancer, diabetes, stroke, asthma, myocardial infarction and angina all of which are defined as high risk chronic diseases are 3.2%, 9.7%, 3.9%, 3.0%, and 2.4% respectively (Statistics Korea 2011). KCDC recommends chronic patients, elderlies, healthcare workers, pregnant women, adults from 50 to 64 years old, and infants to get a seasonal influenza vaccination. However, government's immunization program does not include chronically ill patients while elderlies over 65 years old of age get vaccination free of charge at local medical facilities. Not only chronic disease groups primary care including influenza vaccination is not covered with government's aid, but there are only a few researches on the coverage rate of chronic disease patients.

1-2. Objective

As far as the influenza vaccination coverage is concerned, no previous study has examined influenza vaccine uptake in Korea using nationwide data in chronically ill patient groups. The purpose of this study is to identify seasonal influenza vaccine uptake rate in people with chronic medical conditions, and discover characteristics associated regarding vaccine uptake in chronic disease group.

Chapter 2. Methods

2-1. Data collection

This study used data from Community Health Surveys (CHS), an annual cross-sectional study. CHS, a nationwide survey started from 2008 by the Korean Center for Disease Control and Prevention (KCDC) in collaboration with regional universities and public centers. It is designed to produce community-based health statistics at the city level, country level, and district units. Interviewees are randomly selected based on entire sampling units in each community, a total of approximately 220,000 persons each year, then subjects are notified with mails prior to trained investigators' visit for face-to-face interviews. The survey is carried out in the month of August through October to cover health related questions: health behaviors, chronic diseases, quality of life, injuries, medical facility visits, mental health, vaccinations, social and physical activity and socio-economic status. In this study, data from 2008 to 2010 were collected and pooled.

2-2. Measures

For independent variables, socio-economic status and health behaviors were collected for the analysis (Table 1). These factors were selected as numerous studies have shown a relationship with influenza vaccination uptake. Socio-economic variables include gender, age, final education level, marital status, monthly income, occupation. Age was categorized into four groups: 19-44, 45-64, 65-74 and 75 or older. Education variable refers to final education level: less than middle school, middle and high school(junior and junior high), and above college graduate. Marital status is divided two groups; having a spouse or not(whether unmarried, bereaved or separated). Monthly income is calculated as an equivalent income, dividing monthly income into square root of family size, and then categorized into quartile: 193, 121-192, 68-120, and less than 67 (units are Korean Man-Won). Occupation was grouped into three which are professional/clerical, service/manual, and others including housewives, college students and soldiers. Health behaviors include smoking, drinking, walking, having a biennial health check-up and receiving Influenza A(H1N1) vaccination. Smoking is evaluated in three categories: currently smoking, former smoker and never smoked. Drinking is grouped into two whether having a regular drink more than once in a month or not. Walking activity is defined by walking at least 5 days a week, more than 30 minutes a day. Health check-up is counted from last 2 years and receiving Influenza A(H1N1) vaccination was asked in 2010 only reflecting pandemic Influenza A(H1N1) which occurred in 2009. Participants were also asked questions regarding chronic disease whether they were ever being told by a physician they had malignancy, diabetes, asthma, angina, myocardial infarction or stroke all of which are a high

recommended group for influenza vaccination by KCDC. Questions were “Have you ever been told by a doctor that you had chronic disease?” and “Are you currently taking any medication for that disease?” Chronic disease variable is defined as people having one or more of high-risk medical conditions and currently on a medication for treatment of the disease. The answer (yes/no) was counted.

Influenza vaccination coverage was measure by a question “During the past 12 months, have you been vaccinated against annual influenza?” The answer (yes/no) was used as the dependent variable.

For statistical analysis, SAS 9.3 program (SAS Institute Inc., Cary, NC, USA) was used. A chi-square test was performed in each variables within subgroups. A multiple logistic regression analysis was used to identify the factors associated with the influenza vaccination in adults with disease groups. A p-value <0.05 was considered statistically significant, and odds ratio with a 95% confidence interval (CI) was used.

Chapter 3. Results

Table 1 shows the general socio-economic characteristics and health behaviors of the study population from 2008 to 2010 Community Health Survey. Among 680,202 participants, there were more females(54.0%) than males. 40.3% were less than 44 years old, whereas elderlies older than 65 years old were 23.4%. Almost half of the participants (46.1%) attended middle/high school, and more subjects had spouse (68.0%). In terms of health behaviors, two thirds of the participants (62.9%) never smoked, and half of all subjects do not drink(50.2%). People engaging in regular walking were 48.4%. More had reported that they received biennial health check-up(59.9%) and Influenza A(H1N1) vaccinated were 24.9%.

Among all participants, people having one or more chronic diseases were 98,468(14.5%). Age groups with chronic disease were mostly distributed in 45-64 years old and 65-74 years old. Education level less than middle school had the highest participants(51.5%), and in the lowest income level (67 or less) had 40.6% among all. More than half(58.0%) never smoked, and there were more former smoker in chronic disease group(22.0%) compared to a group without chronic disease(12.6%). More people did not drink regularly(64.2%) in chronic disease group compared to other(47.8%). Engaging in regular walking was 46.7%. More participants had health check-up(68.1%) which is also higher than those without chronic disease(58.5%), and received higher seasonal flu vaccine (58.6%) than the comparision group, however, H1N1 vaccination was only 40.4%.

Except regular walking, chronic disease group showed more health behaviors than the other.

Table 1. General characteristics of study population

variables	N	%	with chronic disease	%	without chronic disease	%	p-value*
Total	680,202		98,468	(14.5)	581,734	(85.5)	
Socio-Economic Status							
Gender	n=680,202		n=98,468		n=581,734		
male	313,013	(46.0)	47,692	(48.4)	265,321	(45.6)	<0.0001
female	367,189	(54.0)	50,776	(51.6)	316,413	(54.4)	
Age	n=680,202		n=98,468		n=581,734		
19-44	274,054	(40.3)	11,300	(11.5)	262,754	(45.2)	<0.0001
45-64	246,782	(36.3)	38,753	(39.4)	208,029	(35.8)	
65-74	104,315	(15.3)	31,873	(32.4)	72,442	(12.5)	
75+	55,051	(8.1)	16,542	(16.8)	38,509	(6.6)	
Education†	n=678,831		n=98,315		n=580,516		
above college	168,452	(24.8)	11,627	(11.8)	156,825	(27.0)	<0.0001
middle and high school	312,677	(46.1)	36,097	(36.7)	276,580	(47.6)	
less than middle school	197,702	(29.1)	50,591	(51.5)	147,111	(25.3)	
Marital status‡	n=678,076		n=98,211		n=579,865		
without spouse	216,742	(32.0)	30,147	(30.7)	186,595	(32.2)	<0.0001
with spouse	461,334	(68.0)	68,064	(69.3)	393,270	(67.8)	
Monthly income§	n=609,777		n=88,630		n=521,147		
>193	149,935	(24.6)	14,058	(15.9)	135,877	(26.1)	<0.0001
121-192	153,227	(25.1)	16,113	(18.2)	137,114	(26.3)	
68-120	153,455	(25.2)	22,461	(25.3)	130,994	(25.1)	
67	153,160	(25.1)	35,998	(40.6)	117,162	(22.5)	
Occupation	n=665,465		n=96,180		n=569,285		
professional/clerical	204,440	(30.7)	16,231	(16.9)	188,209	(33.1)	<0.0001
service/manual	192,310	(28.9)	26,309	(27.4)	166,001	(29.2)	
others**	268,715	(40.4)	53,640	(55.8)	215,075	(37.8)	
Health behavior							
smoking††	n=679,783		n=98,407		n=581,376		
current smoker	157346	(23.2)	19,645	(20.0)	137,701	(23.7)	<0.0001
former smoker	94647	(13.9)	21,680	(22.0)	72,967	(12.6)	
never smoked	427,790	(62.9)	57,082	(58.0)	370,708	(63.8)	
drinking‡‡	n=679,535		n=98,338		n=581,197		
no	340,762	(50.2)	63,169	(64.2)	277,593	(47.8)	<0.0001
yes	338,773	(49.9)	35,169	(35.8)	303,604	(52.2)	
regular walking§§	n=679,260		n=98,327		n=580,933		
<30min/5days/week	350,547	(51.6)	52,415	(53.3)	298,132	(51.3)	<0.0001
≥30min/5days/week	328,713	(48.4)	45,912	(46.7)	292,801	(48.7)	
biennial health check-up	n=680,202		n=98,468		n=581,734		
no	272,600	(40.1)	31,441	(31.9)	241,159	(41.5)	<0.0001
yes	407,602	(59.9)	67,027	(68.1)	340,575	(58.5)	
H1N1 vaccination***	n=229,229		n=34,705		n=194,524		
no	172,173	(75.1)	20,675	(59.6)	151,498	(77.9)	<0.0001
yes	57,056	(24.9)	14,030	(40.4)	43,026	(22.1)	
seasonal flu vaccination	n=680,202		n=98,468		n=581,734		
no	581,734	(85.5)	40,769	(41.4)	379,831	(65.3)	<0.0001
yes	98,468	(14.5)	57,699	(58.6)	201,903	(34.7)	

* Significance was tested by χ^2-test

† Missing=1,371

‡ unmarried, separated or bereaved

§ Equivalent income. Units: Man-won(₩10,000). Missing=70,425

** Others include housewives, college students, soldiers. Missing=14,737

†† Missing=419

‡‡ Missing=667

§§ Missing=942

*** Surveyed in 2010 only

Table 2 shows influenza vaccination coverage rate in people with chronic disease. Vaccination rates were high in females(64.1%) than in males(52.8%). Influenza vaccine uptake was lowest in 19-44 years, and 65 years or older group had over 78.0% of receipt rate. Vaccination rates were also high in lower education level, people without spouse, lower monthly income, jobs involving in service/manual workers and in others(housewives, students and soldiers). Also engaging in health behaviors such as not a current smoker(former smoker or never smoked), not a regular drinker, walking regularly more than 5 days a week had higher influenza vaccine coverage rate. Vaccination against pandemic influenza A(H1N1) was high in people who also had seasonal flu vaccine. People with chronic disease had vaccination coverage of 58.6% overall.

Table 2. Influenza vaccination coverage rate in adults with chronic disease

variables	influenza vaccination					
	vaccinated			unvaccinated		
	n	%	p-value*	n	%	p-value*
Total	57,699	(58.6)		40,769	(41.4)	
Socio-Economic Status						
Gender						
male	25,167	(52.8)	<0.0001	22,525	(47.2)	<0.0001
female	32,532	(64.1)		18,244	(35.9)	
Age						
19-44	2,672	(23.7)	<0.0001	8,628	(76.4)	<0.0001
45-64	16,873	(43.5)		21,880	(56.5)	
65-74	25,088	(78.7)		6,785	(21.3)	
75+	13,066	(79.0)		3,476	(21.0)	
Education†						
above college	4,487	(38.6)	<0.0001	7,140	(61.4)	<0.0001
middle and high school	17,231	(47.7)		18,866	(52.3)	
less than middle school	35,893	(71.0)		14,698	(29.1)	
Marital status‡						
without spouse	18,607	(61.7)	<0.0001	11,540	(38.3)	<0.0001
with spouse	38,961	(57.2)		29,103	(42.8)	
Monthly income§						
>193	6,299	(44.8)	<0.0001	7,759	(55.2)	<0.0001
121-192	7,848	(48.7)		8,265	(51.3)	
68-120	12,878	(57.3)		9,583	(42.7)	
67	24,852	(69.0)		11,146	(31.0)	
Occupation**						
professional/clerical	6,035	(37.2)	<0.0001	10,196	(62.8)	<0.0001
service/manual	14,692	(55.8)		11,617	(44.2)	
others	35,642	(66.5)		17,998	(33.5)	
Health behavior						
smoking††						
current smoker	8,707	(44.3)	<0.0001	10,938	(55.7)	<0.0001
former smoker	13,233	(61.0)		8,447	(39.0)	
never smoked	35,718	(62.6)		21,364	(37.4)	
drinking‡‡						
no	41,030	(65.0)	<0.0001	22,139	(35.1)	<0.0001
yes	16,603	(47.2)		18,566	(52.8)	
regular walking§§						
<30min/5days/week	30,172	(57.6)	<0.0001	22,243	(42.4)	<0.0001
≥30min/5days/week	27,434	(59.8)		18,478	(40.2)	
biennial health check-up						
no	15,062	(47.9)	<0.0001	16,379	(52.1)	<0.0001
yes	42,637	(63.6)		24,390	(36.4)	
H1N1 vaccination						
no	7,097	(34.3)	<0.0001	13,578	(65.7)	<0.0001
yes	12,577	(89.6)		1,453	(10.4)	

* Significance was tested by χ^2-test
† Missing=153
‡ Missing=257
§ Missing=9,838
** Missing=2,288
†† Missing=61
‡‡ Missing=130
§§ Missing=141

Results of multiple logistic regression analysis regarding factors associated with influenza vaccination are shown in table 3. Model 1 shows odds ratio of influenza vaccination between individual socio-economic variables, where model 2 is gender, age, and health behaviors are considered as independent variables. In model 3, all the variables were included as independent variable regarding influenza vaccination among adults with chronic disease. Among the adults with chronic disease, the variables that were significantly associated with influenza vaccine receipt were: (a) female (OR 1.20 95% CI 1.09-1.32), (b) age group 45-64 (OR 1.63 95% CI 1.47-1.82), age group 65-74 (OR 6.01 95% CI 5.32-6.80), and age group 75 years or older (OR 7.33 95% CI 6.38-8.42), (c) education level; less than middle school (OR 1.37 95% CI 1.22-1.54), (d) having a spouse (OR 1.17 95% CI 1.09-1.26), (e) lower monthly income; 67 man-won or less (OR 1.12 95% CI 1.02-1.23), (f) occupation; service/manual (OR 1.11 95% CI 1.01-1.22) and others including housewives, students and soldiers (OR 1.18 95% CI 1.07-1.29), (g) not smoking; former smoker group (OR 1.27 95% CI 1.16-1.40) and never smoke group (OR1.27 95% CI 1.15-1.40), (h) engaging in regular walking (OR 1.16 95% CI 1.06-1.20), (i) having a health check-up (OR 1.70 95% CI 1.59-1.82) and (j) Influenza A(H1N1) vaccination (OR 12.74 95% CI 11.86-13.68) in model 3. Drinking was inversely associated with influenza vaccination uptake (OR 0.87 95%CI 0.82-0.94).

Table 3. Factors associated with influenza vaccination in adults with chronic disease

	model 1		model 2		model 3	
	OR	95% CI	OR	95% CI	OR	95% CI
Socio-Economic Status						
Gender						
male	REF		REF		REF	
female	1.40	(1.36-1.45)	1.28	(1.18-1.39)	1.20	(1.09-1.32)
Age						
19-44	REF		REF		REF	
45-64	2.15	(2.03-2.27)	1.92	(1.75-2.11)	1.63	(1.47-1.82)
65-74	9.116	(8.62-9.74)	7.96	(7.20-8.80)	6.01	(5.32-6.80)
75+	9.21	(8.59-9.88)	10.02	(8.95-11.23)	7.33	(6.38-8.42)
Education						
above college	REF				REF	
middle and high school	1.00	(0.95-1.05)			1.08	(0.97-1.20)
less than middle school	1.22	(1.15-1.29)			1.37	(1.22-1.54)
Marital status						
without spouse	REF				REF	
with spouse	1.32	(1.27-1.37)			1.17	(1.09-1.26)
Monthly income						
>193	REF				REF	
121-192	0.97	(0.92-1.02)			0.95	(0.86-1.05)
68-120	1.06	(1.01-1.11)			1.03	(0.94-1.13)
67	1.12	(1.07-1.18)			1.12	(1.02-1.23)
Occupation						
professional/clerical	REF				REF	
service/manual	1.25	(1.19-1.31)			1.11(	1.01-1.22)
others	1.27	(1.21-1.33)			1.18	(1.07-1.29)
Health behavior						
smoking						
current smoker			REF		REF	
former smoker			1.28	(1.17-1.39)	1.27	(1.16-1.40)
never smoked			1.25	(1.14-1.37)	1.27	(1.15-1.40)
drinking						
no			REF		REF	
yes			0.84	(0.79-0.90)	0.87	(0.82-0.94)
regular walking						
<30min/5days/week			REF		REF	
≥30min/5days/week			1.13	(1.06-1.19)	1.16	(1.06-1.20)
biennial health check-up						
no			REF		REF	
yes			1.79	(1.59-1.80)	1.70	(1.59-1.82)
H1N1 vaccination						
no			REF		REF	
yes			12.75 (11.9-13.62)		12.74	(11.86-13.68)

model 1: socio-economic characteristics
model 2: gender, age and health behavior
model 3: all variables

Chapter 4. Discussion

The average of influenza vaccination coverage during 2008 to 2010 was 58.6% in chronic disease group, 34.7% in those without chronic disease. Compared to other Northeast Asian countries, Korea shows higher vaccination rate whereas 25.9% in Japan (Wada, 2013), 9% in China (Zhou, 2013) regardless of co-morbid conditions. Influenza vaccine uptake in chronic disease group was lower in adults 19-44 years and 45-64 years old group whereas the elderlies had receipt rate of over 78.0%. This uptake rate in elderlies meets the 2010 target set by WHO in Global Agenda on Influenza Surveillance and Control, recommending elderlies vaccinated at least 50% by 2006, and 75% by 2010. When compared to 10 other countries in Africa, Asia Pacific, Europe, Latin America and the Middle East, influenza vaccine coverage rate of the elderlies was the highest in Korea (de Lataillade, 2009). A high rate of flu vaccine uptake in elderlies is due to the fully funded immunization programs by government to people aged 65 years or older at regional health care center and hospitals. Those programs provide the vaccine and administration fee free of charge to elderlies in public practice while others are charged for the vaccine and the administration fee in private practice except children (de Lataillade, 2009). However, vaccinated population in age groups 19 years to 64 years old of age with chronic disease did not meet the herd immunity threshold which is 66% and the target set by the Korea Center for Disease Control and Prevention which aimed 64% among high risk persons. It is also far from the WHO recommendation that aim to cover 90% in risk groups (CDC, 2013), which is to immunize as many people as possible especially in risk groups. Adults from 19-64 years old comprising 50% of chronic

disease groups showing lower vaccine uptake also reflects that risk groups are not prepared in primary prevention against infectious diseases. This is also related to the report that Korea has higher chance of avoidable hospitalizations in chronic disease patient groups which refers primary care needs to be improved according to OECD Health at a glance research in 2009 (OECD, 2011). To reduce the infection, complication and following hospitalizations in risk groups, primary care such as prevention should be reinforced in chronic disease patients. Accordingly, to reach a recommended vaccine uptake rate, government should be in charge of chronic disease patients' primary care with free vaccine administration since Korea only has not been covering any kind of vaccination while 78% of OECD countries are supporting the entire or some of the vaccine expanses for risk groups. Also, the vaccine receipt difference between adults and elderlies in chronic disease group reflects that adults 19-64 years with medical conditions that put them at high risk for complications from flu should be included in fully funded immunization program. The program should expand current vaccination policy to cover most of the age groups to reduce the gap from the target uptake rate, which will be helpful to prevent severe illness from infection and complications in high-risk groups (Puig-Barbera, 2012).

People with older age, lower education level, lower income, and engaging in physical work(service/manual) in chronic disease group have a tendency to take flu vaccines than other comparing subgroups within the variable. These socio-economic factors such as income, education level and types of occupations show different results regarding influenza vaccine uptake in many studies. Mostly, people having poor health or higher education, higher income are known to have more chance of vaccine coverage (Takayama, 2012). In Korea on the other hand, study results consistently show that people with

lower education level, involving in jobs that require physical/manual work, and lower income have higher vaccination coverage, explaining elderlies with chronic diseases are more likely to be undereducated, not having a chance to be in professional jobs and have lower income according to South Korean statistics (Kee 2007, Heo 2013). Differences among countries might be due to the national health care coverage, where in Korea people have no limit in using medical facilities without health insurance problem unlike many other countries which is a major cause of not having a vaccine or hospital visit (Coupland et al., 2007). Also, another explanation is that higher vaccination rate in low income, low education level, living in smaller towns, and involving a job in service/manual could be due to Korean government's policy to group them as 'socially vulnerable group' and offer them free vaccine (Kee, 2007). As seen in the results above, others(soldiers/housewives/college students and unemployed groups) and people engaging in service/manual jobs show the highest vaccine receipt among occupation categories. This could be due to the 100% coverage of influenza vaccine policy in soldiers having most of primary cares aided by government while in a duty in the army.

In terms of engaging in health behaviors, which is known to reduces morbidity and mortality from chronic disease and lowers medical costs in high risk groups (MMWR, 2010) showed same results as previous studies, where people engaged in healthier behavior such as not smoking, not drinking, having daily exercise, and having health check-up had higher chance of influenza vaccine receipt (Takayama, 2012, Kee, 2007).

In 2009, Korea Centers for Disease Control and Prevention began surveillance in Influenza A (H1N1) virus infected patients in Korea. According to the result, two third of confirmed fatal cases had high

risk complications (Kim, 2011) which correlates with the result in the United States in 2009 (Jain, 2009). The most frequent fatal cases distributed in age range 3 to 49 years old, whereas only 1.2% of the patients were older than 60 years old. As commonly known, fatal inpatients were only about 1% in elderlies, at the same time, they had the highest chance of having complications and higher mortality rate. The younger had a higher chance of getting infected by Influenza A(H1N1), lower fatality rate (Kim, 2011). From this study, according to the table 1 and 2, the 2009 pandemic influenza A (H1N1) vaccine administer rate was 24.9% in all population which correlates with Lee *et al*, 24.9% (Lee, 2012), higher than Heo *et al*, 15.5% (Heo, 2013). Uptake of H1N1 vaccination was 89.6% within the seasonal influenza vaccinated group with chronic disease, reflecting that who had flu vaccine also had a higher chance of receiving H1N1 vaccine in chronic disease patients. This might be due to a strong influence that people having been vaccinated against seasonal influenza is more likely to be vaccinated against pandemic influenza (Bish, 2011). Even though high risk groups showed a preventive behavior regarding 2009 pandemic influenza A, showing the highest association than any other variables within the vaccinated group, still the overall uptake rate in adults under 65 years old and in every subpopulation needs to be increased.

4-1. Limitations

The findings in this study have several limitations. First, considering influenza epidemics occur twice a year, mostly predominant in winter and in spring in the following year, the survey answer does not specifically points whether the vaccination was against spring or winter season outbreak. Second, every answer is reported by individuals, hence there is no chance to rule out recall bias from self-reports. Lastly, data used in this study is a cross-sectional survey developed and reviewed by KCDC containing more than 200 questions which do not focus on influenza vaccination solely. Therefore, reasons for taking or not taking seasonal influenza vaccination and any other related factors regarding annual flu could not be measured since the influenza vaccination is counted with a single answer (yes/no).

Chapter 5. Conclusion

Seasonal influenza vaccination in aged 65 or older with chronic disease met WHO recommendation and KCDC target. However vaccine coverage rates in adults from 19 to 64 with high-risk conditions were lower, compared to the elderlies.

To maximize the immunization rates in overall population, and in subpopulation within high risk medical groups, interventions and immunization program aided by government should be enlarged covering all age groups with chronic diseases to prevent avoidable hospitalizations, complications and medical cost expenditure from flu.

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국문초록

국내 만성질환자의 독감예방접종률과 관련 특성

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연구배경: 전 세계적으로 매년 10-20%의 인구가 인플루엔자에 감염되며 인플루엔자 감염으로 인한 입원율과 사망률 역시 높다. 특히 만성질환자는 감염 시 합병증이 생길 위험이 커 인플루엔자에 대해 고위험군으로 분류되어 예방접종 우선대상자로 권고되고 있으나 국내 성인 만성질환자에서의 접종률은 파악되지 않고 있다. 따라서 본 연구는 만성질환자에서의 백신 접종 및 접종 관련 특성을 살펴보고자 한다.

연구방법: 지역사회건강조사 2008-2010년 자료를 이용해 전국 680,202명의 대상자에서 만성질환별, 질환자 내 접종여부별로 군을 나눴으며 만성질환군 내에서 인플루엔자 접종률 및 접종관련 요인을 알아보기 위해 로지스틱 회귀분석을 실시하였다.

연구결과: 전체 만성질환자의 예방접종률은 58.6%였으나 연령이 낮을수록 접종률이 낮았다. 여성일수록, 연령이 높을수록, 소득수준과 교육수준이 낮고 단순사무직 종사자에서 접종률이 높았으며 흡연과 음주를 하지 않고 걷기실천과 건강검진을 받는 경우와 신종플루 접종을 하는 하위그룹에서 접종률이 높았다.

결론: 국내 19-64세 만성질환을 가진 성인에서 접종률은 건강한 성인보다 높지만 연령이 낮을수록 접종률도 낮게 나타났으며, 65세 이상 노인

에 비해 접종률이 낮았다. 65세 이상 노인에서는 무료 백신 접종 정책의 효과로 질환 유무와 상관없이 예방 접종률이 높았다.

주요어: 만성질환, 인플루엔자, 예방접종, 지역사회건강조사

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