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Relevance Between Whether One is Exposed to Second-Hand Smoking at Workplace or Home and the Subjective Health Condition

Su Eon Jeong[1], Yu-Na Kim[2], YongJoo Rhee[3], Jae-Hyun Kim[4]

[1]Department of Health Administration, Dankook University, Korea (jeongse96@naver.com), First Author
[2]Department of Health Administration, Dankook University, Korea (kyn3491@naver.com)
[3]Department of Health Sciences College of Natural Science, Dongduk Women's University, Korea (yrh759@dongduk.ac.kr)
[4]Department of Health Administration, Dankook University, Korea (jaehyun@dankook.ac.kr), Corresponding Author

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ABSTRACT

The purpose of this study is to examine and understand the effect of exposure to second-hand smoking at workplace and home on the subjective health condition. Among the causes of death in Korea, the respiratory diseases account for 12.6% of the total, and the risk of smoking, which is a most typical cause of respiratory diseases, has widely been known. Furthermore, smoking causes the second-hand smoking, which has a detrimental effect not only on the smokers but also on the non-smokers around them. Second-hand smoking causes the discomfort due to cigarette smoke as well as health problems including lung cancer and heart disease. Furthermore, negative changes in the subjective health condition cause on to significantly predict the occurrence of health problems, and hence, an analysis was performed to determine the effect of second-hand smoking indoors at workplace and home on the subjective health condition.
As a result of the analysis performed, it was confirmed that the subjective health condition was 1.205 times and 1.593 times worse, each respectively, than those who did not have any exposure to the second-hand indoors at workplace and home. Hence, education on the harmful effects of the second-hand smoking on the human body and raising awareness about the tertiary smoking are required at a national level, and the proposal of a specific smoking control policy is proposed.

1. Introduction

Among the causes of death in Korea, the respiratory diseases account for the second largest proportion following neoplasms and circulatory diseases (Statistics Korea, 2018). Furthermore, while the current rate of smoking of Koreans continues to fall, the rate of smoking for the men aged 15 and older is still the highest among those of the OECD countries (Lee et al., 2016). This is

a typical cause of the health risks which smoking affects not only terms of causing death, but also the chronic diseases including cancer, diabetes, and coronary artery disease (Song et al., 2008). However, such dangers of smoking are called second-hand smoking (secondhand smoke, passive smoking) as they cause the smokers and non-smokers to inhale the cigarette smoke.

As such, the harms of second-hand smoking are very diverse, ranging from simply feeling unpleasant due to cigarette smoke to causing serious health problems such as lung cancer or heart diseases (Seo, 2007), and have also emerged as a serious issue in society (Lee et al., 2016).

According to a previous study called “Analysis of the Relevance of Dyslipidemia Following Second-Hand Smoking,” the second-hand smoking affects lipid metabolism and causes bad cholesterol in the human body, such as low density lipoprotein (LDL), and has also been found to be operating as a major cause of heart disease by increasing the risk of coronary artery disease (Park, 2018). Furthermore, the second-hand smoking turned out to increase the risk of lung cancer, respiratory disease, heart disease, and stroke (Park, 2018), and turned out to affect not only the physical health but also the mental disorders such as sleep disorder and depression (Bandiera et al., 2010).

As such, the second-hand smoking not only impacts the health of smokers, but also that of the non-smokers, and hence, there are quite a few people who are adversely affected by smoking, and the quality of life is expected to fall by physical and mental diseases. Hence, it is considered that there is a need to study the second-hand smoking.

As in the above, the second-hand smoking affects the health of non-smokers, and in which process, the subjective health condition of the non-smokers is related to the actual health condition, and the occurrence of health problems may be predicted and prevented according to the perception of the subjective health condition (Yu, 2019; Choi, 2016; Ngamaba et al., 2017). Through which, it is considered that the subjective health condition is used as a key predictor of the future health, and it is necessary to study the subjective health condition to promote the public health.

Hence, based on the data of the National Health and Nutrition Survey, this study assumes that the people exposed to second-hand smoking at workplace and home are more likely to have negative subjective health conditions than those who are not, and the correlation between the exposure to second-hand smoking and subjective health condition was analyzed.

2. Research Method

2.1 Research data

This study is a secondary data related analytical study using the raw data from the 7th 3rd year (2018) data of the National Health and Nutrition Survey conducted by the Korea Centers for Disease Control and Prevention. The National Health and Nutrition Survey has been conducted since 1998 to determine the health and nutritional conditions of the people in accordance with Article 16 of the National Health Promotion Act. According to the characteristics of each subject's life cycle, 10,000 people are divided into children (1-11 years old), adolescents (12-18 years old), and adults (19 years old or older), while the questions of survey are applied according to each characteristic. The National

Health and Nutrition Survey is designed to identify the current status and trends regarding the health and nutritional conditions of the people, select the health vulnerable groups which ought to be given a policy priority, and calculate the statistics needed to evaluate as to whether health policies and projects are delivered effectively. Through which, the statistics and collected data are used to establish and evaluate the national health promotion plans, calculate the health indicator statistics required by international organizations (OECD and WHO, etc.) and compare them between the nations.

In this study, among the questions of the 7th (2016 - 2018) National Health and Nutrition Survey, the exposure to indoor second-hand smoking at home, extent of stress perception, gender, marital status, education level, income, occupation, and age, etc., were used for the analysis.

2.2 Variables

2.2.1 Independent variable

As an independent variable, the exposure to the indoor second-hand smoking at workplace and home was used. The exposure to second-hand smoking at work was classified into “Yes”, “No”, and “Have no job”, and the exposure to second-hand smoking indoors at home was classified into “Yes”, “No”, and “There is no one who smokes daily at home except oneself among the family.”

2.2.2 Dependent variable

The subjective health condition was used as the dependent variable. According to the National Health and Nutrition Survey, the subjective health condition was classified into “Very good”, “Good”, “Average”, “Bad”, and “Very bad”, yet in this study, the negative effect of the second-hand smoking on the subjective health condition was verified by classifying it into “Very good”, “Good”, and “Average” for the positive responses, and “Bad” and “Very bad” for the negative responses.

2.2.3 Control variables

(1) Demographic characteristics

Age, gender, and marital status were used as the variables demonstrating the demographic characteristics. In this study, minors were excluded from the survey since the recognition criteria for the subjective health condition were considered to be ambiguous. Accordingly, the sample was limited to those over the age of 19, “20s (19-29 years of age)”, “30s (30-39 years of age)”, “40s (40-49 years of age)”, “50s (50-59 years of age)”, “60s (60-69 years of age)”, and “70 or older (70 years of age and older)”, while the gender was classified into “Male” and “Female”, and the marital status was classified into “Yes” and “No.”

(2) Socioeconomic level

Income level, occupation, and education level were used as the variables indicating the socioeconomic level. Income was classified into “Low”, “Low-middle”, “Middle-high”, and “High” based on the

standard amount for each household's income quartile. As for occupation, "manager", "expert and related worker", "office worker", "service worker", and "sales worker" were classified into white color (indoor worker) to classify the indoor and outdoor occupations, while "skilled workers for agriculture and fisheries", "skilled worker and related skilled worker", "skilled worker and related technical worker", "device and machinery operation and assembly worker", "simple labor worker", and "soldier" were classified into blue color (outdoor worker), and the responses corresponding to "Not applicable" were classified as unemployed.

(3) Health behaviors and condition variables

As for the health behavior and status variables, stress perception, inpatient use for 1 year, and outpatient use for 2 weeks were used as variables. Stress perception was classified into "Feeling very much", "Feeling a lot", "Feeling a little", and "Not feeling at all", and the inpatient use for 1 year and outpatient use for 2 weeks were classified into "Yes" and "No," respectively.

2.3 Statistical analysis

A chi-square test was conducted to determine the correlation between the second-hand smoking indoors at home and the subjective health cognition among the adults. Furthermore, the relationship between the second-hand smoking and the subjective health condition and the quality of life was identified, while the multivariate logistic regression analysis was performed. For the organization and the statistical analysis of the collected data, the SAS ver. 9.4 (SAS Institute Inc., Cary, NC, USA) was used, and the significance level (α) of all analyses set to less than 0.05.

3. Research results

The purpose of this study was to examine and understand the relevance of the subjective health condition for those who have experienced the second-hand smoking indoors at home and work. The research data were carried out based on the 2016-2018 data of the National Health and Nutrition Survey, and the final 17,482 participants were included among the subjects of the analysis, excluding any missing values.

3.1 Subjective health condition following general characteristics

Table 1 illustrates the subjective health condition according to the general characteristics of the participants. The total number of participants was 17,482, of which 3,457 people (17.8%) responded negatively for the subjective health condition, and of which, 297 people (1.9%) answered that they experienced an indoor second-hand smoking exposure, while 1,320 people (7.4%) answered that they had no such experience. Furthermore, 227 people (1.4%) answered that they experienced an exposure to the second-hand smoking indoors at home, and 485 people (2.5%) answered that they had no such experience. Meanwhile, 14,025 people (82.2%) responded positively for the subjective health condition,

and of which, 1,442 people (9.7%) answered that they experienced an exposure to the second-hand smoking indoors at work, and 7,639 people (46.1%) answered that they had no such experience.

Of which, 700 people (4.3%) answered that they experienced an exposure to the second-hand smoking indoors, and 2,160 people (12.8%) answered that they had no such experience. Furthermore, 6784 people (34.8%) answered that they did not have a job regardless of the subjective health condition regarding the exposure to second-hand smoking at workplace, and regarding the exposure to the second-hand smoking indoors at home, 13,910 people (79.0%) answered that there is no one who smokes except for one's self among the family (Table 1).

Table 1. Subjective health condition according to the general characteristics of subjects

	Subjective health condition						
	Sum		Positive		Negative		
	N	%	N	%	N	%	P-value
Whether one is exposed to second-hand smoking at workplace							*<.0001
Yes	1739	11.6	1442	9.7	297	1.9	
No	8959	53.5	7639	46.1	1320	7.4	
Not going to work	6784	34.8	4944	26.3	1840	8.5	
Whether one is exposed to second-hand smoking at home							*<.0001
Yes	927	5.7	700	4.3	227	1.4	
No	2645	15.3	2160	12.8	485	2.5	
No one smokes except myself	13910	79.0	11165	65.0	2745	14.0	
Age							*<.0001
20s (age 19 ~ 29)	2115	18.1	1846	15.6	269	2.4	
30s (age 30 ~ 39)	2768	18.0	2429	15.7	339	2.3	
40s (age 40 ~ 49)	3217	20.3	2788	17.6	429	2.7	
50s (age 50 ~ 59)	3322	19.8	2692	16.1	630	3.7	
60s (age 60 ~ 69)	3054	12.9	2281	9.7	773	3.2	
Over 70 age	3006	11.0	1989	7.3	1017	3.6	
Sex							*<.0001
Male	7614	49.6	6334	41.9	1280	7.6	
Female	9868	50.4	7691	40.2	2177	10.2	
Marital status							*0.0003
Yes	14536	76.4	11531	62.2	3005	14.2	
No	2946	23.6	2494	20.0	452	3.6	
Income quartile (household)							*<.0001
Low	3345	15.7	2139	10.4	1206	5.3	
Low-Intermediate	4242	23.5	3381	19.3	861	4.2	
Upper-Intermediate	4798	29.5	4054	25.2	744	4.3	
Advanced	5097	31.3	4451	27.3	646	4.0	
Job status							*<.0001
White Collar	6611	42.1	5775	36.7	836	5.4	
Blue Collar	4022	22.7	3254	18.8	768	3.9	
Unemployed	6849	35.2	4996	26.6	1853	8.6	

	Subjective health condition						
	Sum		Positive		Negative		
	N	%	N	%	N	%	P-value
Awareness of usual stress level							*<.0001
feel very much	829	5.0	445	2.8	384	2.2	
tend to feel a lot	3839	23.0	2750	17.2	1089	5.8	
tend to feel a little bit	9796	56.9	8232	48.9	1564	8.1	
hardly feel	3018	15.0	2598	13.3	420	1.7	
Inpatient for a year							*<.0001
Yes	2031	11.2	1387	8.1	644	3.1	
No	15451	88.8	12638	74.1	2813	14.7	
Outpatient for 2 weeks							*<.0001
Yes	5430	28.5	3880	21.1	1550	7.4	
No	12052	71.5	10145	61.1	1907	10.4	
Year							0.7507
2016	5760	32.8	4604	26.9	1156	6.0	
2017	5791	33.1	4648	27.3	1143	5.8	
2018	5931	34.1	4773	28.1	1158	6.0	
Sum	17482	100	14025	82.2	3457	17.8	

*p<0.05, result form chi-square

3.2 Relevance of subjective health condition whether one experienced second-hand smoking inside workplace or home

Table 2 illustrates the results of the regression analysis performed with other control variables corrected to determine the relevance of the experience of second-hand smoking indoors at workplace and home and the subjective health condition. The analysis was performed by carrying out by constructing 3 models. Model 1 is a correlation analysis between the second-hand smoking at the workplace and the subjective health condition, while Model 2 is a correlation analysis between the second-hand smoking indoor at home and the subjective health condition, while Model 3 is a model corrected for the second-hand smoking at workplace and home. As a result of the analysis performed, the subjective health condition of those who had such experience of exposure was 1.205 times (OR: 1.205, 95% CI: 1.014-1.433) worse than those who had never been exposed to the second-hand smoking indoors at work, and the subjective health condition of those with the experience of exposure to the second-hand smoking indoors at home was worse 1.593 times (OR: 1.593, 95% CI: 1.271-1.997) than those without such an experience.

Furthermore, as a result of analyzing both the second-hand smoking at workplace and home at the same time, the second-hand smoking indoors at workplace did not turn out to be statistically significant, yet in the case of the second-hand smoking indoors at home, the subjective health condition of those whose experienced the second-hand smoking relative to those who did not experience such turned out to be 1.562 times worse (OR: 1.562, 95% CI: 1.247-1.956), and the group which responded that there is no one who smokes inside home except for one's self was analyzed to be 1.207 times (OR: 1.207, 95% CI: 1.055-1.381) worse (Table 2).

Table 2. Relevance of subjective health condition whether one experienced second-hand smoking inside workplace or home

	Model 1				Model 2				Model 3			
	Subjective health condition (negative)				Subjective health condition (negative)				Subjective health condition (negative)			
	OR	95%CI		P-value	OR	95%CI		P-value	OR	95%CI		P-value
Whether one is exposed to second-hand smoking at workplace												
Yes	1.205	1.014	1.433	*0.0346					1.176	0.989	1.398	0.0666
No	1.000								1.000			
Not going to work	1.021	0.48	2.171	0.9562					1.051	0.496	2.227	0.8973
Whether one is exposed to second-hand smoking at home												
Yes					1.593	1.271	1.997	*<.0001	1.562	1.247	1.956	*0.0001
No					1.000				1.000			
No one smokes except myself					1.206	1.055	1.379	*0.0063	1.207	1.055	1.381	*0.0061
Age												
20s (age 19~29)	1.000				1.000				1.000			
30s (age 30~39)	1.414	1.134	1.764	*0.0022	1.433	1.15	1.786	*0.0014	1.428	1.146	1.779	*0.0016
40s (age 40~49)	1.839	1.442	2.345	*<.0001	1.862	1.462	2.371	*<.0001	1.851	1.453	2.358	*<.0001
50s (age 50~59)	2.801	2.182	3.595	*<.0001	2.834	2.21	3.633	*<.0001	2.817	2.198	3.611	*<.0001
60s (age 60~69)	3.533	2.743	4.55	*<.0001	3.558	2.768	4.574	*<.0001	3.567	2.776	4.583	*<.0001
Over 70 age	4.319	3.312	5.632	*<.0001	4.376	3.363	5.696	*<.0001	4.392	3.374	5.716	*<.0001
Sex												
Male	1.000				1.000				1.000			
Female	1.136	1.023	1.263	*0.0175	1.116	1.003	1.242	*0.0438	1.13	1.015	1.258	*0.0253
Marital status												
Yes	1.000				1.000				1.000			
No	1.645	1.344	2.013	*<.0001	1.637	1.337	2.004	*<.0001	1.637	1.337	2.004	*<.0001
Income quartile (household)												
Low	1.000				1.000				1.000			
Low-intermediate	0.586	0.506	0.679	*<.0001	0.589	0.509	0.682	*<.0001	0.588	0.508	0.681	*<.0001
Upper-intermediate	0.517	0.448	0.598	*<.0001	0.522	0.452	0.602	*<.0001	0.52	0.45	0.601	*<.0001
Advanced	0.447	0.379	0.527	*<.0001	0.449	0.381	0.529	*<.0001	0.45	0.382	0.53	*<.0001
Job status												
White Collar	0.905	0.786	1.043	0.1665	0.895	0.777	1.03	0.1218	0.904	0.785	1.042	0.1638
Blue Collar	1.000				1.000				1.000			
unemployed	1.372	0.651	2.894	0.4049	1.352	1.181	1.547	*<.0001	1.328	0.632	2.792	0.4533
Awareness of usual stress level												
feel very much	9.29	7.33	11.774	*<.0001	9.285	7.318	11.781	*<.0001	9.231	7.281	11.704	*<.0001
tend to feel a lot	4.227	3.605	4.956	*<.0001	4.237	3.614	4.966	*<.0001	4.218	3.599	4.944	*<.0001
tend to feel a little bit	1.845	1.582	2.15	*<.0001	1.845	1.584	2.151	*<.0001	1.845	1.583	2.151	*<.0001
hardly feel	1.000				1.000				1.000			
Inpatient for a year												
Yes	1.696	1.47	1.956	*<.0001	1.701	1.477	1.96	*<.0001	1.702	1.477	1.961	*<.0001
No	1.000				1.000				1.000			
Outpatient for 2 weeks												
Yes	1.643	1.492	1.81	*<.0001	1.645	1.494	1.811	*<.0001	1.647	1.495	1.814	*<.0001
No	1.000				1.000				1.000			

*p<0.05, results from logstic regression analysis

4. Considerations

This study sought to analyze the correlation between the second-hand smoking indoors at work and home and the subjective health condition, and the results of this study are as follows. It turned out that those who had an exposure to the second-hand smoking at workplace and home were 1.205 times and 1.593 times more negative for the subjective health condition relative to those who did not. Furthermore, when the second-hand smoking at workplace and home were analyzed simultaneously, the second-hand smoking at workplace did not demonstrate a statistical significance, yet those who were exposed to the second-hand smoking at home had their subjective health condition turn out more negatively than those who were not.

According to the results of this study, those who experienced second-hand smoking at home turned out to have a more negative subjective health condition than those who were not, which poses the possibility that they inhaled sidestream smoke given the smaller area at home than the workplace, and it is thought that the following results were derived from their exposure to a large quantity of cigarette smoke at a close distance to those around the smoker (Kim et al., 2001), and from January 2015, regardless of area, smoking has been prohibited across all establishments registered as general restaurants, rest area restaurateurs, and bakeries, and some public facilities have been designated as non-smoking areas since 2012 (Yu & Kim, 2015). Hence, the second-hand smoking has a negative effect on the subjective health condition, which suggests that the second-hand smoking at home should be more cautioned against.

According to a previous study conducted for the non-smokers in Switzerland, it turned out that the exposure to second-hand smoking at home resulted in a significant decrease among questions such as physical role, physical function, pain, social function, and vitality (Bridevaux et al., 2007), and a study of 36,225 Hong Kong adolescents also demonstrated that smoking significantly negatively affected the subjective health condition (Wang et al., 2012). This suggests that the second-hand smoking can negatively affect the subjective health condition, and the exposure to second-hand smoking affects not only the physical health but also the mental health such as stress, depression, and anxiety, thereby resulting in various health problems (Nugent et al., 2011).

Furthermore, second-hand smoking at home increases the risk of exposure to tertiary smoking, a process in which chemical substances in the form of gases produced during smoking are adsorbed in the walls, clothes, furniture, and indoor dust, then are reemitted into the air. This suggests that second-hand smoking at home is a threatening variable for the health condition since other members may be exposed to harmful substances remaining for a long time in the indoor environment by the members who smoke at home (Kim et al., 2018). As such, second-hand smoking at home has a negative effect on the health of members at home. In terms of the education of second-hand smoking, especially for the infants and young adult, education is very important. This is so because there is a high possibility of exposure to diseases caused by second-hand smoking due to long time spent they spend at home, and as the rate of smoking of adolescents and adults increases, second-hand smoking of infants and children also increases (Maeil Business News Korea, 2009; Promotion Foundation, 2013). Even in the case of adolescents, whether the adolescents' correct knowledge and awareness of second-hand smoking can protect themselves from against the second-hand

smoking and affect smoking attitudes after adults (Park et al., 2014), it is apparent that the second-hand smoking prevention related education program for such infants and young adults is important.

According to the "Effect of Application of the Second-Hand Smoking Prevention Related Education Program for Infants," which is a relevant study conducted thereto, such educational programs ensure that the infants and young adults are aware of the problems of the second-hand smoking, it also turned out that the attitudes and perceptions towards quitting smoking were also positively improved by allowing them to acquire skills on how to deal with them (Kim, 2012). Furthermore, in the study of the "Effect of the Second-Hand Smoking Prevention Linked Education Program for Children and Parents," the group which participated in the educational program for the prevention of second-hand smoking for children and parents decreased the number of cigarettes smoked by 1.1 cigarette per day on average, and it turned out that the parents' awareness increased after education relative to before education (Shin et al., 2011).

Hence, based on the studies conducted as in the above, there is a need for an educational program to recognize the problem of second-hand smoking by connecting children or the children and parents together regarding the second-hand smoking and make all family members to quit smoking. Accordingly, considering that the second-hand smoking at home negatively affects the subjective health condition and that the subjective health condition can predict multi-dimensional individual health, and in order to enhance the social perception of second-hand smoking at the national level, it is thought that various educational programs and specific regulatory policies are needed.

The limitations of this study are as follows. First, since this study has analyzed the data using a cross-sectional study design, the temporal relationship between the second-hand smoking and the subjective health condition could not be clearly examined and understood. Second, this study did not consider the clinical health data which may have affected the subjective health condition given the limitations in the analysis using the secondary data. However, using the date of the National Health and Nutrition Survey conducted by the Korea Centers for Disease Control and Prevention, which is a publicly trusted institution representing Korea, they are highly reliable and may be generalized only for the Republic of Korea. Furthermore, while there have been many studies on the relevance of smoking and health condition in the previous studies, considering that there are few similar studies covering the effect of second-hand smoking on the subjective health condition, it is significant in that this study has examined the relevance of the second hand smoking and the subject health condition.

5. Conclusion

This study has examined the effect of the second-hand smoking indoor at workplace and home on the subjective health condition among the Korean adults aged 19 years or older. As a result of the analysis performed, the possibility of a negative subjective health condition turned out to be higher than that of those who did not have an exposure to the second-hand smoking, and it was possible to secure the result which might yield a greater negative result at home than at workplace. Accordingly, this study may be said to be one performed with meaningful results to emphasize the gravity of the second-hand smoking in the current society sensitive to the smoking issue Hence,

considering that the subjective health condition may be used to predict the future health multidimensionally, a recommendation is made such that the awareness be enhanced at the national level through the provision of education on the harmful effects of the second-hand smoking on the human body, and launch more specific smoking regulation and policies towards that end.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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