

## Analysis of influential factors on respiratory symptoms of nail shop workers

Jung-ae Kim<sup>1\*</sup>, Su-min Kim<sup>2</sup>

<sup>1</sup>Chodang University, Nursing Department  
jjosha6615@naver.com

<sup>2</sup>Chodang University, Beauty design Department  
kles225@cdu.ac.kr

### Abstract

Nail art is a kind of nail painting or decoration that adds to the beauty. Throughout making nail art, the worker was on a dusty operation with the smoothing of chemicals and nails. People working at nail shops not only use a variety of chemicals, but also experience a lot of fine powder during the process of nail trimmings. While drying the chemical adhesive, the workers often complain of eye, nose and throat discomfort. In addition, the acrylic brush is characterized by a lot of smell when washed with washing solution. Also nail art workers directly influence the worker's breathing through the work done by placing the guest's hands in a work space called a nail table. Chemical ingredients used in nail art procedures include acetone, ethyl acetic acid, toluene, butyl acetic acid, glue, and top coating of nail varnishes. Prolonged inhalation of these substances may cause dizziness, vomiting, as well as impaired respiratory system. The purpose of this study is to investigate the respiratory symptoms of nail shop workers who are likely to be affected by work in nail shop and to find out which factors have the greatest influence if they have respiratory symptoms. Therefore this study is to provide basic data on the health management system of people engaged in nail shop and to develop health education program. For this study, the data collection was collected on July 7, 2017 for the nail shop workers attending the nail art trend seminar held in Gwangju, in Korea. The data were all 236. However, except for the poor data, 208 data were used for the final analysis. The questionnaire consisted of 30 in general questions, questions about self-efficacy in 24 questions. elf-efficacy measuring tool developed by A.Y, Kim, I. Y, Park(2001). The self-efficacy questionnaire consists of 24 items and is self-reported 7-point Likert scale. The reliability of this tool was cronbach alpha = .934. The collected data were analyzed using spss 18.0. Information of Research participant performed frequency analysis. To examine the effects of personal characteristics on self-efficacy,  $X^2$  analysis was conducted. And also  $X^2$  analysis was conducted to analyze the coughing symptom appearance according to individual and environmental factors. A hierarchical regression analysis was used to determine which of the personal and environmental factors influenced cough symptoms.

**Keywords:** Coughing symptom, Environmental factors, Individual factors, Nail art workers, Self-efficacy.

## 1. Introduction

Women's pursuit of beauty can be seen to be the same in every country in the world [1]. As one of the beauty pursuits, nail and toenail management is popular among women in recent years. The Korean nail industry was introduced in the United States in the late 1990s [2]. Currently, there are about 50,000 people in the nail industry [2-3]. At present, the beauty industry in Korea is rapidly developing with economic growth. Among the beauty industry, the nail art field has been newly established with national qualifications and is becoming more popular among people [1]. Nail art is a kind of nail painting or decoration that adds to the beauty. At this stage of making beauty, nail art is a dusty operation with the smoothing of chemicals and nails [4]. As a result, the United States has been interested in nail art materials since the 1980s. In addition, the US Environmental Protection Agency has produced and distributed a guide to the health care of nail shop workers [5]. In Korea, however, nail shop-related substances are controlled by the Cosmetic Act. Therefore, it is difficult to identify the hazard information of nail shop workers [6-7].

The duties of a nail shop can be divided into nail care, toenail management, artificial nail extension, and nail art. People working at nail shops not only use a variety of chemicals, but also experience a lot of fine powder during the process of nail trimmings. While drying the chemical adhesive, the workers often complain of eye, nose and throat discomfort [8-9]. In addition, the acrylic brush is characterized by a lot of smell when washed with washing solution. Also nail art workers directly influence the worker's breathing through the work done by placing the guest's hands in a work space called a nail table. Chemical ingredients used in nail art procedures include acetone, ethyl acetic acid, toluene, butyl acetic acid, glue, and top coating of nail varnishes [10]. Prolonged inhalation of these substances may cause dizziness, vomiting, as well as impaired respiratory system.

There have been many studies on nail shop workers regarding stress and maintenance [11-12]. The nail shop is a service industry and it is a simple work environment, so that research has priority. However, there have been many studies on exposure to chemical substances, but it has not been investigated in relation to the direct symptoms of practitioners. So far, most of the nail shop practitioners' studies on hazards are mainly about occupational exposure and awareness of the hazards. In previous studies, Yang Jin-hee published a study on organic compound concentration in 2010[13]. This study was significant in that it examined the exposure of nail shop workers to hazardous substances. In 2010, Kim Ho-hyun et., al assessed the subjective symptoms of exposure to hazardous substances[14]. And Lee Ji-young also studied formaldehyde among the hazardous substances in the same year [15]. Then in 2012, Park studied the effects of awareness of the hazards of nail products on the preference of nail products. The most recent studies have led to the study of occupational exposure assessment [7]. Analysis of the research so far has revealed that the process in the nail shop has been harmful to the human body. In particular, it is negative for people working in nail shops to work with protective equipment, such as masks or gloves. People who receive services tend to think that nail shop workers are treated like they have an infectious disease if they wear protective wearing. So, it is a reality that workers often endure work with fine dust and a strong smell in Korea. This situation is very different from the American environment, which is a developed nation of nail shops.

In the above analysis, even though nail shop workers have a lot of pain due to their working environment, it can be seen that the research has not yet been conducted regarding the clinical symptoms and the direct influencing factors. Therefore, it can be said that it is meaningful to know what kind of symptoms these harmful substances cause to the body.

The purpose of this study is to investigate the respiratory symptoms of nail shop workers who are likely to be affected by work in nail shop and to find out which factors have the greatest influence if they have respiratory symptoms. Therefore this study is to provide basic data on the health management system of people engaged in nail shop and to develop health education program.

## 2. Research Method

### 2.1 Research design

The purpose of this study was to analyze factors affecting cough, respiratory symptoms of nail art workers, by analyzing personal factors, environmental factors, and work experience (Figure 1). As for the personal factors, it was surveyed the presence of smoking, religion, and residence type, and environmental factors such as working hours, wearing protective equipment and cleaning tools were investigated.

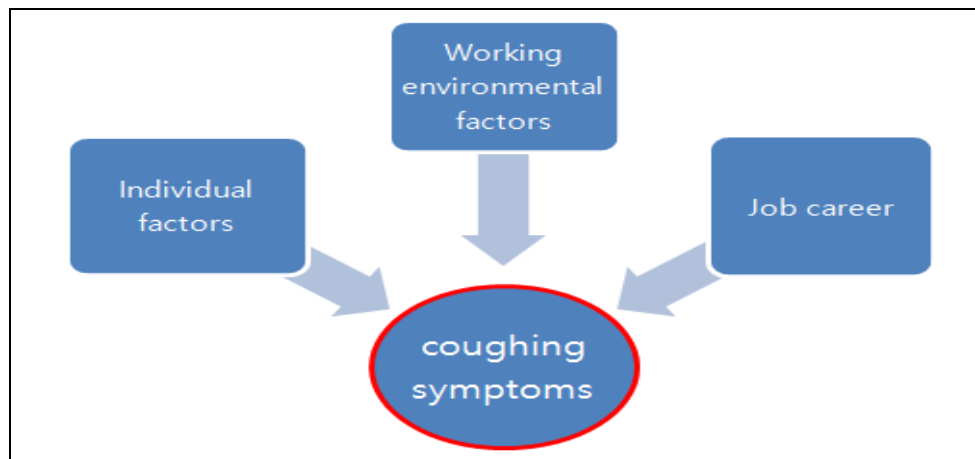


Figure 1. Affecting factors for respiratory symptoms

### 2.2 Data collection

For this study, the data collection was collected on July 7, 2017 for the nail shop workers attending the nail art trend seminar held in Gwang ju city, in Korea. The data were all 236. However, except for the poor data, 208 data were used for the final analysis. The questionnaire consisted of 30 in general questions, questions about self-efficacy in 24 questions, and questionnaires took about 20 minutes. The researchers described the questionnaire before filling out the questionnaire and instructed not to use it for other purposes. And only those participants voluntary agree to the study were asked to respond to the questionnaire. The age of participants ranged from 20 to 49 years and It was distributed as people who worked directly with the nail shop and those who worked.

### 2.3 Research tool – Self efficacy

Self-efficacy can be defined as a belief in one's ability to organize and carry out the necessary course of action to achieve the goal. In other to measure nail art workers' self-efficacy, it was used the general self-efficacy measuring tool developed by Kim et., al [16]. The self-efficacy questionnaire consists of 24 items and is self-reported 7-point Likert scale(1 point = not at all, 2 points = not, 3 points = slightly, 4 points =average, 5 = slightly yes, 6 points = yes, 7 points = very much). The reliability of this tool was cronbach alpha = .934.

### 2.4 Data analysis

The collected data were analyzed using SPSS 18.0. Information of Research participant performed frequency analysis. To examine the effects of personal characteristics on self-efficacy,  $\chi^2$  analysis was conducted. And also  $\chi^2$  analysis was conducted to analyze the coughing symptom appearance according to

individual and environmental factors. A hierarchical regression analysis was used to determine which of the personal and environmental factors influenced cough symptoms. The KMO Bartlett value was checked to see if the standard data sampled by the researchers fit the factor analysis. If the value of KMO Bartlett is 0.6 or more, the standard data sampled by the researcher is suitable for factor analysis. In other words, it is interpreted that the selection of variables for factor analysis is good. In this data, KMO Bartlett value is 0.823 and the data is suitable for factor analysis.

### 3. Result

#### 3.1 Information of research participants

A frequency analysis was conducted to analyze the personal characteristics of participants. The results of this study were as follows: All 208 participants were female. The most common age group was between the ages of 31 and 35 (28.8%), followed by 52 (25.0%), 32 persons (15.4%) were 36-40 years old, 16 persons (7.7%) were 41-45 years old, and 4 persons (1.9%) were over 46 years old. The number of respondents who answered that there is no religion was 112 (53.8%), followed by Protestant 40 (19.2%), Buddhism 32 (15.4%), Catholic 16 (7.7%). Among those who worked more than 49 months, 92 (44.2%) were the most. The followings were 48 (23.1%) for 12-24 months, 36 (17.3%) for 25-48 months and 32 (15.4%) for less than 6 months. When analyzing the working hours, 180 (86.5%) of those working eight hours a week were the most among the respondents, then 24 (11.5%) worked for 6 hours, and 4 (1.9%) worked for more than 24 hours. As a result of analyzing the number of breaks per week, 148 (71.2%) of the participants were resting once a week, followed by 1.5 (32.4%) and 28 (13.5%). The result of survey on type of residence that was currently in residence was as follows. 136 people (65.4%) were living in apartments, 28 people (13.5%) were single houses, 24 people (11.5%) were in one room, 16 people (7.7%) were in office buildings and 4 people (1.9%). The results of the survey on smoking status are as follows. As a result of the analysis, 28 people were smoking in 13.5% of the total participants, and 180 people who did not smoke or quit smoking accounted for 67.3% of the total subjects (Table 1).

**Table 1. Information of Research participant**

(N=208)

Characteristic		Freq. (N)	Ration (%)
Gender	Female	208	100.0
	Male	0	0.0
Age	↓ 25 years old	52	25.0
	26-30 years old	44	21.2
	31-35 years old	60	28.8
	36-40 years old	32	15.4
	41-45 years old	16	7.7
	↑ 46 years old	4	1.9
Religion	Catholic	16	7.7
	Protestant	40	19.2
	Buddhism	32	15.4
	Etc	8	3.8
	None	112	53.8

Job career	↓ 6 mo	32	15.4
	7-24 mo	48	23.1
	25-48 mo	36	17.3
	↑ 46 mo	92	44.2
Work time per week	↓ 6 hrs	24	11.5
	7-8 hrs	180	86.5
	↑ 24 hrs	4	1.9
Off work per week	1 time	148	71.2
	2 times	28	13.5
	1.5 times	32	15.4
Residence type	Apartment	136	65.4
	Officetel	16	7.7
	One room	24	11.5
	House	28	13.5
	Etc	4	1.9
Smoking	Smokers	28	13.5
	None smokers	168	61.5
	Stop smoking	12	5.8

### 3.2 Self-efficacy according to individual characteristics

A cross-sectional analysis was conducted to determine whether there was a difference in self-efficacy according to individual characteristics (Table 2). The reliability of the self-efficacy tool was cronbach alpha = .934. As a result of the analysis, 180 people answered that they worked 8 hours a week, accounting for 86.5%.

As a result of the analysis of the difference of self-efficacy by working hours per week, those who answered that working hours were less than 6 hours per week had the highest self-efficacy score of 8 (29.1%) between 5.01 and 3.51-4.0. Those who answered that working hours were 8 hours a week had the highest self-efficacy score of 4.51-5.0 (76.2%). And 100% of those working more than 24 hours had self-efficacy of less than 3.50 ( $p < .000^{**}$ ). The one who had a day off on the first week had the highest self-efficacy score of 4.51-5.0 (64.2%), among those who took 1.5 times off, 12 (50.0%) had the highest self-efficacy between 3.51-4.00, The self-efficacy of those who took three breaks a week was the highest with 4.51-5.0 occupying 50% of the total ( $p < .000^{**}$ ). Analysis of self - efficacy per work experience revealed significant results ( $p < .000^{**}$ ). The results of the analysis showed that the self - efficacy score of 4.01-4.50 was the most frequent in 12 (37.5%), The most frequently used work experience was in the period of 7-24 months (4.01-4.50) with 24 (50.0%), The number of people with 25-48 months of work experience was below 3.50 and 4.51-5.00 with 12 persons (33.3%) each of them. And those with more than 49 months of work experience had the greatest self-efficacy score of 4.51 to 5.0 (47.8%). The analysis of self - efficacy by type of work showed significant meaning as  $P < .004$ . Basic nail had the highest self-efficacy score of 4.01-4.50 (37.5%), Tip nail (artificial nail) was the most common with 4.51-5.00 (42.7%), Wrap nail (silk nail) was the highest at 4.51-5.00 (56.0%), Gel nail was the highest at 4.01-4.50 (30.5%). As a result of analyzing the self-efficacy according to presence or absence of smoking, the self-efficacy of the smokers was the highest 4.51-5.00 score (42.9%), Among those who did not smoke, 4.51 to 5.00 were the highest (38.1%), Among those who quit smoking, 33.3% of those who are currently smoking quit, with the exception of the lowest score and the highest score of self-efficacy ( $p < .000^{**}$ ).

Table 2. Self-efficacy according to individual characteristics

Variables	Categories	Self-Efficacy					Total (%)	$\chi^2$ (p)
		↓ 3.50	3.51-4.00	4.01-4.50	4.51-5.00	↑ 5.01		
Work time per week	6 hrs	0 (0.0)	8 (33.3)	4 (7.1)	4 (5.0)	8 (25.0)	24 (11.5)	.000**
	8hrs	12 (75.0)	16 (66.7)	52 (92.9)	76 (95.0)	24 (75.0)	180 (86.5)	
	↑ 24hrs	4 (25.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	4 (1.9)	
Off work Per week	1 time	8 (50.0)	8 (33.33)	40 (71.4)	64 (80.0)	28 (87.5)	148 (71.2)	.000**
	1.5 times	4 (25.0)	12 (50.0)	12 (21.4)	0 (0.0)	0 (0.0)	28 (13.5)	
	2 times	4 (25.0)	4 (16.7)	4 (7.2)	16 (20.0)	4 (12.5)	32 (15.4)	
Job career	↓ 6 mo	0 (0.0)	8 (33.3)	12 (21.4)	8 (10.0)	4 (12.5)	32 (15.4)	.000**
	7-24 mo	4 (25.0)	4 (16.7)	24 (42.9)	16 (20.0)	0 (0.0)	48 (23.1)	
	25-48 mo	12 (75.0)	8 (33.33)	0 (0.0)	12 (15.0)	40 (12.5)	36 (17.3)	
	↑ 49 mo	0 (0.0)	4 (16.7)	20 (35.7)	44 (55.0)	24 (75.0)	92 (44.2)	
Work type	Basic nail	0 (0.0)	3 (12.5)	9 (16.1)	7 (8.75)	5 (15.6)	80 (45.5)	.004*
	Tip nail (artificial nail)	6 (37.5)	8 (33.3)	18 (32.1)	32 (40.0)	11 (34.4)	16 (9.1)	
	Wrap nail (silk nail))	2 (12.5)	6 (25.0)	11 (19.6)	28 (35.0)	3 (9.4)	24 (13.6)	
		8 (50.0)	7 (29.2)	18 (32.1)	13 (16.25)	13 (40.6)	56 (31.8)	
Smoking	Smokers	8 (50.0)	4 (16.7)	4 (7.1)	12 (15.0)	0 (0.0)	28 (13.5)	.000**
	None smokers	8 (50.0)	16 (66.7)	48 (85.8)	64 (80.0)	32 (100.0)	168 (80.7)	
	Stop smoking	0 (0.0)	4 (16.7)	4 (7.1)	4 (5.0)	0 (0.0)	12 (5.8)	

\*, p<.005, \*\*, p<0.01, missing data were excluded.

### 3.3 Coughing symptom appearance according to individual and environmental factors

The cough symptom's status of the respiratory diseases was analyzed according to personal and

working environment characteristics (Table 3). The results of the analysis showed that the factors related to the symptoms of coughing were wearing a mask at the time of work, cleaning frequency, nail shop experience, but smoking was not related. In the nail art work, 88.5% of all workers wear a mask. Only 90.2% of the workers wearing the mask had no cough, whereas 62.5% of the workers who did not wear the mask had no cough ( $p = 0.001$  \*\*). The relationship between the frequency of cleaning in the workplace and cough symptoms was analyzed to obtain meaningful results. In an analysis of how many times a workplace is cleaned in a week, 91.2% of people who clean 14 times a week did not have cough, 68.6% of people who clean 7 times, 100% of people who clean 2 times, 76.9% of those who did 1 time ( $p = 0.002$  \*\*). However, only one person answered that they clean twice a week, so they were excluded from the analysis. Analysis of the relationship between the work experience in the nail shop and cough symptoms showed significant result. In the nail shop, 21.7% of people who worked for more than 49 months answered that they had cough symptoms, people who worked less than 6 months did not have cough symptoms, 7-24 months were 6.25%, 25-48 months were 8.3% ( $p = 0.005$  \*\*). Significant results were obtained by analyzing cough symptoms and sanitary towels used at the time of work. As a result of analysis, 92.6% of people using cotton towel did not show cough symptoms, 85.4% of people using paper towel did not show it, 76.9% of people using water tissue did not show it ( $p = 0.021$  \*\*).

**Table 3. Coughing symptom appearance according to individual and environmental factors**

Variables	Categories	Cough		Total (%)	$\chi^2(p)$
		Yes (%)	No (%)		
Smoking	Smokers	4 (14.3)	24 (85.7)	28 (13.5)	.088
		19 (11.3)	149 (88.7)	168 (80.7)	
	Stop it	4 (33.3)	8 (66.7)	12 (5.8)	
Mask wearing upon the working	Put on	18 (9.8)	166 (90.2)	184 (88.5)	0.001**
	None	9 (37.5)	15 (62.5)	24 (11.5)	
Cleaning work place per week	1 time	3 (23.1)	10 (76.9)	13 (6.25)	0.002**
	2 times	0 (0.0)	1 (100.0)	1 (0.5)	
	7 times	11 (31.4)	24 (68.6)	35 (16.8)	
	14 times	13 (8.8)	146 (91.2)	159 (76.4)	
Job career on nail shop field	↓6 mo	0 (0.0)	32 (100.0)	32 (15.4)	0.005**





D										.017	-.129	-1.962	.958 .929 .998 .967
Statistic value	R <sup>2</sup> =.069, Modified R <sup>2</sup> =.065, F=15.368, p=.000		R <sup>2</sup> =.081, Modified R <sup>2</sup> =.072, F=2.492, p=.000		R <sup>2</sup> =.141, Modified R <sup>2</sup> =.128, F=14.260, p=.000		R <sup>2</sup> =.157, Modified R <sup>2</sup> =.140, F=3.850, p=.000, Durbin Watson=2.017						

\*, p<.005, \*\*, p<.01

## 4. Conclusion

This study was conducted to analyze the factors affecting cough symptoms in nail shop. Nail art is a kind of nail painting or decoration that adds to the beauty. People working in nail shops work on narrow nail tables with simple, repetitive tasks, the worker was on a dusty operation with the smoothing of chemicals and nails. People working at nail shops not only use a variety of chemicals, but also experience a lot of fine powder during the process of nail trimmings. Also while drying the chemical adhesive, the workers often complain of eye, nose and throat discomfort. In addition, the acrylic brush is characterized by a lot of smell when washed with washing solution. Also nail shop workers directly influence the worker's breathing through the work done by placing the guest's hands in a work space called a nail table. Chemical ingredients used in nail art procedures include acetone, ethyl acetic acid, toluene, butyl acetic acid, glue, and top coating of nail varnishes. Prolonged inhalation of these substances may cause dizziness, vomiting, as well as impaired respiratory system.

The purpose of this study is to investigate the respiratory symptoms of nail shop workers who are likely to be affected by work in nail shop and to find out which factors have the greatest influence if they have respiratory symptoms. For this study, the data collection was collected on July 7, 2017 for the nail shop workers attending the nail art trend seminar held in Gwangju, in Korea and 208 data were used for the final analysis. The questionnaire consisted of general questions, questions about self-efficacy. A hierarchical regression analysis was used to determine which of the personal and environmental factors influenced cough symptoms.

It has been rare until now to conduct health-related research of nail shop workers. In conclusion, this study concluded with emphasis on interpreting the results of this study. Because of the nature of the nail shop, all 208 participants were women. The most common age group was between the ages of 31 and 35 (28.8%), followed by 52 (25.0%), 32 persons (15.4%) were 36-40 years old, 16 persons (7.7%) were 41-45 years old, and 4 persons (1.9%) were over 46 years old. As a result, people aged 46 years or older seem to have fewer nail shop workers. According to experts in the nail art industry, people who have worked for more than three years are less likely to resign from their jobs. The beauty profession uses the term shop in the shop a lot, which means that there is a lot of difference in the salary of the employees. The salary difference between the first year of work and the third year is almost twice. People will become experts when they have more than 5 years of experience in beauty and will be able to apply the latest trends. According to this study, those of them who worked more than 49 months, 92 (44.2%) were the most. The followings were 48 (23.1%) for 12-24 months, 36 (17.3%) for 25-48 months and 32 (15.4%) for less than 6 months. The subjects of this study were more than 49 months old, so be careful when interpreting them

When analyzing the working hours, 180 (86.5%) of those working eight hours a week were the most among the respondents, then 24 (11.5%) worked for 6 hours, and 4 (1.9%) worked for more than 24 hours. As a result, working in a nail shop has many different characteristics from that of a 40-hour-a-week type of regular workplace. But it did not mean that the working days were small. 148 (71.2%) workers were resting once a week, 32.4% resting 1.5 times, and 13.5% 2 times. This means that the hours worked a day are shorter

than any other job.

In order to examine whether self-efficacy is related to health care, this study first analyzed the relationship between personal characteristics and self-efficacy. The reliability of the self-efficacy tool was cronbach alpha = .934. As a result of the analysis of the difference of self-efficacy by working hours per week, those who answered that working hours were less than 6 hours per week had the highest self-efficacy score of 8 (29.1%) between 5.01 and 3.51-4.0. Those who answered that working hours were 8 hours a week had the highest self-efficacy score of 4.51-5.0 (76.2%). And 100% of those working more than 24 hours had self-efficacy of less than 3.50 ( $p < .000$  \*\*). These results suggest that those who work more than 24 hours per week have lower self-efficacy, and those who have less than 6 hours have the highest self-efficacy. The rationale for this needs to be studied again. As a result of analyzing the self - efficacy according to the work experience, the self - efficacy was found to be higher in the working career than 24 months. This result is consistent with the fact that the more experienced workers have the ability to develop their own trends.

As a result of crossover analysis, it was found that wearing masks, workplace cleaning frequency, working career and kind of sanitary towel were meaningful in the work. Of the workers wearing masks, only 90.2% did not show cough symptoms, while 62.5% did not show cough symptoms ( $p = 0.001$  \*\*). In this study, 91.2% of those who cleaned more than 14 times a week did not show coughing symptoms, and 76.9% did not show coughing symptoms. These results show the importance of wearing protective equipment at work and show how important cleaning is to remove fine dust.

After analyzing factors affecting the cough symptoms of people working at the nail shop, this study conducted a hierarchical regression to find the most influential factors. Factors affecting cough symptoms were working experience, wearing protective equipment at work, type of sanitary towel, and frequency of cleaning. The most influential factor was job career ( $\beta = -.251$ ). The next most influential factors were the type of protective equipment at work ( $\beta = -.241$ ), the type of sanitary towel used ( $\beta = -.129$ ), and the number of store cleaning ( $\beta = .081$ ). For those with a lot of experience, the substance will be exposed for much longer.

This would be clear evidence that the working environment affects respiratory symptoms, the cough symptoms. Therefore, in this study, it was necessary to investigate which working environment influences cough symptoms. As a result of analysis, protective equipment such as mask wear was the biggest cause, followed by sanitary towel used, and lastly cleaning frequency of the nail shop. These results suggest that protective equipment should be worn at work and sanitary towels should be selected with good absorbency and cleaned frequently at nail shops. These results are the same as those in [17].

Nail art is a blind spot that has been applied to cosmetics in Korea despite the fact that fine dust exists more than other industries and continues to be used while working on chemicals. The nail art industry gets disease due to its poor working environment. However, due to the nature of the workers' ability to quit their jobs easily, the disease is not easily exposed. The pursuit of beauty is growing rapidly as economic growth. It is therefore desirable to respond early to the potential health risk factors of nail art workers. For this, as shown in this study, Improvements to the nail shop's working environment should be prioritized. However, the subjects of this study were limited to interpretation because they were only interested in long-time workers attending the nail art trend seminar. Therefore, in order to get more accurate results, it would be a generalization to go to the nail shop as well as the participants of the seminar. However, this study was significant in that it analyzed the health-related symptoms and the direct influence factors of nail shop workers. Therefore this study is to provide basic data on the health management system of people engaged in nail shop and to develop health education program.

## References

- [1] Ehlinger-Martin A, Cohen-Letessier A, Taïeb M, Azoulay E, du Crest D. Wmen's attitudes to beauty, aging, and the place of cosmetic procedures: insights from the QUEST Observatory. *J Cosmet Dermatol*. 15(1):89-94, 2016.

- [2] White H, Khan K, Lau C, Leung H, Montgomery D, Rohlman DS. Identifying Health and Safety Concerns in Southeast Asian Immigrant Nail Salon Workers. *Arch Environ Occup Health*, 70(4):196-203. 2015.[2]
- [3] Korean Nail Association. The history of nail art in Korea available from: URL:<http://www.knanail.or.kr>, 19: 573-576, 2007.
- [4] Banga G, Patel K. Glycolic Acid peels for nail rejuvenation. *J Cutan Aesthet Surg*. 7(4):198-201, 2014.
- [5] U.S. EPA. Protecting the health of nail salon workers; available from:URL:<http://www2.epa.gov/saferchoice/protecting-health-nail-salon-workers-0>, 2007.
- [6] Jeong J. Study on managing hazardous substances in public hygiene sector. Korea Institute for Health and Social Affairs. Report No. Health promotion study Jeconcheck:11-11. 2011
- [7] S Park, S Gwak, S Choi, Assessment of occupational symptoms and chemical exposures for nail salon technicians in Daegu City, Korea, *J Prev Med Public Health*, 47(3):169-176, 2014.
- [8] Vaccaro M, Guarneri F, Barbuza O, Cannavò SP. Airborne contact dermatitis and asthma in a **nail art** operator. *Int Occup Med Environ Health*, 27(1):137-40, 2014.
- [9] Gjølstad M<sup>1</sup>, Thorud S, Molander P. Occupational exposure to airborne solvents during nail sculpturing. *J Environ Monit*. 8(5):537-42. 2006.
- [10] GM. Kim, YH. Jeong, CS. Lee, SH Lee, JH. Park, EJ. Park, Nail art manual book, Gwangmun gak, 2009.
- [11] Lux L, Marshall J, Parker S, Collard S, Rogers B, Fuson S. Do educational interventions targeted to nail salon workers and customers improve infection control practices in these salons? *J Am Podiatr Med Assoc*. 104(2):174-6, 2014.
- [12] Garcia E, Sharma S, Pierce M, Bhatia S, Argao ST, Hoang K, Quach T. Evaluating a county-based healthy nail salon recognition program. *Am J Ind Med*. 58(2):193-202, 2015.
- [13] JH Yang, DH Han, Occupational exposure of nail technicians to airborne chemicals and biological monitoring. *J Korean Soc Occup Environ Hyg*, 20(1):53-62, 2010.
- [14] HH Kim, JY Yang, CS Park, DC Shin, YO Im, Health risk assessment of VOCs in the facilities under uncontrolled Korean-IAQ regulation, *Korean Institute of interior engineering*, 4(1):42-52, 2007.
- [15] JY Lee, Analysis of Formaldehyde in Nail Polish = The Study of Analysis of Formaldehyde in Nail Polish, *Korean Society of Skin Beauty and Beauty*,5(4):51-62, 2010.
- [16] A.Y, Kim, I. Y, Park, Self-efficacy scale development and validation study, *Korean Journal of educational research*, 39(1), 95-123, 2001.
- [17] Lux L, Marshall J, Parker S, Collard S, Rogers B, Fuson S. Do educational interventions targeted to nail salon workers and customers improve infection control practices in these salons? *J Am Podiatr Med Assoc*, 104(2):174-6, 2014.