

The Gender Difference in the Occupational Hazards and Injuries of Cleaning Workers and Janitors

Chang Lyul Choi

KOSHA, Dongbu Branch, Gyeongbuk, 37822

Corresponding Author

Chang Lyul Choi
KOSHA, Dongbu Branch, Gyeongbuk,
37822
Mobile : +82-10-2790-9661
Email : chang9661@naver.com

Received : May 08, 2017

Revised : May 22, 2017

Accepted : June 19, 2017

Objective: The purpose of this study is to analyze the accident characteristics according to the gender of the injured workers in building cleaning and to reflect them in the Industrial Accident Prevention Policy.

Background: An analysis of industrial accidents is an essential process for establishing systematic industrial accident prevention measures. In order to establish industrial accident prevention measures for workers effectively, it is necessary to analyze accident characteristics by job type for workers who do the same work.

Method: In this study, we analyzed the accident characteristics of 1,645 janitors who were approved of work-related injuries in 2015. We also analyzed the characteristics according to gender by dividing them into worker-related factors and accident-related factors.

Results: The accidents caused to the janitors showed different characteristics according to gender, age, work experience, agency of accident, and distribution of original cause materials. In other words, 70.2% occurred to workers over 60 years old and 56.2% occurred to unskilled workers with less than a year of work experience. In the case of accident pattern, 79.1% occurred in tripping (slip) hazards, and 68.2% of accidents occurred on the floor (including the ground) and the stairs, indicating that the accident occurred most frequently during cleaning work on the floor or stairs.

Conclusion and Application: The results of the study on the accident characteristics of the janitors can be used as basic data for systematic preventive measures against accidents occurring to the elderly female workers in the service industry.

Keywords: Building cleaners, Elderly workers, Female workers, Accident analysis

1. Introduction

The Korean Standard Classification of Occupations (Statistics Korea, 2007) defines a building cleaner (hereinafter including a janitor) as a person cleaning and tidying up inside a public building, an office building, a commercial building, and an APT building. The Korean Dictionary of Occupations defines a building cleaner as a person cleaning the inside and outside of an office building, a public building, and an APT building. A building cleaner is classified as a simple laborer. A building cleaner refers to a person who cleans the inside and outside of a building including buildings, shopping malls, and apartment buildings using water and cleaning detergents and also a person who even polishes a building depending on the situation.

Copyright©2017 by Ergonomics Society of Korea. All right reserved.

© This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0/>), which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

According to the Korea Building Owners and Managers Association, the building cleaners are directly managed by building owners or managed by entrusted cleaning companies through signing a service/entrustment contract between a building owner and a professional cleaning company. In Korea, 634,491 workers worked at 14,770 businesses as of 2016 (Table 1). Full-time workers accounted for 86.3%, day workers 9.59%, and temporary workers 4.11%. Therefore, professional cleaning companies' full-time workers took up most of the entire percentage. According to gender, females took up 67%. Regarding age, the building cleaners younger than 50 took up 6%, those aged 50~69 took up 48%, those aged 60~69 took up 37%, and those aged 70 or older took up 9%. The building cleaners aged 50 or older thus accounted for 94% of the total cleaning workers. The elderly female workers were intensively distributed in the building cleaning work (KABM, 2016).

A building cleaner carries out cleaning work to shape the pleasant environment in and outside of buildings or apartment buildings. The major duties of a building cleaner includes cleaning floors, corridors, ceilings, walls, structures, windows, stairs, toilets, and outer spaces, and also segregating garbage collection, and building floor waxing. Building cleaners have a very high risk of slipping or tripping on the slippery floor or stairs, according to the use of water or cleaning detergents in view of the work characteristics (HSE, 2005). They have a risk of falling due to the use of a chair or ladder while working on high places including ceiling, wall, and window. They are also exposed to an electrocution risk, owing to the unskilled use of machines and equipment for cleaning such as a floor grinder or insufficient electric insulation. Concerning garbage segregation, the building cleaners have a very high risk of being cut or getting pricked by broken glass or a sharp object, and may have a backache carrying waste and cleaning gear. In the case of floor cleaning or waxing, lots of chemicals are used, and detergents for cleaning and foam oil and polish are used for floor waxing; therefore, they are exposed to health disorder risks (Cal/KOSHA, 2005; Charles et al., 2009; EU-OSHA, 2009; Gao and Abeysekera, 2004; Goggins, 2007; KOSHA, 2011; OSHA, 2012; Wolkoff et al., 1998; Zock, 2005).

Among the accidents occurring in Korea in 2016, the service industry accounted for 32.75%, which was higher than Korea's representative industries - manufacturing and construction (Table 1). The accidents in the building management industry, a part of the service industry to which building cleaners belong, took up 12.28%, which was the third highest industry following food and lodging, and wholesale and retail (Table 2). The accidents of building cleaners took up 1.81% of the total accidents, 5.52% of the accidents in the service industry, and 44.97% in the building management industry. Actually, efforts to prevent the accidents of building cleaners are deemed highly necessary.

Table 1. Number of accidents by the type of industry in Korea in 2016

Division	Manufacturing	Construction	Service	Others	Total
Number of accidents (%)	26,142 28.84%	26,570 29.31%	29,692 32.75%	8,282 9.1%	90,656 100%

Table 2. Number of accidents by service industry in Korea in 2016

Division	Food and lodging	Wholesale and retail	Building management	Health and social welfare	Hygiene and similar service	Education service	Others	Total
Number of accidents (%)	9,393 31.63%	5,704 19.21%	3,645 12.28%	2,850 9.6%	2,035 6.85%	1,318 4.44%	4,747 15.99%	29,692 100%

An industrial accident analysis is an essential process to establishing systematic prevention measures against accidents. The recent efforts to prevent accidents have taken the direction of analyzing accident characteristics by job type, rather than by industry, and

thus the efforts are changing to a trend to establishing prevention measures by job type (Ahn et al., 2006; Cho and Jeong, 2013; Lee, 2012). This study aims to systematically analyze accident characteristics by the job type of the building cleaner and to present measures to prevent accidents.

2. Methods

2.1 Data collection

This study targeted 1,645 injured building cleaners approved of work-related injuries requiring four days or more of recuperation in 2015. Table 3 shows the distribution of the injured persons as the subjects in this study. Regarding gender distribution, 86.1% and 13.9% of the total injured persons were females and males, respectively. 97.1% of the total injured persons were victims of accident, and 2.8% fell into illness. By gender, 93.9% of the males were involved in an accident and 6.1% in illness. 97.7% of the females were involved in an accident and 2.4% in illness. 97.7% of the females were involved in an accident and 2.4% in illness.

Table 3. Distribution of injured persons (unit: person, %)

Classification	Male		Female		Total	
	N	%	N	%	N	%
Accident	214	93.9%	1,384	97.7%	1,598	97.1%
Illness	14	6.1%	33	2.4%	47	2.8%
Total	228	13.9%	1,417	86.1%	1,645	100.0%

2.2 Data analysis

This study investigated differences according to gender by analyzing the characteristics of the injured persons (gender, age, work experiment, and working condition/employment type), company size, accident characteristics (day of the week, time of the day, accident type, agency of accident, injury type, injury level, and foregone working days). To compare the differences among the injured persons according to gender, the Chi-square test was used, and in doing so, $p=0.05$ was used.

3. Results

3.1 Analysis of injured persons' characteristics

3.1.1 Distribution of injured persons by company size

Table 4 shows the distribution of the injured persons (building cleaners) by company size. 24.6% of the total accidents occurred in the companies with less than 5 people, 38.5% at companies with 5~15 people, and 16.7% at companies with 16~29 people. Therefore 79.8% of the total accidents occurred in the companies with less than 30 people.

Differences were shown in the distribution of injured persons by company size according to gender ($\chi^2=14.738$, $p=0.005$). 72.4% of the injured males were from companies with less than 30 people, but 81.1% of the injured persons were females. With this, female workers' injury ratio from small-sized companies was higher.

Table 4. Distribution of injured persons by company size

Size (person)	Male		Female		Total	
	N	%	N	%	N	%
< 5	49	21.5%	356	25.1%	405	24.6%
5~15	70	30.7%	564	39.8%	634	38.5%
16~29	46	20.2%	229	16.2%	275	16.7%
30~49	26	11.4%	117	8.3%	143	8.7%
>= 50	37	16.2%	151	10.7%	188	11.4%
Total	228	100.0%	1,417	100.0%	1,645	100.0%

3.1.2 Distribution of injured persons by age

Table 5 shows the distribution of the injured persons by age. 29.8% of the total injured persons were injured younger than 60, 50.5% were 60~69, and 19.6% were older than 70. Therefore, 70.2% were 60 or older. Males aged 60 or older took up 69.8%, and females aged 60 or older took up 70.2%. At the significance level of 0.05, no statistical difference was shown in the distribution of the injured persons by age ($\chi^2=4.781$, $p=0.092$).

Table 5. Distribution of injured persons by age

Age	Male		Female		Total	
	N	%	N	%	N	%
< 60	69	30.3%	422	29.8%	491	29.8%
60~69	103	45.2%	728	51.4%	831	50.5%
>= 70	56	24.6%	267	18.8%	323	19.6%
Total	228	100.0%	1,417	100.0%	1,645	100.0%

3.1.3 Distribution of injured persons by work experience

Table 6 shows the distribution of the injured persons by work experience. The ratio of the injured with less than one year of work experience took up 56.2%. As work experience was longer, accident ratio decreased.

Table 6. Distribution of injured persons by work experience

Work experience	Male		Female		Total	
	N	%	N	%	N	%
< 6 month	102	44.7%	485	34.2%	587	35.7%
0.5~1 year	33	14.5%	302	21.3%	335	20.4%

Table 6. Distribution of injured persons by work experience (Continued)

Work experience	Male		Female		Total	
	N	%	N	%	N	%
1~2 years	42	18.4%	274	19.3%	316	19.2%
2~3 years	18	7.9%	138	9.7%	156	9.5%
> 3 years	33	14.5%	218	15.4%	251	15.3%
Total	228	100.0%	1,417	100.0%	1,645	100.0%

In the distribution of the injured persons by work experience according to gender, differences were revealed at a significance level of 0.05 ($\chi^2=11.487$, $p=0.022$). Novice males with less than six months of work experience accounted for 44.7%, while novice females accounted for 34.2%; therefore, novice males' accident ratio was higher than that of novice females.

3.1.4 Distribution of injured persons by working condition

Table 7 shows the distribution of the injured persons by working condition (employment type) according to gender. Regular workers were 59.3% of the total injured persons, while temporary workers were 40.7%. The distribution of the injured persons by working condition according to gender showed statistically significant differences at a significance level of 0.05 ($\chi^2=6.298$, $p=0.012$). Temporary male workers took up 48.2%, while temporary female workers took up 39.4%. Temporary male workers' accident ratio was higher.

Table 7. Distribution of injured persons by working condition

Working condition	Male		Female		Total	
	N	%	N	%	N	%
Regular	118	51.8%	858	60.6%	976	59.3%
Temporary	110	48.2%	559	39.4%	669	40.7%
Total	228	100.0%	1,417	100.0%	1,645	100.0%

3.2 Analysis of accident characteristics

3.2.1 Distribution of injured persons by day of the week

Table 8 shows the distribution of the injured persons by day of the week. 19.8% of the total injured persons occurred on Monday, followed by on Tuesday (17.2%), Wednesday (15.6%), Thursday (14.7%), Friday (14.2%), Saturday (13.3%), and Sunday (5.2%). More accidents occurred during the beginning of the week, and relatively smaller accidents took place on Saturdays and Sundays. Distribution of the injured by day of the week according to gender showed no statistical difference at a significance level of 0.05 ($\chi^2=5.450$, $p=0.487$).

Table 8. Distribution of injured persons by day of the week

	Male		Female		Total	
	N	%	N	%	N	%
Mon	54	23.7%	272	19.2%	326	19.8%
Tue	37	16.2%	246	17.4%	283	17.2%
Wed	33	14.5%	224	15.8%	257	15.6%
Thu	37	16.2%	204	14.4%	241	14.7%
Fri	30	13.2%	204	14.4%	234	14.2%
Sat	23	10.1%	195	13.8%	218	13.3%
Sun	14	6.1%	72	5.1%	86	5.2%
Total	228	100.0%	1,417	100.0%	1,645	100.0%

3.2.2 Distribution of injured persons by time of the day

Table 9 shows the distribution of the injured persons by time of the day according to gender. 29.1% of the total injured persons occurred between 10:00 and 12:00, followed by 27.1% between 13:00 and 15:00, and 26.5% between 07:00 and 09:00.

Statistical differences at the significance level of 0.05 were shown in the distribution of the injured persons by time of the day according to gender ($\chi^2 = 17.394$, $p = 0.002$). Males' and females' accident rates at nighttime working hours were 17.1% and 11.9%, respectively, which shows a difference in accident ratio during the nighttime. Males' accident ratio between 07:00~09:00 was 16.7%, while females' was 28.1%, and thus there was a difference.

Table 9. Distribution of injured persons by time of the day

Time	Male		Female		Total	
	N	%	N	%	N	%
19~06	39	17.1%	157	11.1%	196	11.9%
07~09	38	16.7%	398	28.1%	436	26.5%
10~12	68	29.8%	410	28.9%	478	29.1%
13~15	67	29.4%	378	26.7%	445	27.1%
16~18	16	7.0%	74	5.2%	90	5.5%
Total	228	100.0%	1,417	100.0%	1,645	100.0%

3.2.3 Distribution of accident type

Table 10 shows the distribution of the injured persons by accident type according to gender. Out of the total injured persons, 79.1% were due to tripping, followed by falling (8.3%), being struck by something (6.3%), and excessive action (4.9%).

Statistical differences at the significance level of 0.05 were revealed in the distribution of the injured persons according to gender ($\chi^2=146.456$, $p<0.001$). Tripping (42.1%) was highest in males, followed by falling (20.2%), being struck by something (11.8%), and being cut/amputated/punctured (11.0%). Slipping took up most of the percentage at 76.7% among females.

Table 10. Distribution of injured persons by accident type

Accident type	Male		Female		Total	
	N	%	N	%	N	%
Slipping	96	42.1%	1,087	76.7%	1,183	71.9%
Falling	46	20.2%	90	6.4%	136	8.3%
Being struck by an object	27	11.8%	77	5.4%	104	6.3%
Excessive action	16	7.0%	65	4.6%	81	4.9%
Cuts/amputations/punctures	25	11.0%	32	2.3%	57	3.5%
Illness	14	6.1%	33	2.3%	47	2.9%
Others	4	1.8%	33	2.3%	37	2.2%
Total	228	100.0%	1,417	100.0%	1,645	100.0%

3.2.4 Distribution of injured persons by agency of accident

Table 11 shows the distribution of the injured persons by agency of accident according to gender. Of the total injured persons, 42.7% were injured on the floor (including ground) followed by on the stairs (25.5%), with a tool/facility (11.9%), and at a structure (5.7%).

The distribution of the injured persons by agency of accident according to gender showed statistical differences at the significance level of 0.05 ($\chi^2=129.511$, $p<0.001$). Males were injured on the floor (29.8%), with a tool/facility (18.4%), and on the stairs (12.7%),

Table 11. Distribution of injured persons by agency of accident

Agency	Male		Female		Total	
	N	%	N	%	N	%
Floor (including ground)	68	29.8%	635	44.8%	703	42.7%
Stair	22	9.6%	397	28.0%	419	25.5%
Tool/Facility	42	18.4%	154	10.9%	196	11.9%
Structure	19	8.3%	75	5.3%	94	5.7%
Ladder	29	12.7%	38	2.7%	67	4.1%
Elevator	12	5.3%	25	1.8%	37	2.2%
Others	36	15.8%	93	6.6%	129	7.8%
Total	228	100.0%	1,417	100.0%	1,645	100.0%

whereas females were injured on the floor (44.8%), on the stairs (28.0%), and with a tool/facility (10.9%). There were differences according to gender.

4. Conclusion and Discussion

Building cleaners (janitors) take up a high ratio in the service industry, with the ratio of elderly female workers being high. An analysis of the service industry jobs in which many elderly female workers work can be baseline data to establish a baseline policy for accident prevention reflecting weak elderly female workers' characteristics.

This study analyzed what accident characteristics are shown to building cleaners according to gender. According to the results of this study, the injuries to the building cleaners show different characteristics in terms of age, work experience, accident type, and agency of accident according to gender. Of the total injured persons, 70.2% were aged 60 or older by age, and 56.2% were unskilled workers with less than one year of work experience. By accident type, slipping took up 79.1%, and accidents on the floor (including ground) and stairs accounted for 68.2%; therefore, slipping while cleaning the floor or stairs occurred most of the time.

As for accident frequency in consideration of gender characteristics by each variable item, the accidents of slips during general cleaning, water cleaning, or waxing work on the floor (ground) or losing one's footing on the stairs mainly occurred among female building cleaners. Slips and falls mainly occurred among male building cleaners while they were cleaning, repairing, and maintaining by using a ladder or a tool in dangerous places, where females find it hard to work (this includes ceilings, walls, and structures, in addition to floor or stairs). Deaths or injuries were caused by slips, while elderly workers aged 60 or older were doing water cleaning stairs or waxing stairs through losing one's footing, or by falls while they were cleaning in a high place using a ladder.

This study suggests prevention measures by item as regards the items where accident frequency is high. The most frequently occurring accident to building cleaners is a slip. A slip occurs in three types: slipping and tripping while working on slippery floor using water, cleaning detergents or wax, tripping by an obstacle, and losing one's footing while cleaning stairs. To prevent a slip during water cleaning or waxing, slip-prevention material construction is recommended to elevate floor friction coefficient. Cleaners need to wear boots against slip and tidy up things in order not to trip over something. A slip warning sign should be posted, and an action including access prohibition except for cleaners needs to be taken. To prevent a slip on a stair, slip-prevention material needs to be attached to the end of each stair. By avoiding top-down moving method and by using bottom-up movement, cleaners need to work in a posture watching the front, and they should not move by stepping backward.

To prevent a fall during cleaning work in high places, a movable scaffolding system equipped with safety rail should be used. In using A-shaped ladder, ladder safety measures should be consolidated, such as a locking system to prevent a ladder's gap from widening, and slip-prevention action. When working on the top of a ladder, at least three body parts, namely the hand, arm, and elbow, should be contacted, and cleaners should not use a chair with wheels.

To prevent being pricked and being cut while segregating garbage, the workers need to wear gloves and check the content of garbage. For the prevention of health disorders due to handling chemicals such as cleaning detergents and wax used in cleaning, MSDS needs to be placed in the workplace, and education on hazards or cautions should be offered. When a cleaner puts a material in another vessel, the material's name should be marked on the vessel to avoid misuse.

When a floor grinder, water vacuum cleaner, and auto floor washing apparatus are used, a cord reel attached with a short circuit breaker needs to be used in order to control the cord and prevent electric shock by short circuit since there is a danger of tripping by the cord or a risk of an electric shock accident.

This study implies that customized accident prevention measures are needed because different characteristics are shown among injured persons and accident characteristics according to gender. Females took up 67%, and males took up 33% of the total building cleaners; however, 86.1% were female injured persons and 13.9% were male injured persons, which implies that females are significantly vulnerable to accidents. From the work intensity aspect, mainly males carry out difficult work including work in high places where females find it hard to work; therefore, females' vulnerability to accidents is much higher. The reason is partly derived from the physical characteristics of elderly females aged 60 or older, which include weakening muscle strength. Therefore, it was verified that differentiated responses among female workers are needed in establishing accident prevention measures.

This study is meaningful in that the accident characteristics of male and female building cleaners were analyzed targeting the accidents of the building cleaners causing 4 or more days of recuperation. The study results are presumed to be used as baseline data to present a policy or guidelines to prevent accidents caused to building cleaners. However, there is a limitation that only simple accident-related characteristics associated with building cleaners were analyzed. In this regard, a further study needs a systematic approach including risk evaluation using the characteristics of accident frequency and/or intensity.

References

- Ahn, T.H., Kim, J.S. and Jeong, B.Y., Ergonomic job hazard assessment of hotel chef. *Journal of the Ergonomics Society of Korea*, 25(3), 105-111, 2006.
- Cal/OSHA, *Working Safer and Easier: for Janitors, Custodians, and Housekeepers*, 2005. https://www.dir.ca.gov/dosh/dosh_publications/janitors.pdf
- Charles, L.E., Loomis, D. and Demissie, Z., *Occupational hazards experienced by cleaning workers and janitors: a review of the epidemiologic literature*. *Work*, 34(1), 105-116, 2009.
- Cho, K.S. and Jeong, B.Y., Lead Exposure Indices, Workloads, and Environmental Factors in Battery Manufacturing Workplace. *Journal of the Ergonomics Society of Korea*, 32(3), 259-266, 2013.
- EU-OSHA, *Preventing harm to cleaning workers*, EU-OSHA, 2009. <https://osha.europa.eu/en/tools-and-publications/publications/reports/TEWE09006ENC>
- Gao, C. and Abeysekera, J., *A systems perspective of slip and fall accidents on icy and snowy surfaces*. *Ergonomics*, 47(5), 573-598, 2004.
- Goggins, R., *Hazards of Cleaning*. *Professional Safety*, 52(3), 20-27, 2007.
- HSE, Slips and trips: *The importance of floor cleaning*, 2005. <http://www.hse.gov.uk/pubns/web/slips02.pdf>
- KABM (Korea Association of Building Management), *16 years of building management business*, 2016. www.kabm.orghttp://www.kabm.org/info/info05.asp
- KOSHA, *Building Management Business, Safety and Health a Guide*, 2011, <http://guide.kosha.or.kr/guide/content.do?menuId=7102>
- Lee, K.T., The characteristics of industrial accidents in shipbuilding industry. *Journal of the Ergonomics Society of Korea*, 31(1), 137-142, 2012.

OSHA, *Protecting Workers Who Use Cleaning Chemicals*, 2012. <https://www.osha.gov/Publications/OSHA3512.pdf>

Statistics Korea. *Korean Standard Classification of Occupations*, 2007. http://kostat.go.kr/e_book/kssc/KSCO07/EBook.htm

Wolkoff, P., Schneider, T., Kildesø, J., Degerth, R., Jaroszewski, M. and Schunk, H., Risk in cleaning: chemical and physical exposure. *Science of the Total Environment*, 215(1), 135-156, 1998.

Zock, J.P., World at work: cleaners. *Occupational and Environmental Medicine*, 62(8), 581-584, 2005.

Author listings

Chang Lyul Choi: chang9661@naver.com

Highest degree: PhD candidate, Department of Industrial Safety, Korea National University of Transportation

Position title: Director, Dongbu Branch, Gyeongbuk, KOSHA

Areas of interest: Safety and Health Management