

## Improvement Plans and Analysis on Correlation of Kindergarten Teacher's Fire Safety Management According to Institution Types

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**Abstract:** This research proposed improvement plans on fire safety management based on correlation analysis and analysis result of fire safety management according to infant institution types. According to the analysis result there were significant difference on fire extinguisher, exit sign and emergency broadcast facilities according to work institutions. It is because some private kindergartens founded before 2005 are located in shopping district buildings or do not satisfy regulations on kindergarten installation criteria. Proposing improvement plans based on survey analysis results from research result is as follows. First, fire extinguisher is a crucial fire-fighting facility that extinguishes fire in the early stage of fire. Thus, the installation of fire extinguishers in every room through strict control is necessary. Second, the percentage of women takes up the majority of teachers working in kindergartens, it is especially important to reinforce training on how to use fire extinguishers and standpipe and hose stations. Finally, it is necessary to expand the installation of self contained type fire alarm to the whole kindergarten.

**Key words:** Kindergarten, fire safety management, fire prevention facilities, fire extinguisher, standpipe and hose station

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### INTRODUCTION

The importance of teacher's knowledge on safety and disasters and ability to react in kindergartens can be emphasized. Yet above all, considering that most teachers are struggling with lack of knowledge on infant safety, the importance of accident prevention through thorough safety training should be emphasized.

Above all, fire accident should be given attention since not only does it have great impact on a child's physical and mental health but it can also take away life in a split second. Especially, Sealand fire incident, Daegu subway arson incident and other big fire accidents after the 1990s tell us the importance of fire safety management in provision of fire accidents.

Considering the insufficiency of infant's safety management and ability to react to disasters, it could be understood that in addition to safety training in provision of fire, proper awareness of fire prevention safety and strict control to prevent fire accident are needed. In order to do so, installation state of fire prevention facilities,

inspection state and others should be taken care of. As kindergarten teachers are in charge of lives and safety of infants, the necessity of this research can be suggested to provide actual fire safety management that is necessary for infants by examining understanding of fire prevention safety management among teachers.

The researches on kindergarten fire safety were organized as follows. Park (2009) figured out the problems and weak points of escape safety through comparison analysis on national and foreign legislations on kindergarten fire safety and analysis and reality investigation on emergency risk facilities installation status.

Seo *et al.* (2009) pointed out in a study on kindergarten safety prevention installation and fire safety awareness conducted on kindergartens in Daegu that theoretical education through educational brochures was the main part of monthly fire safety education and refuge training.

Yun (2016) pointed out in a study on fire safety education system conducted on kindergarten teachers

and principals in Cheonan and Asan that children’s fire safety education system and program by professionals that can be used for fire safety education in provision of fire by kindergarten teachers is needed.

Rhee (2013) compared and analyzed the criteria for kindergarten interior space design and fire extinguishing facilities in the United States and Korea. She pointed out that Korea as less interior activity space and childcare rooms are not naturally ventilated.

Lee (2001) suggested the need of facility design taking fire safety into account from the designing state of a kindergarten, in a study on fire safety assessment on public kindergartens in Seongnam (Lee, 2001).

Choi (2002) proposed that kindergartens with teachers who have not received fire safety education was 24%, kindergartens which does not address fire safety education in parents education was 78% in a study on fire prevention facilities and fire safety education conducted on principals of district kindergartens in Seoul

It was shown from researches mentioned above that researches on kindergarten fire facilities management and safety awareness examination are taking place but most of them were visiting research and literature research analyzing legislation and studies about fire safety management on teachers who will actually instruct children in case of fire in a kindergarten were lacking. Even if there were researches on kindergarten teachers they were mostly about public kindergartens and researches on private kindergartens where most infants go to are insufficient and the objects of researches were limited to only certain areas. This research attempts to supplement such limitations of precedent researches and investigate contents on fire safety management on different types of kindergarten teachers in major cities all over the country including those from private kindergartens. This study is significant that it then attempts to look for actual requirements of kindergarten fire safety management by studying the investigation and finally find an improvement plan.

**MATERIALS AND METHODS**

This research combined literature review and survey stand. First of all, literature review on the definition of kindergarten and kindergarten fire safety legislations, precedent researches on kindergarten teachers about fire safety was taken place and then the information was reorganized. Next, the surveys consisting of questions about fire safety conducted by Yun (2016) and Choi (2002) were edited and supplemented according to this research and was carried out to teachers in

15 kindergartens in Seoul, Daegu, Daejeon, Gwangju, Cheongju, Choongcheongbuk-do, Gyeongsangbuk-do, Jeollabuk-do (Yun, 2016; Choi, 2002).

**RESULTS AND DISCUSSION**

Table 1 shows current state of installation of fire prevention facilities in kindergartens. Table 2 shows fire safety management and awareness of kindergartens. Table 3 shows correlation analysis of fire safety management by institution types (i.e., company, private and home institutions). Table 4 shows no correlation of kindergarten fire safety management by area type.

Table 1: Current state of installation of fire prevention facilities in kindergartens

Variables	Parameters	Frequency	Percent
Extinguishers	<b>An extinguisher in each room</b>		
	Yes	126	96.9
	No	4	3.1
	<b>Quantities on each floor</b>		
	1~3	38	45.8
	4~7	14	16.9
	8~11	15	18.1
	12 or more	16	18.3
	<b>How to use an extinguisher</b>		
	Aware	95	81.9
	Unaware	21	18.1
	<b>Visibility of extinguishers</b>		
	Yes	126	81.9
No	21	18.1	
Standpipe and hose stations	<b>These stations on each floor</b>		
	Yes	106	84.8
	No	19	15.2
	<b>How to use these stations</b>		
	Yes	87	59.3
Sprinkler systems	<b>These systems on each floor</b>		
	Yes	110	87.3
	No	16	12.7
Fire detectors	<b>Fire detectors on each floor</b>		
	Yes	116	95.1
	No	6	4.9
	<b>Fire detectors in a staffroom</b>		
	Yes	113	92.6
	No	9	7.4
	<b>Visibility of fire detectors</b>		
	Yes	90	79.6
	No	23	20.4
Emergency PA systems	<b>PA in a staff (admin.) room</b>		
	Yes	100	81.3
	No	23	18.7
Emergency lights	<b>These lights on each floor</b>		
	Yes	120	96.0
	No	5	4.0
Exit lamps and exit sign lamps	<b>These lamps on each floor</b>		
	Yes	124	97.6
	No	3	2.4
	<b>Exit sign lamps above exits</b>		
	Yes	118	93.7
Self-contained type fire alarms	<b>These alarms on each floor</b>		
	Yes	102	83.6
	No	20	16.4
Evacuation (the 2nd floor or higher)	<b>Rescue/descent devices/slides</b>		
	Yes	99	88.4
	No	13	11.6

Table 2: Fire safety management and awareness of kindergartens

Variables	Details	Frequency	Percent
Exit signs	<b>Operability checks</b>		
	Yes	108	88.5
	No	14	11.5
	<b>The number of times</b>		
	Once a month	66	58.4
	Once in 3 months	36	31.9
	Once in 6 months	4	3.5
	Once a year	3	2.7
	Never in a year	4	3.5
Exits (for emergency)	<b>Function, security etc., checks</b>		
	Yes	119	98.3
	No	2	1.7
	<b>The number of times</b>		
	Once a month	75	65.2
	Once in 3 months	29	25.2
	Once in 6 months	9	7.8
	Once a year	1	0.9
	Never in a year	1	0.9
Exit conditions (surroundings)	<b>Obstacle checks</b>		
	Yes	122	96.8
	No	4	3.2
	<b>The number of times</b>		
	Once a month	74	62.2
	Once in 3 months	39	32.8
	Once in 6 months	5	4.2
	Once a year	0	0.0
	Never in a year	1	0.8
Extinguishers	<b>Location checks</b>		
	Yes	124	97.6
	No	3	2.4
	<b>The number of times</b>		
	Once a month	92	77.3
	Once in 3 months	22	18.5
	Once in 6 months	5	4.2
	Once a year	0	0.0
	Never in a year	0	0.0
Bells or sirens (for emergency)	<b>Regular sound checks</b>		
	Yes	104	82.5
	No	22	17.5
	<b>The number of times</b>		
	Once a month	59	52.2
	Once in 3 months	35	31.0
	Once in 6 months	4	3.5
	Once a year	8	7.1
	Never in a year	7	6.2
PA systems (for emergency)	<b>Failure checks</b>		
	Yes	94	81.7
	No	21	18.3
	<b>The number of times</b>		
	Once a month	53	48.6
	Once in 3 months	32	29.4
	Once in 6 months	9	8.3
	Once a year	6	5.5
	Never in a year	9	8.3
Gas leak alarms (circuit breakers)	<b>These systems in the kitchen</b>		
	Yes	119	96.7
	No	4	3.3
	<b>The number of times</b>		
	Once a month	78	67.2
	Once in 3 months	27	23.3
	Once in 6 months	2	1.7
	Once a year	9	7.8
	Never in a year	0	0.0

Table 3: Correlation analysis of kindergarten fire safety management by institution type: a cross check

Variables	Frequency (%)	Institution types			Total	Q ( $\chi^2/df$ )	CR (p-value)
		Company	Private	Home			
<b>Exit signs</b>							
Yes	Frequency	10	95	2	107	7.286	0.026*
	Type/total	9.3	88.9	1.9	100.0		
No	Frequency	2	9	2	13		
	Type/total	15.4	69.2	15.4	100.0		
	Total frequency	12	104	4			
	Type/total	10.0	86.7	3.3	100.0		
<b>Exits (for emergency)</b>							
Yes	Frequency	11	102	4	117	3.596	0.166
	Type/total	9.4	87.2	3.4	100.0		
No	Frequency	1	1	0	2		
	Type/total	50.0	50.0	0.0	100.0		
	Total						
	Frequency	12	103	4	119		
	Type/total	10.1	86.6	3.4	100.0		
<b>Exit conditions (surroundings)</b>							
Yes	Frequency	11	101	8	120	1.308	0.520
	Type/total	9.2	84.2	6.7	100.0		
No	Frequency	1	3	0	4		
	Type/total	25.0	75.0	0.0	100.0		
	Total						
	Frequency	12	104	8	124		
	Type/total	9.7	83.9	6.5	100.0		
<b>Extinguishers</b>							
Yes	Frequency	10	104	8	132	11.563	0.003**
	Type/total	8.2	85.2	6.6	100.0		
No	Frequency	2	1	0	3		
	Type/total	66.7	33.0	0.0	100.0		
	Total						
	Frequency	12	105	8	125		
	Type/total	9.6	84.0	6.4	100.0		
<b>Bells or sirens (for emergency)</b>							
Yes	Frequency	8	91	5	104	4.033	0.133
	Type/total	7.7	87.5	4.8	100.0		
No	Frequency	4	14	2	20		
	Type/total	20.0	70.0	10.0	100.0		
	Total						
	Frequency	12	105	7	124		
	Type/total	9.7	84.7	5.6	100.0		
<b>PA systems (for emergency)</b>							
Yes	Frequency	8	84	2	94	6.298	0.043*
	Type/total	8.5	89.4	2.1	100.0		
No	Frequency	4	13	2	19		
	Type/total	21.1	68.4	10.5	100.0		
	Total						
	Frequency	12	97	4	113		
	Type/total	10.6	85.8	3.5	100.0		
<b>Gas leak alarms (circuit breakers)</b>							
Yes	Frequency	12	99	6	117	3.093	0.213
	Type/total	10.3	84.6	5.1	100.0		
No	Frequency	0	3	1	4		
	Type/total	0.0	75.0	25.0	100.0		
	Total						
	Frequency	12	102	7	121		
	Type/total	9.9	84.3	5.8	100.0		

The signification level: \*,\*\*<0.05 and 0.01

Table 4: Correlation analysis of kindergarten fire safety management by area type: a cross check

Variables	Frequency (%)	Area types			Q ( $\chi^2/df$ )	CR (p-value)
		Urban	Rural	Total		
<b>Exit signs</b>						
Yes	Frequency	82	25	107	0.026	1.000
	Type/total	76.6	23.4	100.0		
No	Frequency	11	3	14		
	Type/total	78.6	21.4	100.0		
Total		Frequency	93	28	121	
		Type/total	76.9	23.1	100.0	
<b>Exits (for emergency)</b>						
Yes	Frequency	91	27	118	0.590	0.980
	Type/total	77.1	22.9	100.0		
No	Frequency	2	0	2		
	Type/total	100.0	0.0	100.0		
Total		Frequency	93	27	120	
		Type/total	77.5	22.5	100.0	
<b>Exit conditions (surroundings)</b>						
Yes	Frequency	92	29	121	1.407	.257
	Type/total	76.0	24.0	100.0		
No	Frequency	2	2	4		
	Type/total	50.0	50.0	100.0		
Total		Frequency	94	31	125	
		Type/total	75.2	24.8	100.0	
<b>Extinguishers</b>						
Yes	Frequency	93	30	123	.126	1.000
	Type/total	75.6	24.4	100.0		
No	Frequency	2	1	3		
	Type/total	66.7	33.3	100.0		
Total		Frequency	95	31	126	
		Type/total	75.4	24.6	100.0	
<b>Bells or sirens (for emergency)</b>						
Yes	Frequency	75	28	103	0.771	0.425
	Type/total	72.8	27.2	100.0		
No	Frequency	18	4	22		
	Type/total	81.8	18.2	100.0		
Total		Frequency	93	32	125	
		Type/total	74.4	25.6	100.0	
<b>PA systems (for emergency)</b>						
Yes	Frequency	70	23	93	0.306	0.778
	Type/total	75.3	24.7	100.0		
No	Frequency	17	4	21		
	Type/total	81.0	19.0	100.0		
Total	Frequency	87	27	114		
	Type/total	76.3	23.7	100.0		
<b>Gas leak alarms (circuit breakers)</b>						
Yes	Frequency	87	31	118	0.003	0.719
	Type/total	73.7	26.3	100.0		
No	Frequency	3	1	4		
	Type/total	75.0	25.0	100.0		
Total		Frequency	90	32	122	
		Type/total	73.8	26.2	100.0	

The significance level: \* $<0.05$

### CONCLUSION

This study analyzed current state of installation of fire protection systems in a kindergarten and awareness of current state of fire safety management in the kindergarten. This study also analyzed correlation of fire safety management in a kindergarten depending on type of facility and region. The results are as the following. In regard to current state of fire safety management in

kindergartens, it appeared that sprinkler system, emergency PA system and installation of self contained type fire alarm are relatively insufficient. Also as a result of awareness of current state of fire safety management, regular inspection on exit sign, emergency exit and the surroundings, fire extinguisher, emergency bell and emergency PA system is done well while regular inspection on emergency PA system and emergency bell showed relatively insufficient. In correlation with fire

safety management depending on type of facility there was a meaningful difference depending on working organizations in case of fire extinguisher, emergency exit and emergency PA system. Through this, we can recognize the importance of management of fire extinguisher, emergency exit and emergency PA system. This is because there are kindergartens which are located in a commercial building or do not satisfy the standards of kindergarten installation related law in case of those established before 2005.

### **SUGGESTIONS**

Suggested improvement plan based on survey results analysis shown in study results is as follows. First, there is a need to thoroughly manage fire extinguishers (Choi *et al.*, 2015). Second, it is necessary to strengthen education on the instructions about fire protection systems (Shin *et al.*, 2015). Finally, there is a need to expand installation of self-contained type fire alarm.

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