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A Research on the Fire Safety for the Elderly Care Facilities in Japan

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Abstract In Japan, there are over the 100's fires in the social welfare organs every years. People are interested in fire protection who live in an institution for the aged or weak person's places and worried about it. I surveyed the social welfare organs were safety from fire to firewarden who worked at an institution for the aged in Tokyo. In the paper, I asked how do you think about the fire safety problems and condition of the facilities. And base on firewarden's view, I reviewed(examined) the fire prevention measures, each facility's problems and how to improve the fire protection.

Keywords: Fire Safety, Elderly Care Facilities, Special Nursing Home

1. INTRODUCTION

1.1 Background and Purpose

Japan is turning into a rapid aging society, and its elderly population 65 years old or older occupies more than 20% of its total population. It is expected that a new aging will make progress in Japan also from now on. Hereupon, the elderly who need care of facilities are on the rise in the super aging society, and the facilities in charge of welfare of the elderly are being built one by one. Going with it, it is worried that a situation in which one fire leaves many dead or injured might occur.

Currently, in Japan, over 100 cases of fire occur at social welfare facilities every year, and the burden of carers gets bigger in the super aging society. It is needed to consider a measure on fire prevention and safety in addition to general work in the facilities in which many who are week to disasters reside such as special nursing homes for the aged.

This study aims to grasp what measures are taken to what extent, the realities of fire prevention measures and the tasks of each facility from the viewpoint of the person in charge of fire prevention management on the basis of a survey and to thereby obtain knowledge and wisdom for thinking of effective fire prevention and safety measures in the welfare facilities for the elderly playing an important role in the super aging society that is expected to make new progress from now on.

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1.2 Methods and Procedure

Before the survey, previous studies were arranged and referred to, and the details are as follows.

This study conducted a survey on fire prevention and safety with welfare facilities for the elderly within Tokyo (special nursing homes for the aged, nursing homes for the aged, elderly homes with reduced fees) and totaled and analyzed the results and thereby grasped the realities of fire prevention measures of welfare facilities for the elderly.

Murai	Conducts a survey with special nursing homes for the aged and care and welfare facilities for the elderly nationwide. Obtains knowledge and wisdom for considering effective evacuation plans such as disaster drills, construction plans and so on.
Hirabuki	Conducts a hearing and a survey with special nursing homes for the aged. Obtains knowledge and wisdom for establishment of effective evacuation measures such as evacuation instruments, balcony, horizontal escape and so on.
Fujimoto	Analyzes the data on recent trends of fire and scale and shape of facilities in medical and welfare facilities. Shows a variety of scale and shape of facilities and thereby indicates that there are fire damages occurring regardless of scale.
Toyama	Organizes the points in making private rooms and unit care through the examination on behavior of residents and employees in special nursing homes for the aged and health services for the elderly. Obtains basic data in reviewing establishment and operation of special nursing homes for the aged and so on.

2. REALITIES OF WELFARE FACILITIES FOR THE ELDERLY

2.1 Realities of Aging Society

Among the elderly population, those who are 65 years old or older and 74 years old or younger will see its peak at 17.44 million in 2016 after [the generation who was born in around 1948] turns an old age. Next, it is estimated that they will have a trend to decline until 2032 but will increase again after that and reach 16.69 million in 2041 and then will decline after that.

Meanwhile, it is forecasted that those who are 75 years old or older will continue to increase and top those who are 65 years old or older and 74 years old or younger in 2017 and will have a trend to increase continuously even after that. Thus, it is viewed that the ratio of those who are 75 years or older will be greater in the increasing number of the elderly.

2.2 Special Nursing Homes for the Aged

Special nursing homes for the aged are welfare facilities for the elderly regulated by Article 20-5 of the Act for Welfare for the Elderly and aim to provide help in everyday life such as bathing, excretion, eating and so on, functional training, health management and nursing care to the elderly who are 65 years old or older with notable physical or mental disorder or need for regular care and difficulties in living at home. They are called designated care and welfare facilities for the elderly in the Act for Care Insurance.[1,2]

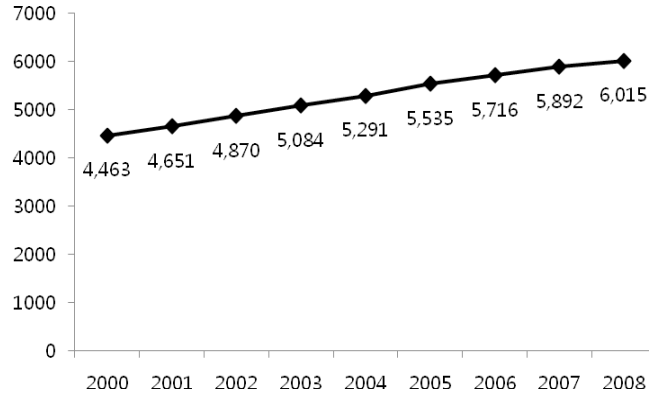


Figure 1. Number of Special Nursing Homes for the Aged[3]

Up until now, quads have been the main in the special nursing homes for the aged, but since 2002, the maintenance of new special nursing homes for the aged whose rooms are all private rooms and that provide unit care has been implemented. This is to plan the conversion from the care for treatment for groups into the care respecting the independence of individuals from the viewpoint that special nursing homes for the aged are [a place of living]. Its goal is to secure the living space that can maintain the privacy of individuals and to enable the residents to lead their lives and receive care in a more homely atmosphere at the same time.[4]

2.3 Nursing Homes for the Aged

Nursing homes for the aged are welfare facilities for the elderly regulated by Article 20-4 of the Act for Welfare for the Elderly and aim to have and provide care to the elderly who are 65 years old or older with difficulties in living at home by physical, mental, environmental or economic reason. Since 2006, [physical or mental] reason was excluded from those reasons.[1,2]

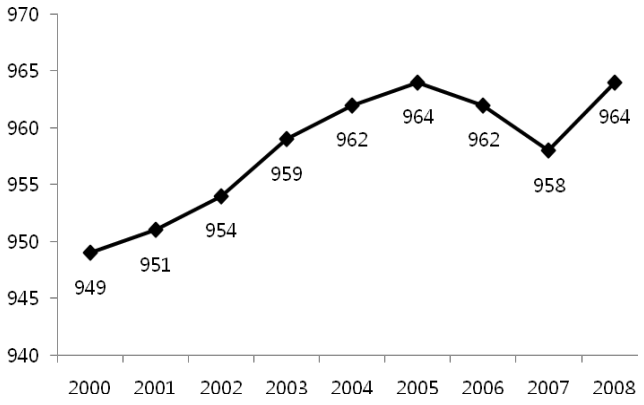


Figure 2. Number of Nursing Homes for the Aged[3]

2.4 Elderly Homes with Reduced Fees

Elderly homes with reduced fees are welfare facilities for the elderly regulated by Article 20-6 of the Act for Welfare for the Elderly, and the elderly with difficulties in living in a house for reasons such as family background, housing circumstances and so on can enter these facilities and receive conveniences needed in every day life such as provision of meals and so on.[1,2]

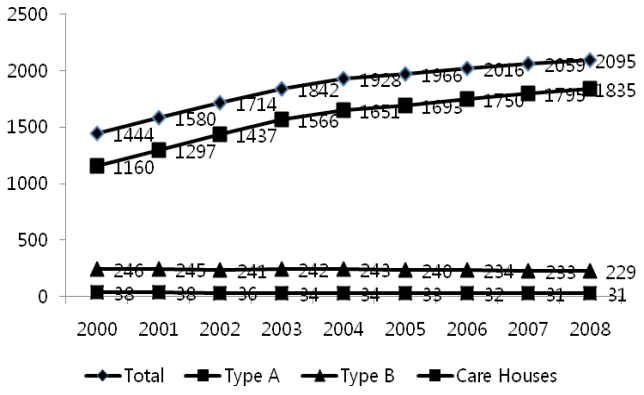


Figure 3. Number of Elderly Homes with Reduced Fees[3]

'Care houses' which provide living consultation, bathing service, meal service and a structure caring those living with a wheelchair are the main kind, and there also are [Type A] which provides meals or convenience needed in daily life and [Type B] with the principle of cooking for oneself.

[1] Act for Welfare for the Elderly, Law No. 133, July 11th, 1963

[2] Japanese Council of Senior Citizens Welfare Service; http://www.roushikyo.or.jp/jsweb/html/public/

[3] Ministry of Health, Labour and Welfare, Overall Condition of Results of Examination of Care Service Facilities and Businesses;
2008:http://www.mhlw.go.jp/toukei/saikin/hw/kaigo/service08/index.html
2006:http://www.mhlw.go.jp/toukei/saikin/hw/kaigo/service06/index.html
2005:http://www.mhlw.go.jp/toukei/saikin/hw/kaigo/service05/index.html

[4] Ministry of Health, Labour and Welfare, Ver. 2002 [Health, Labour and Welfare White Paper, Chapter 10]

2.5 Welfare Facilities for the Elderly in Tokyo

The number of facilities and residents (as of 2009) of special nursing homes for the aged, nursing homes for the aged and elderly homes with reduced fees in Tokyo which is the subject of survey of this study are as follows.

Special nursing homes for the aged in Tokyo have the largest number of facilities and capacity in Japan, and those who are waiting to enter special nursing homes for the aged in Tokyo are 43,746 (December 2009) and are the largest in Japan showing a great difference from the number of those waiting in Hyogo, 25,100, which is the second largest. [5]

Table 1. Number of Welfare Facilities for the Elderly in Tokyo (2009)[5]

	Number of Facilities	Capacity
Special Nursing Homes for the Aged	395	34,597
Nursing Homes for the Aged	32	3,904
Elderly Homes with Reduced Fees : Type A	9	660
: Type B	4	250
Care Houses	37	1,857

3. FIRE DAMAGES IN JAPAN

3.1 Realities of Fire

In view of the fluctuations of number of fire cases since 1999 until 2009, the number declined since 2002 in which it recorded 63,651, and the number of fire outbreak cases in 2009 was 51.139. In addition, the death toll by fire has shown a constant decrease since 1999.

In view of the realities of occurrence of death by fire by age, the number of the elderly 65 years old or older is 777 (59.8%). In view of the details of occurrence of death per 100 cases of fire in 2009 by time zone, the occurrence increases since 10 pm until 6 am the next morning, and the average death toll per 100 cases of fire in the same time zone is 6.8 which is 1.87 times of 3.7, the average of all the time zones.

In addition, in view of the cause of fire outbreak (data of 2009), incendiary fire is the highest of 6,615 cases out of total 35,820 cases, and has increased by 219 cases (3.4%) compared with the previous year (6.396 cases). [6]

3.2 Building Fire

In view of ratio of fire outbreak in 2009, building fire occupied 55.5% as the highest, and the next was vehicles, forests and fields, ship and airplanes. This ranking has not changed since 1985. In addition, the death toll by building fire in 2009 was 1,352 and the number of injured was 6.594, and most casualties by fire are occurring by building fire.

[5] Bureau of Social Welfare and Public Health, Welfare Statistic of Tokyo, Annual Report on Welfare Statistics, Welfare for the Elderly, 2009

[6] Fire and Disaster Management Agency of Ministry of Internal Affairs and Communications, Fire Fighting White Paper 2010; http://www.fdma.go.jp/html/hakusho/h22/index.html

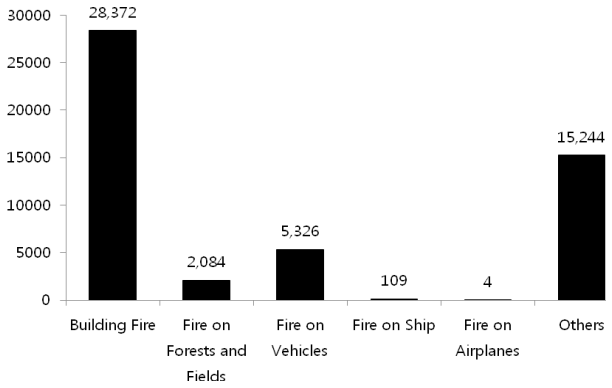


Figure 4. Number of Cases of Fire Outbreak by Kind of Fire in 2009[6]

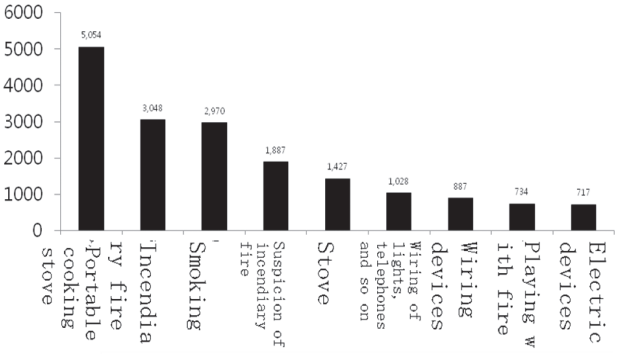


Figure 5. Main Causes of Fire Outbreak of Building Fire in 2009[6]

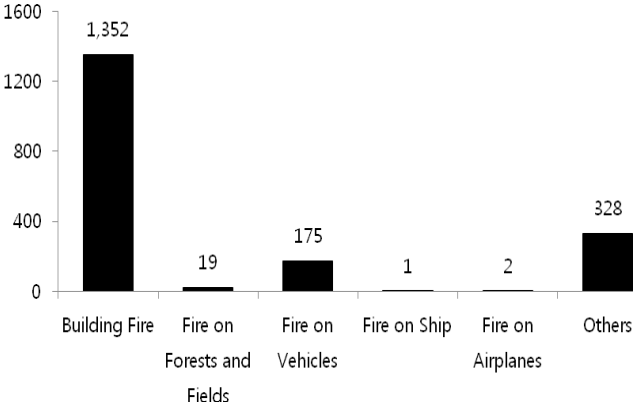


Figure 6. Death Toll by Kind of Fire in 2009[6]

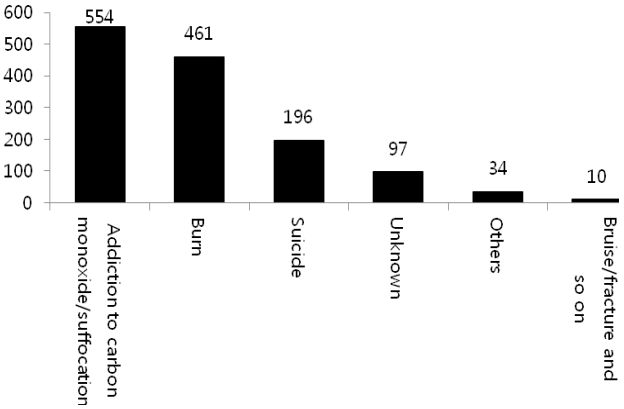


Figure 7. Causes of Death by Building Fire in 2009

3.3 Fire in Welfare Facilities for the Elderly

In view of the main fire cases by usage recorded in the Fire Fighting White Paper of the Fire and Disaster Management Agency of the Ministry of Internal Affairs and Communications, large-scale fire has decreased since the fire in Matuzyuen in 1987, but fire in small-scale facilities is still on the rise.[7]

Table 2. Main Fire Cases in Social Welfare Facilities and So on

	Place	Casualties (Dead/ Injured)
Feb 17th, 1898	Seibonosonoyourouin	99/9
Jan 14th, 1968	Minorigakuenkoyuriryou	6/-
Mar 20th, 1970	Izumirouzinhome	4/-
Mar 14th, 1973	Rouzinhomehigasimurayamabunin	2/-
Feb 8th, 1986	Toukoukaikusanagien	2/6
Jul 31st, 1986	Youkikaiyouykiryou	8/-
Feb 11th, 1987	Butusyouin	3/1
Jun 6th, 1987	Syouseikaimatuzyuen	17/25
Oct 5th, 1988	Yougomourouzinhomenasinokien	-/-
Jan 8th, 2006	Yasuragonosatosakurakan	7/3
Jun 2nd, 2008	Haimuhimawari	3/1
Nov 13th, 2008	Rokugounoyasiro	-/33
Dec 26th, 2008	ROSE-Kuraburuburai	2/3
Mar 19th, 2009	Seiyouhometamayura	10/1
Mar 13th, 2010	Grouphome-Miraitonden	·7/2

Table 3. Overview of Fire[8]

		Matuzyuen	Nasinokien
Date and TIme		23:20 June 6th, 1987	09:37 October 5th, 1988
Structure		3-storybuilding made off erroconcrete (fi–reproofconstruction)	2-story building of ferroconcrete (partial steel skeleton) (partial single story) and 2-story building of simple fireproof construction (partial single story)
Capacity	Residents	120	67
	Employees	27	20 (another 20 in the nearby Second Nasinokien)
Occupants at the Time of Fire Outbreak	Residents	74	67
	Employees	2	20
Cause		Suspicion of incendiary fire	They cut the intake duct during repair of the heating apparatus and thus flames impinged on the urathane foam inside the duct.
Casualties	Dead	17	-
	Injured	25	-

The Matuzyuen fire was found at an early stage by an automatic fire alarm equipment, but the early fire extinguishing failed and thus the smoke generated by fire expanded rapidly leading to death of those with difficulties in walking on the second floor.

This facility was suited to laws and ordinances in framing fire fighting plans, execution of evacuation training and so on, and there were enough fire prevention measures such as escape stairs, indoor fire hydrants, installation of emergency broadcasting facilities and so on. However, several issues were discovered after the fire.

① There was a slide established through which people could escape directly from the balcony, but there was a level difference between living room and balcony. ② The early fire extinguishing with fire extinguishers failed. ③ Those on night duty were two women who were weak. ④ The bedclothes in the Linen Room caught and thereby expanded fire.

This fire served as a momentum for some parts of the enforcement ordinance of the Act for Fire Fighting of social welfare facilities and hospitals to be revised, and the standard of establishment of sprinklers was reinforced from 6,000㎡ or more into 1,000㎡ of total floor space .

The fire at Nasinokien occurred in the morning when the employees usually work and the whole building was burned down, but the evacuee guidance was a success and thus there was no one dead or injured. In addition, their maintenance of emergency contact system with employees of the Second Nasinokien, local fire fighters and neighbors and the cooperation system of evacuee guidance and execution of constant comprehensive training made the safe evacuee guidance possible.

4. SURVEY

4.1 Overview of Survey

This survey was composed for special nursing homes for the aged, and the questionnaires were also distributed to nursing homes for the aged and elderly homes with reduced fees though the subjects were fewer. The survey was conducted since May 19th until June 30th, 2010, and the survey was conducted again since August 21st until September 19th in the same year to increase the reliability of survey. In addition, an additional survey on residents' living rooms (whether they have private rooms or not, whether unit care was employed or not and so oon) in the special nursing homes for the aged that made responses was conducted since October 7th until October 10th in the same year.

Table 4. Responses of Each Facility

	Number of Responses	Component Ratio
Special Nursing Homes for the Aged	108	87.1%
Nursing Homes for the Aged	11	8.9%
Elderly Homes with Reduced Fees	5	4.0%
Total	124	100%

In total, 463 questionnairs were distributed and among them, 127 questionnairs were returned, and there were 124 effective responses occupying 26.8% of the total.

7 Fire and Disaster Management Agency, Ministry of Internal Affairs and Communications, Fire Fighting White Paper 2009; http://www.fdma.go.jp/html/hakusho/h21/index.html

8 Institute for Fire Safety & Disaster Preparedness; http://www.bousaihaku.com/bousaihaku2/images/exam/pdf/c011.pdf http://www.bousaihaku.com/bousaihaku2/images/exam/pdf/c014.pdf

4.2 Analysis of Survey

4.2.1 System of Employees of Day and Night Shift

The number of residents in each facility was removed with the number of employees (the average including staff and part-time workers other than caring employees) for each time zone, and the number of residents per employee of each of day and night shift was calculated. The average of night shift was about 5 times of that of day shift, and the average of night shift of a facility was even about 20 times of that of day shift. The night shift of special nursing homes for the aged had the average of 16.56 and the maximum of 27.5, and though the trend of elderly homes with reduced fees could not be grasped because of the small number of population parameter, but the figure was similar to that of special nursing homes for the aged.

It is hard to objectively evaluate the current employee system because of several conditions to consider, but it is decided to tell the subjective evaluation of respondents in the following direction.

Table 5. Number of Residents of which One Employee Takes Charge in Each Facility

		Minimum	Maximum	Average
Special nursing homes for the aged (N=101)	D	0.67	9.17	2.69
	N	7.50	27.50	16.56
Nursing homes for the aged (N=11)	D	5.00	25.00	10.51
	N	30.00	100.00	54.58
Elderly homes with reduced fees (N=3)	D	0.67	12.00	4.94
	N	5.00	30.00	18.67

4.2.2 On Evacuation

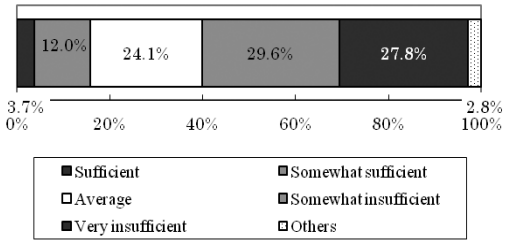
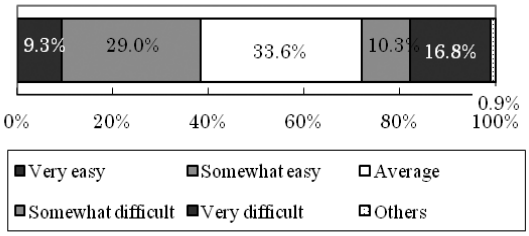


Figure 8. Degree of Substantiality of Evacuation System Supposing



the Time of Fire at Night (N=108)

Figure 9. Evacuation Safety of Buildings Supposing the Time of Fire at Night (N=107)

In order to secure safe evacuation at the time of occurrence of fire at night, how substantial the evacuation safety of the current system and buildings was subjectively evaluated. You can see that more than half of the respondents are dissatisfied with the system with 29.6% said 'somewhat insufficient' and 27.8% said 'very insufficient'. The responses 'sufficient' and 'somewhat sufficient' occupied 15.7% put together. In addition, the buildings were evaluated more highly with responses that said 'very easy' of 9.3% and 'somewhat easy' of 29.0% compared with the system . (Figure 8, Figure 9)

Moreover, for the question that looked for the issues in hardware in evacuation, the facilities that responded that 'there is no problem in evacuation in particular' occupied 34.7%. The responses that said 'others' which are minority and show the issues such as level difference, depth of balcony and so on had many opinions that said it is not realistic to let residents use the equipments for evacuation such as slides for evacuation and so on together with the responses that said the difficult part is the escape from the upper floors. (Figure 10)

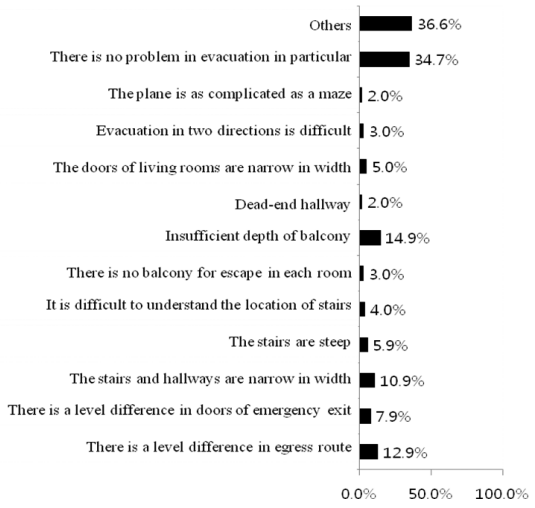


Figure 10. Problems in Evacuation in Buildings (N=101)

Furthermore, about the problems of evacuee guidance at the time of fire at night, the most responses that occupied 91.7% said that 'it takes time to guide residents with difficulties in escaping for themselves', and the second most response that said 'the number of the employees on night duty is small' occupied 75.0% and thus almost all facilities had a problem. There was only one facility that responded that 'there is no problem in evacuation in particular'. (Figure 11)

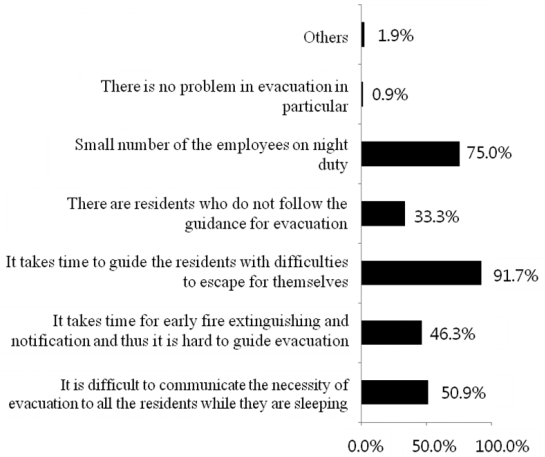


Figure 11. Problems in Evacuee Guidance at the Time of Fire at Night and So on (N=108)

Many special nursing homes for the aged established their services open to the local communities such as day service and etc. on the

first floor and the living rooms in upstairs, and this phenomenon occurs often in urban areas such as Tokyo and so on. In case when evacuee guidance using stairs for those with difficulties to escape for themselves is needed, at night the employees are insufficient and thus it is hard to make safe evacuation of everyone.

While there are many facilities with trouble in deploying employees, there is a strong trend to demand help to neighbors during disaster.

This survey found that many facilities are concluding cooperation agreements with neighbors in preparation for disasters. (Figure 12)

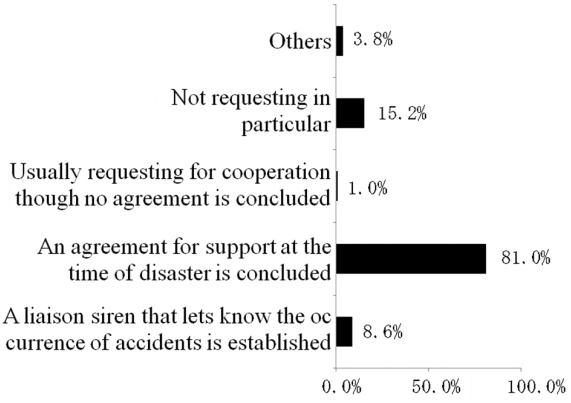


Figure 12. Cooperation System with Neighbors Preparing for Disasters (N=105)

In addition, it can be known that there is a trend that the facilities that actively make everyday exchanges with neighbors can expect cooperation from them. It can be said that it is also important that the exchanges are deepening in daily lives in having cooperation system with neighbors. There was also a facility that conducts a disaster drill jointly with neighbors in the free description. It is needed to review the construction of a better cooperation system including everyday exchanges from now on. (Figure 13)

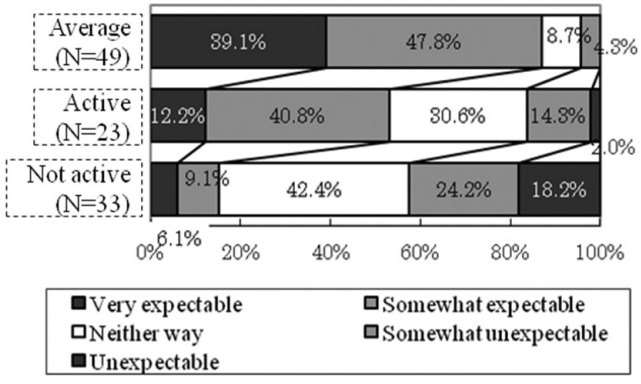


Figure 13. Degree of Expectations on Cooperation of Neighbors at the Time of Fire and Everyday Exchanges

4.2.3 On Measures for Prevention of Fire Outbreak and Spread

In the questions on 'Do your facility take a measure for prevention of fire outbreak?', 88.0% of all the respondents are conducting 'smoking at a designated place' which has the highest rate of execution. It is thought that the fire damages from the cause of careless smoking in the past would have been some lesson. 'Guidance for non-smoking inside the buildings' occupied 50.0% as a measure concerning smoking. There is a possibility that some residents might smoke hiding due to the restrictions on smoking, and the measures such as thorough patrol by employees and so on are necessary. 'Thorough night patrol' is conducted at the rate of 65.7%. In addition, 'training for fire prevention of employees' is conducted in facilities of 80% or more, but, the rate of execution of 'guidance for fire prevention of residents' is low. However, it is conducted in 3 out of 5 elderly homes with reduced fees and all nursing homes for the aged, and thus it is thought that the degree of care and nursing of residents is relevant in that. One facility responded that 'not conducting in particular'. (Figure 14)

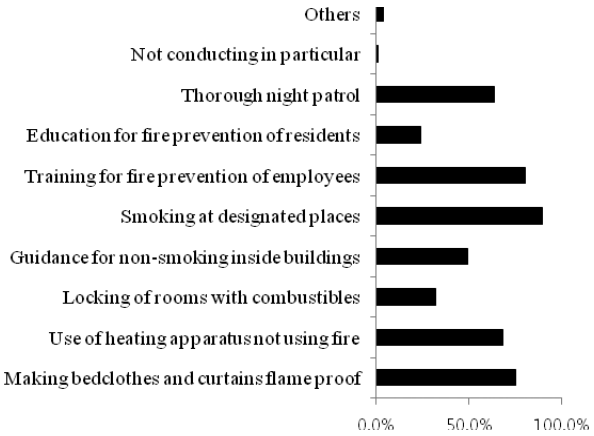


Figure 14. Measures for Prevention of Fire Outbreak (N=108)

4.2.4 Various Safety Measures

The situation of execution, difficulties in execution and the degree of expectation for effects of fire prevention were asked in 10 items such as evacuation, measures for flame proof and so on. The most conducted measure was 'establishment of balcony in all directions' which is effective for evacuation and occupied 73.0%. The second most was 'exclusion of items obstructing evacuation' that occupied 68.9%, and the third most was 'strengthening of management of combustibles' that occupied 68.9%. 'Having living rooms of those who are week to escape at lower floors' that was conducted by more than half facilities and was the least conducted as Item 7 occupied 16.4%. As mentioned above, in many cases living rooms are established on upper floors, and it is one of the examples with a difference between the requests from welfare aspect and those from aspect of disaster prevention. The second lowest rate of execution was occupied by 'installation of lighting' and 'establishment of stair entrance space' which are measures effective for flame proof. (Figure 15).

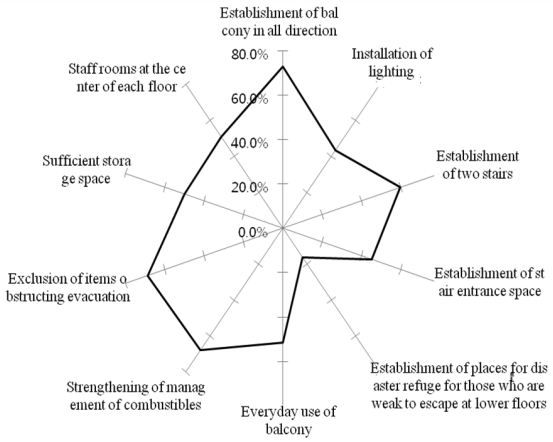


Figure 15. Various Safety Measures (N=106)

Moreover, there are also measures that can have higher possibility to be realized if the pertinent facility makes efforts, and some measures that are hard to conduct in a simple way. The data of Figure 4-9 would be useful in examining what is the fire prevention measure that facilities can readily take.

'Exclusion of items obstructing evacuation', 'strengthening of management of combustibles' and 'sufficient storage space' can be measures that can be conducted comparatively easily and be expected to have effects of fire prevention in the facilities still not conducting these measures. 'Establishment of balcony in all directions', 'establishment of two stairs' and 'establishment of places for disaster refuge for those who are weak to escape on lower floors' are seen as difficult to execute though they can be expected to have effects of fire prevention. In addition, 'establishment of stair entrance space', 'everyday use of balcony', 'installation of lighting' and 'staff rooms at the center of each floor' are considered to be difficult to realize and to hardly have effects of fire prevention. (Figure 16)

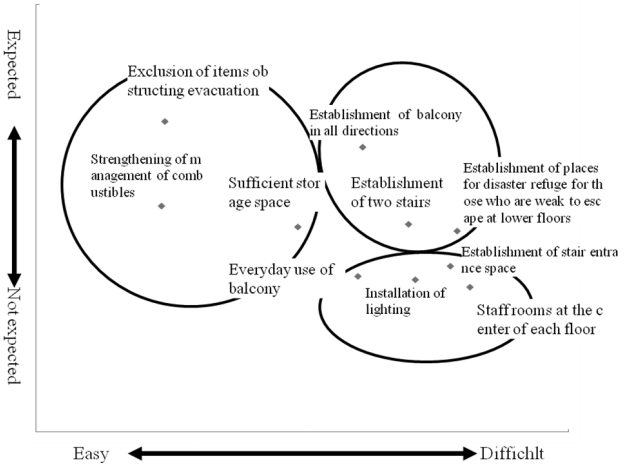


Figure 16. Degree of Difficulty of Execution of Various Safety Measures and Degree of Expectation for Effects of Fire Prevention

4.2.5 Private Room Unit Care and Fire Prevention

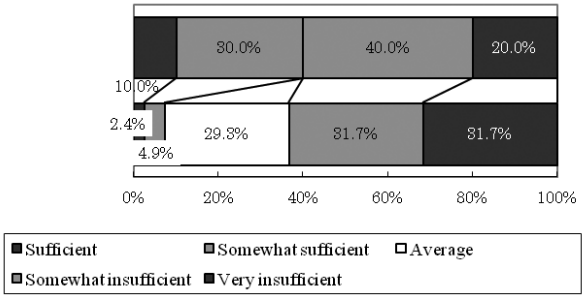


Figure 17. Degree of Substantiality of Evacuation System Supposing the Time of Fire at Night (Different from Private Room Unit Type and Some Unit Type and Conventional Type)

Among the special nursing homes for the aged of unit type (which operate only private room units) and the special nursing homes for the aged of some unit type or conventional type (which have rooms for several people or private room of conventional type), there was a trend that those of unit type received high evaluation with respect to degree of substantiality of evacuation system supposing the time of fire at night and evacuation safety of buildings. This is a subjective evaluation of respondents in all respects, but, the facilities of unit type recently being maintained have the possibility to be enjoying the effects also in the aspect of fire prevention along with care. (Figure 17, Figure 18)

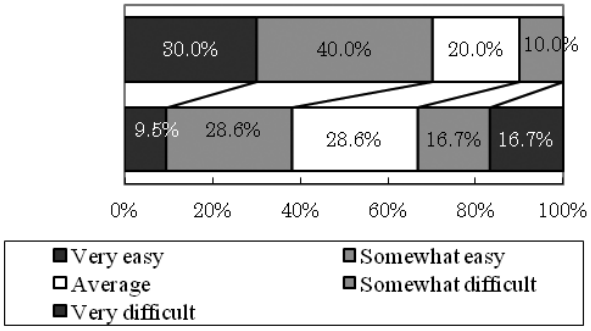


Figure 18. Evacuation Safety of Buildings Supposing the Time of Fire at Night (Different from Private Room Unit Type and Some Unit Type and Conventional Type)

4.3 Arrangement of Survey

The matters found in the survey are arranged as follows.

① The shortage of number of employees working on night shift is becoming a great problem in the aspect of evacuee guidance at the time of fire at night.

② There is a phenomenon in which the evacuation instruments are not effectively equipped for evacuation of residents.

③ The measures for hardware and prevention of fire outbreak and spread are making progress compared with problems in the aspect of evacuee guidance.

④ The measures for flame proof are small in quantity compared with the measures for prevention of fire outbreak, establishment of fire extinguishing equipments and so on.

⑤ Most facilities are employing some cooperation system with their neighbors, and coalition with local communities is becoming one of the important matters in measures for fire prevention.

⑥ The degree to which the cooperation system is expected as an active execution of everyday exchanges with local communities is on the rise.

5. CONCLUSION

In this survey, it seems that Establishment of fire extinguishing equipments, measures for prevention of fire outbreak and spread and so on are making progress. Also, it is troublesome to make an effective evacuation measure, and thus it is possible that the ratio of hardware measures and measures for prevention of fire outbreak and spread is getting bigger. However, there are some cases in which equipments such as sprinklers fail to extinguish fire at the time of fire outbreak, and it is one of the important matters for the enhancement of measures for fire prevention in welfare facilities for the elderly to reduce the problems in evacuee guidance from now on.

The insufficient number of employees on night shift was one of the great problems in evacuation at the time of fire at night, and it is also an issue that there was only a small number of facilities that establish living rooms of those who are week to escape on lower floors. In addition, many argued that it is not realistic to let residents use evacuation instruments and equipments, and

therefore it is needed to have many number of personnel that can help the residents with difficulties in escaping for themselves from upper floors.

In addition, the most causes for death in fire in buildings were addiction to carbon monoxide and suffocation, and it is judged that it is needed to improve the rate of execution of measures by letting the knowledge on flame proof be known.

In connection with these results of the survey, it is also one of the important measures for fire prevention to maintain the cooperative relationship with local communities including everyday exchanges from now on. However, this survey was conducted as a subjective safety evaluation of respondents, and thus it is thought that it is needed to verify the fire prevention and safety using objective indicators such as plane analysis and so on about the facilities of private room unit type which are being promoted to be maintained and so on.

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