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Environmental Hazards in Elderly Nursing Homes in Jakarta, Indonesia

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Falls among the elderly remains a major public health problem that occurs worldwide, especially in the Asia Pacific region. In many cases, the quality of life of the elderly may decrease due to this phenomenon. In addition to individual factors, environmental factors also contribute to the increased incidence of falls among the elderly. This study is a descriptive qualitative study conducted in two elderly nursing homes in Jakarta to identify the environmental risk factors for falling. We discovered that home layout, lighting levels and floor conditions posed as potential risks for falls. A house that was cluttered with appliances also hampered movement. The lighting levels in both homesteads needed to be improved as they ranged from 7 to 60 lux, which was below the Indonesian standard of 120 to 200 lux for living rooms and 20 lux for bathrooms. Moreover, marble flooring and sloped roads tended to become slippery, especially when wet.

Keywords: elderly; environmental factors; falls; floor; layout; lighting; elderly home

I. INTRODUCTION

The ageing population in Indonesia has started to emerge as a distinct demographic feature, and the proportion of older persons which was approximately 6% between 1950 and 1990 now exceeds 8% and it is projected to increase to 13% by 2025, and further to 25% by 2050. Therefore, by 2050, one in every four Indonesians would be classified as an older person, compared to one in twelve currently (Abikusno, 2007).

As the world population rapidly ages, falls among the elderly has become a significant public health issue. In 2010, falls accounted for over 77% and 85% of years lived with disability (YLD), resulting from unintentional injuries in adults aged 50 to 69 and 70 years and over, respectively. One-third of community dwellers aged above 65 years old and 60% of people in nursing and retirement homes have a fall each year (Karlsson *et al.*, 2013)

Risk factors for falls can be divided into two types; namely, intrinsic risk factors and extrinsic risk factors. The intrinsic risk factors pose greater risk than the extrinsic risk factors (Brown, Kurichi, Xie, Pan, and Stineman, 2014; Cameron *et al.*, 2010; Gillespie *et al.*, 2009; MacCulloch, Gardner, and Bonner, 2007).

The extrinsic factors include environmental risk factors such as living in a nursing home, immobile lifestyle, malnutrition, loose rugs, slippery and uneven floors and outdoor surfaces, poor lighting, electrical cords, stools without handrails and unsuitable footwear. Hence, many types of researches have started to explore the intrinsic risk factors associated with falling. However, extrinsic risk factors such as home layout, lighting levels and floor conditions remain critical in this issue.

The Indonesian government has a legal obligation to ensure the welfare of the elderly. This obligation includes the establishment of public nursing homes that cater to homeless elderly. Government's policy regarding social rehabilitation of the elderly has been regulated by the Minister of Social Affairs Regulation No. 5 of 2018 that contains several conditions that must be satisfied in providing support and assistance to the elderly. However, there exists no specific regulations regarding the environmental standards of public nursing homes for the elderly. This study aims to identify the environmental hazards in elderly nursing homes in Jakarta.

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II. MATERIALS AND METHOD

This study had utilized the descriptive method of investigation to examine the environmental factors in public elderly homes in PSTW Budi Mulia I, Jakarta. Among the six existing nursing homes, only two were chosen for examination; namely, the Catelya and Edelweis nursing homes. These homes had the highest number of residents. The measured environmental factors included the following:

(a) lighting measured using lux meters in all rooms;
(b) room layout measurement, using a carpenter's meter tape and human observation in all rooms, especially in terms of the existing facilities, layout and floor conditions.

This study also required data relating to activities that were conducted by the elderly during their stay in the nursing homes. Therefore, observations and interviews were conducted with residents of the elderly nursing home and nursing home caregivers. The population constituted of 80 persons; however, only 70 elderly persons satisfied the inclusion criteria as 10 people were unwilling to participate in the study. The sample inclusion criteria included independent elderly willing to participate, able to communicate using the Indonesian language, and free of any mental disorder. The data was collected over a period of 2 weeks.

III. RESULT

The findings from the observation of environmental hazards in the two nursing homes included elderly daily activities, home layout, facilities available and home lighting.

A. Elderly Activities Factor

From our observations and interviews with the elderly, we discovered that activities for the elderly were generally concentrated in the morning and comprised of gymnastics, recitation, devotional services, joyful stages, and many more activities; however, after lunch time (after twelve noon), the activities tended to be conducted only around the room or nursing home. Few elderly persons commonly took naps, laid down, knitted, engaged in casual conversations and did laundry. Feeding activities were performed in their rooms because there were no dining halls to allow them to sit together when dining. This resulted in food being scattered in the room and attracting various animals into the room, such as insects and cats.

It was also apparent that the physiological abilities of the independent elderly were reduced, namely:

(1) the movement of independent elderly members was not as fluid as normal adults;
(2) most independent elderly people could still walk at normal speed;
(3) most independent elderly persons could still use squat toilets to defecate;
(4) most of their visions had deteriorated.

B. Catelya Nursing Home

Catelya Nursing Home is a women's nursing home that is inhabited by approximately 30 independent elderly people aged 60 to 79 years old. This nursing home consisted of 12 rooms and one pantry for gathering. Most of the elderly who lived in this nursing home were still able to move freely and communicate normally.

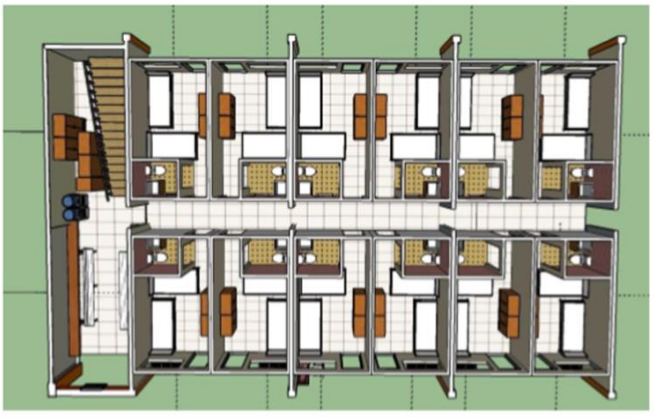


Figure 1. Room layout of Catleya Nursing Home

1. Room Layout

Each room at Catelya nursing home was occupied by two or three elderly women and was equipped with an indoor

bathroom. Each room on average had beds and wardrobes, and the floor was tiled with ceramic, which became very slippery, particularly if there was a water spill.

2. Lighting

Table 1. A comparison between Catelya room lighting conditions and standards

No.	Standards	Room condition at Catelya
1	Even lighting (Kroemer, 2006)	Not suitable, lighting varies in one room
2	Minimum 100 lux for reading activities (Sharit, 2006)	Not suitable, the lighting was only 40 lux maximum in each room
3	Lighting in the bedroom 120-250 lux (National Standardization Agency of Indonesia /SNI 03-6575-2001)	Not suitable, the maximum lighting in each room was less than 120 lux
4	Lighting in the bathroom 250 lux (National Standardization Agency of Indonesia/SNI 03-6575-2001)	Not suitable, the maximum lighting in the bathroom was only 40 lux

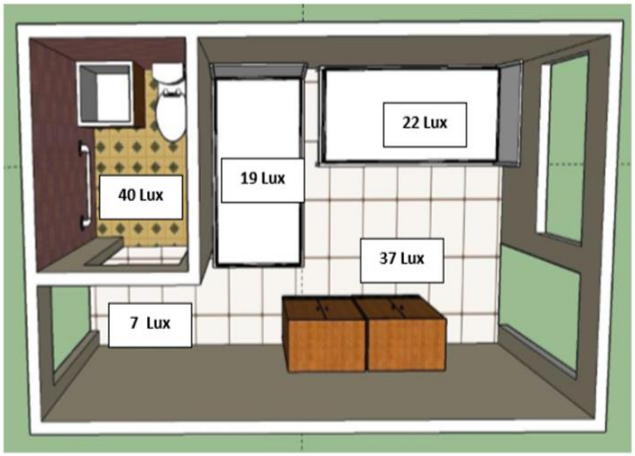
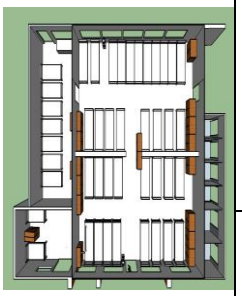
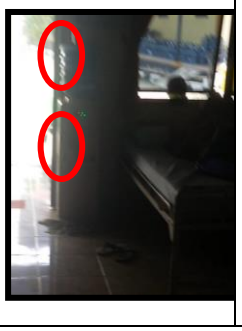


Figure 2. Lighting measurement results and layout at Catleya Nursing Home

C. Edelweis Nursing Home

Edelweis Nursing Home is a men's nursing home that is inhabited by approximately 40 independent elderly people aged between 60 and 69 years old. This nursing home consisted of 45 beds. Most of the elderly who lived in this nursing home were still able to move freely and communicate like normal adults.

Table 3. A comparison between the room layout at Edelweis Nursing Home and the Kroemer Design Standards

No	Picture	Description	Kroemer Design Standards
1		There is a partition between the bedroom and bathroom	There is no partition between the room, bathroom and toilet
		Uneven placement of water dispensers, especially those in small spaces	Easily reachable and visible
2		The drinking glasses are placed around the water dispenser (above the water gallon and under the waterspout)	The storage of the equipment should be separated by its function

1. Room lighting

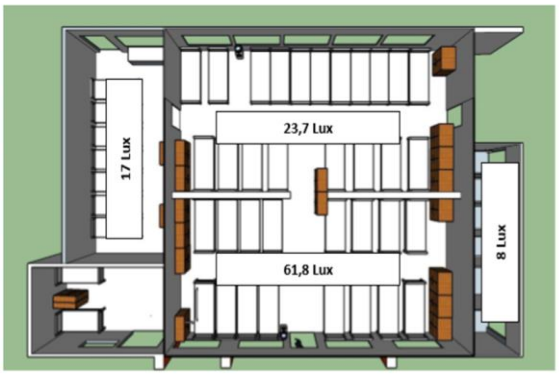


Figure 3. Lighting measurement results at Edelweis Nuring Home

Table 4. A comparison between the Edelweis room lighting and the standards

No.	Standards	Conditions
1	Even lighting (Kroemer, 2006)	Not suitable, various lighting in each room
2	Minimum 100 lux for reading activities (Sharit, 2006)	Not suitable, the maximum lighting in each room was only 61.8 lux
3	Lighting in the bedroom 120-250 lux (National Standardization Agency of Indonesia/ SNI 03-6575-2001)	Not suitable, the lighting in each room is less than 120 lux
4	Lighting in the bathroom 250 lux (National Standardization Agency of Indonesia/ SNI 03-6575-2001)	Not suitable, the lighting in the bathroom was only 8 lux

F. Flooring conditions in the rooms at Edelweis Nursing Home

The bedroom and bathroom flooring were made of ceramic which was slippery. Housekeeping in some rooms in the nursing home was good, because most items were placed in their appropriate closets.

IV. DISCUSSION

This study was the first to investigate environmental hazards in public elderly nursing homes. However, it included a few limitations: observations of elderly activities were only based on interviews and daytime activities. Besides that, light measurements were only conducted during the day, yet lighting during the day would differ from lighting in the night.

A. Inadequate lighting

The lighting at Edelweis Nursing Home was still below the recommended standard. According to Kroemer (2006), Sharit (2006), and SNI (2001), sufficient lighting remained highly necessary, especially to prevent accidents when water was spilled on the floor. Dim lighting reduces the awareness of the elderly when walking. The lack of lighting in the bathroom needs to be addressed since it increases the risk of falling among the elderly (Câmara, 2010). Therefore, it is better to put brighter lamps in place.

Some previous studies have demonstrated that out of the 43% of fall accidents that the elderly experienced, 18% of them were caused by poor lighting (Hignett and Masud, 2006). This finding is in line with previous results which suggested that poor lighting contributed to 20% of incidents in postal delivery elderly workers (Hignett and Masud, 2006). In

addition, a prior retrospective study also indicated that 35% to 45% of elderly falls were caused by environmental hazards at home, such as inadequate lighting (Fong *et al.,* 2015).
Overall, inadequate lighting was the most common factor associated with fall risk in the living room and bedroom. When the elderly are able to see objects clearly with brighter lighting, they will avoid tripping and reduce the risk of falling at the home. A previous study also observed that the elderly mostly spent an average of 12 to 16 hours a day at home; thus, adequate lighting is imperative (Chacko *et al.,* 2014).

B. Room Layout

Basically, there is no threshold to the size of a room if the room has adequate space to move and rest, and if it allows other social needs to be fulfilled (Ching, 2008, p.328). Unlike the Catelya nursing home, Edelweis nursing home, which was inhabited by elderly men, took the layout of a barracks. This nursing home consisted of beds, water dispensers and cabinets. The barracks-like homestead design allowed large numbers of elderly persons to stay in a common room. Windows that were rarely opened and doors used as the only form of air ventilation led to stagnant air circulation inside the barracks area. This condition increased the risk of diseases spreading quicker because the elderly experienced a decrease in immunity and would be easily infected.

As for some other findings related to the layout, the location of the bathroom and bedroom was quite far from the bed. With such distance, it was especially risky for them to fall, especially at night. In addition, the uneven distribution of dispensers in the room meant that some elderly people had to walk further to reach the dispenser. The placement of bathrooms and dispensers did not satisfy the elderly design standards which proposed that the equipment must be easily accessed (Kroemer, 2006).

To prevent the risk of falling among the elderly, all the furniture, including the water dispenser should be reachable and should also be sturdy and secure. In addition, all the furniture that have wheels should be removed and arranged in a manner that does not obstruct the mobility of elderly persons (Rogers *et al.*, 2004). Moreover, the bathroom should be available on the same floor with the bedroom (Rogers *et al.*, 2004). The showers should be set up in seated positions. The toilet should also be modified and elevated to be easily reached. Handrails should also be installed in showers or tubs and in toilets. There should be adequate lighting in the pathway to the bathroom, and the pathway should also be free from clutter (Rogers *et al.*, 2004).

C. Slippery Ceramic Floors and the Presence of Different Heights and Slopes

The flooring in the Edelweis Nursing Home was similar to the one in the Catelya Nursing Home. According to Lachance (2001), walking pads with the lowest risk of falls for the elderly were vinyl and carpet materials. However, the examinations at the institution revealed that ceramic that became slippery when exposed to water was used. Under normal circumstances, the floor should always be dry; however, often it had spilled or splashed water from the bathroom. The elderly run the risk of falling when living with slippery flooring because of their weaker vision in fairly dark rooms and their declining balance (Kroemer, 2006). In addition, a difference in height between the room and bathroom flooring also poses a risk of tripping and falling.

In term of injuries, a previous study revealed that the wet or slippery floor surfaces contributed to 66% of fall-related hip fractures (Chalovich and Eisenberg, 2013). Thus, designing a compliant flooring is one of the intervention methods to reduce the stiffness of the ground in order to lessen the impact to the body of the elderly in the event of a fall. The appropriate floor design would contribute towards reducing the severity and incidence of injuries caused by falling, including brain injuries and hip fractures (Chalovich and Eisenberg, 2013).

D. Risk of Falling Among the Elderly

Some of the analysis above mentioned the many risks of falls caused by the ergonomic mismatches in the environment. This included layout design used by the examined institution that did not consider the capacity and limitations of the elderly as vulnerable populations. Falling is one of the public health problems that should be considered as a major public health concern. The majority of fatal fall accidents in Asia-Pacific countries mostly happened to the elderly (WHO,

2018). The other independent risk factors for fall among the elderly included balance impairment, polypharmacy (consuming more than four medications), walking difficulty, depression, dizziness, being older than 80 years and cognitive impairment (Tareef, 2011).

Falls are presented as a 'gateway' and 'catalyst' towards further degeneration, because they are usually followed by pain syndromes, functional limitations, dislocations, serious tissue injuries and fractures, which lead to high health care costs and high mortality rates (Karlsson *et al*., 2013). These institutions did not periodically record events of falls in the elderly. Recording was done only if the fallen elderly was referred to the hospital. However, when the researcher sought data from the clinic section of the institutions, the officers were unable to provide records or the results of the fall event as they only recalled the accidents from memory. Clinicians claimed that the falls that needed to be referred to hospital were rare. In addition, they reasoned that the status of independent elderly people meant that they would usually self-report if they fell. However, at Catelya Nursing Home and Edelweis Nursing Home, according to the clinical staff, there were no incidents of falls until they had to be taken to the hospital. There were only two people at the Catelya Nursing Home who had experienced falls that resulted in bruising. According to the nursing staff, there were elderly people whose dependency status had changed from independent to semi-independent or even total dependence because of falling. This statement was supported by clinical officers on guard.

There was an addition number of the residents in the nursing home even though all the homesteads are fully occupied. Therefore, the residents of the nursing home will accumulate, which increases their risk of falling. Hence, the institution must consider about the level of fall risk among the residents by controlling the number of occupancies. In addition, documenting and reporting the occurrence of falls along with their locations can be used as a basis for future improvement for future nursing facilities.

V. CONCLUSION

Based on the observations of elderly activities were only based on interviews and daytime activities. To summarize, environmental factors such as inadequate lighting, room layout and slippery floors contributed to falls among the elderly in the nursing homes.

VI. ACKNOWLEDGEMENT

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VII. REFERENCES

Abikusno, N, 2007, Older population in Indonesia: trends, issues and policy responses. UNFPA Indonesia and Country Technical Services Team for East and South-East Asia.

Karlsson, M. K. *et al*, 2013, 'Prevention of falls in the elderly - A review', Osteoporosis International, vol. 24, no. 3, pp. 747–762.

Brown, J., Kurichi, J. E., Xie, D., Pan, Q., & Stineman, M. G. (2014). Instrumental activities of daily living staging as a possible clinical tool for falls risk assessment in physical medicine and rehabilitation. PM&R, 6(4), 316-323.

Cameron, I. D., Murray, G. R., Gillespie, L. D., Robertson, M. C., Hill, K. D., Cumming, R. G., & Kerse, N. (2010). Interventions for preventing falls in older people in nursing care facilities and hospitals. The Cochrane Library.

Gillespie, L. D., Robertson, M. C., Gillespie, W. J., Lamb, S. E., Gates, S., Cumming, R. G., & Rowe, B. H. (2009). Interventions for preventing falls in older people living in the community. Cochrane Database Syst Rev, 2(2).

MacCulloch, P. A., Gardner, T., & Bonner, A. (2007). Comprehensive fall prevention programs across settings: a review of the literature. Geriatric Nursing, 28(5), 306-311.

Kroemer, K. H. E, 2006, 'Designing for older people', Ergonomics in Design, vol. 14, no. 4, pp. 25–31

Sharit, J 2006, 'Human Error', eds Salvendy *et al*, in

Handbook of human factors and ergonomics, John Willey and Sons, chapter 27: 708–760.

Câmara, J. J. D., *et al* 2010, 'Analysis and ergonomics of houses for elderly people', Periodicum Biologorum, vol 112, no. 1, pp. 47–50.

Hignett, S. & Masudj, T 2006, 'A review of environmental hazards associated with in-patient falls', Ergonomics, vol 49, no. 5, pp. 605–616.

Fong, K. N. *et al* 2015, 'Domiciliary environmental risk factors for accidental falls among community-living older persons: A prospective 12-month study', Healthy Ageing Research, pp. 1–10. doi: 10.12715/har.2015.4.5.

Chacko, T. V *et al* 2014, 'How Fall-Safe is the Housing for the Elderly in Rural Areas?: A Cross Sectional Study using Fall Prevention Screening Checklist', Journal of The Indian Academy of Geriatrics.

Ching, F 2008, Arsitektur: Bentuk, Ruang, dan Tatanan (in Bahasa Indonesia), 3rd edition, Erlangga, Jakarta, Indonesia.

Rogers, M. E. *et al* 2004, 'Reducing the Risk for Falls in the Homes of Older Adults Reducing the Risk for Falls in the Homes of Older Adults', Journal of Housing for Elderly, vol 18, no. 2, pp. 29-39.

Lachance, C. C. *et al* 2017, 'Compliant flooring to prevent fall-related injuries in older adults: A scoping review of biomechanical efficacy, clinical effectiveness, cost-effectiveness , and workplace safety', PLOS ONE, pp1–23. doi: 10.1371/journal.pone.0171652.

Chalovich, J. M. & Eisenberg, 2013, E. NIH Public Access. Magnetic Reson Imaging, 31(3): 477–479. doi: 10.1016/j.immuni.2010.12.017.

WHO (World Health Organization), Falls, 2018, viewed June 2018
http://www.who.int/mediacentre/factsheets/fs344/en/

Tareef Al-Aama 2011, 'Falls in the elderly: Spetrum and prevention', Canadian Family Physician, vol. 57, no. 7, pp. 7