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Evaluating existing features of window in elderly housing

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Abstract

The design of windows in housing is crucial in ensuring that elderly people have adequate visual comfort. The study aimed to assess the association between existing design and needs of the elderly people with regard to window design and to know the relationship between type of house and existing design of window. A sample of elderly women (n=60) were selected purposively from the Kurnool district of Andhra Pradesh. A self-structured questionnaire was developed as per the guidelines to collect the information regarding existing window features and needs of elderly people in the housing. Standard design guidelines were identified to assess the design of window in elderly housing. The results revealed that height of the window in living areas was found as per the requirements of elderly. Major lacuna was cross ventilation in common areas and corridors, and accessible curtains or blind controls for wheelchair users at a height of 2 feet 7 inches to 3 feet 3 inches. Elderly respondents preferred to have window in living areas, bathrooms and kitchen at recommended height. The elderly felt neutral with reference to the provision of windows with controls that permits the use of wheelchair users.

Keywords: Housing, window, elderly people, design

Introduction

Lack of adequate housing are one of the issues that lead to health issues which further compromises the quality of life and wellbeing of elderly people as a result of social and environmental inequality in the residence. The housing needs of an elderly population are quite difficult as they age. There is an urgent need for a greater understanding of and catering for the various housing needs of elderly people. To avoid the need to alter housing designs as people age and their lifestyles change an inclusive and affordable house design is essential. Designers must create homes that accommodate elderly people demands, facilitate their daily activities and promote their independence and active participation in all areas of society. When altering the architecture of a home the elderly's physical, psychological and social features must be taken into account (Mnea *et al.* 2023., Hansen and Gottschalk, 2007., Engineer *et al.* 2018)^[6, 3, 2]. The window design, opening and closing, material used and placement in the house where elderly people reside must have all the necessities with proper dimensions in each and every room and should not hinder ventilation and thermal protection. While designing the height and width should be considered as per the room and should serve the purpose of the residents. Many studies revealed that elderly feel distress, loneliness with no proper ventilation and no connection with outdoors in the housing environment.

The design of windows in housing is crucial in ensuring that elderly people have adequate visual comfort and that electric lighting uses less energy than necessary. In day lighting, the maximum daylight autonomy determines visual comfort. Almost all every type of housing, building or any structure must have windows. The current method for designing windows is centred on making sure that the basic needs are met in order to provide functions for natural lighting, thermal protection, acoustic protection, aesthetic view of outdoors etc. Windows serve a variety of purposes as a structural component of the building and also help to define its architectural style. However, letting daylight into the building's interior is its primary functional goal. Consequently, windows play a crucial role in creating a favourable microclimate inside the building (Acosta *et al.* 2016., Tikhomirov *et al.* 2019)^[1, 9].

Residents have been proven to benefit in a variety of ways from window views that offer an aesthetic connection to the outdoors. Improvements in physical and mental well-being, cognitive function, satisfaction with one's surroundings, a decrease in discomfort and stress relief are some of these consequences. Additionally, an excellent window view could raise a building's appraised value in the market (Heschong *et al.* 2021., Ko *et al.* 2020., Yildirim *et al.* 2007., Turan *et al.* 2021) [4, 5, 11, 10].

Objectives

1. To study the association between existing design and needs of t the elderly people with regard to window design
2. To know the relationship between type of house and existing design of window

Methodology

A sample of elderly women (n=60) were selected purposively from the Kurnool district of Andhra Pradesh. A self-structured questionnaire was developed as per the guidelines given by Parker (1987) [8] and National Building Code (2016) to collect the information regarding existing window features and needs of elderly people in the housing. Existing design of window were evaluated in terms of above the recommended

guidelines, as per the guidelines and below the guidelines with scores 3, 2, 1 and needs were scored as 3, 2,1 for essential, preferred, neutral respectively. Chi sqaure test and ANOVA were used to statistically interpret the data.

Results and discussion

Existing Window design

Seven standard design guidelines were identified to assess the design of window in elderly housing. The data are presented in the table 1. Below.

Height of the window from floor level in living area was found to be a maximum of 3 feet 2 inches and minimum of less than 1 feet in three fourth of the existing houses. The opening of the window in the bathroom and kitchen from the floor was found to be at a minimum of 3 feet 6 inches and maximum of 6 feet 8 inches in eighty per cent of the houses. Cross ventilation in common areas such as corridors and lifts was not found as per the recommended design guide lines. Large windows were not provided at the end of long and dark corridors in three fourth of the existing houses. Seventy-eight per cent of the houses had windows with controls at proper height that permits the use of wheelchair users. Majority (83%) had window sills at a height as per the recommended guidelines.

Table 1: Existing Window design features n=60

S. No	Recommended Design guidelines	Status of existing design features against the guidelines						Total	
		Above the recommended guidelines		Exactly as per the recommended guidelines		Below the recommended guidelines			
		N	%	N	%	N	%	N	%
1	Height of the window from floor level in living area should be maximum of 3feet 2 inches and minimum of less than 1 feet	9	15	45	75	6	10	60	100
2	The opening of the window of bathroom and kitchen from the floor should be minimum of 3 feet 6 inches and maximum of 6feet 8 inches	9	15	48	80	3	5	60	100
3	Cross ventilation was optimized in common areas such as corridors	22	36.67	0	0	38	63.33	60	100
4	Large windows were provided at the end of long and dark corridors	13	21.67	0	0	47	78.33	60	100
5	A window had controls at desirable height that permits use from wheelchair users	47	78.33	11	18.33	2	3.33	60	100
6	Curtain or a blind controls were accessible for wheelchair users at height of 2 feet 7 inches to 3 feet 3 inches	2	3.33	55	91.67	3	5	60	100
7	Windows sills were present at a height of less than 3 feet 3 inches from the floor	1	1.67	50	83.33	9	15	60	100

Height of the window in living areas was found as per the requirements of elderly. Major lacuna was cross ventilation in common areas and corridors, and accessible curtains or blind controls for wheelchair users at a height of 2 feet 7 inches to 3 feet 3 inches.

Design needs in windows

The respondents were asked to state their recommendations to design windows to enable them to operate without difficulty (Table 2.).Nearly three fourth of the elderly respondents

preferred to have windows in living area at a maximum height of 3feet 2 inches and minimum of less than 1 feet from floor level. Majority (85 %) of the elderly preferred to have opening of the window of bathroom and kitchen from the floor at a height of minimum of 3 feet 6 inches and maximum of 6feet 8 inches. Cross ventilation in common areas such as corridors and lifts was felt neutral by more than fifty per cent of the respondents. Nearly half of the elderly expressed neutral opinion for the provision of windows with controls at proper height that permits the use of wheelchair users.

Table 2: Needs of elderly people in designing windows n=60

S. No	Needs of the elderly in designing windows	Adequacy of housing needs						Total	
		Essential		Preferred		Neutral			
		N	%	N	%	N	%	N	%
1	Height of the window from floor level in living area should be maximum of 3feet 2 inches and minimum of less than 1 feet	11	18.33	44	73.33	5	8.33	60	100
2	The opening of the window of bathroom and kitchen from the floor should be minimum of 3 feet 6 inches and maximum of 6feet 8 inches	6	10	51	85	3	5	60	100
3	Cross ventilation should be optimized in common areas such as corridors and lifts	17	28.33	8	13.33	35	58.33	60	100
4	A window shall have controls at Preferred height that permits use from wheelchair users	10	16.67	21	35	29	48.33	60	100

Elderly respondents preferred to have window in living areas, bathrooms and kitchen at recommended height. The elderly felt neutral with reference to the provision of windows with controls that permits the use of wheelchair users.

Hypothesis testing

H₀1. There is no association between existing windows design and needs of elderly with reference to windows design

Chi-square test was used to test the association between existing window design and needs of elderly people. Almost total sample preferred to have windows as per the guidelines of windows from floor level in various rooms, type of furnishings and controls for wheel chair users were the recommended guidelines provided by the various researchers (Table 3.)

Table 3: Association between existing design features of windows and needs of the elderly n=60

Existing windows features	Design needs with reference to windows							
	Neutral		Preferred		Essential		Total	
	N	%	N	%	N	%	N	%
As per the recommended guidelines	2	3.33	47	78.33	10	16.67	59	98.33
Above the recommended guidelines	0	0.00	0	0.00	1	1.67	1	1.67
Total	2	3.33	47	78.33	11	18.33	60	100.00
χ^2 value	4.5300							
Probability value	0.2167							

The Chi-square value was found to be non-significant. There is no association between the existing window design and the needs of the respondents to age in place with reference to window design.

Hence, null hypothesis was accepted

H₀ 2. There exists no significant relationship between existing housing conditions and type of the house
 Analysis of variance (ANOVA) was carried out to test the null hypothesis stated below. F-test was used for testing equality of variance of two populations. Significant variation was found between respondents with different types of the house and the existing design of windows (Table 4.)

Table 4: Analysis of variation in existing window design with regard to type of the house

Existing housing conditions	Type of house	N	Mean	Std	F-Value
Windows	Independent house	23	12.83	0.83	0.0001*
	Independent double storied house	15	13.07	0.88	
	Apartment/flat	18	16.00	1.50	
	Duplex	4	14.00	1.15	

Significant variance (F=0.0001) was found in the design of windows among different types of houses. The t-test was used to compare the means of different types of houses with

reference to the design of windows. The results are presented in table 5.

Table 5: Differences between mean scores of design of windows by type of house

Existing housing condition	Type of house comparison	Mean difference	t-value	Significance
Windows	Independent house Vs. Independent double storied house	-0.24	-0.66	ns
	Independent house Vs. Apartment/Flat	-3.17	-9.14	**
	Independent house Vs. Duplex	-1.17	-1.96	ns
	Independent double storied house Vs. Apartment/Flat	-2.93	-7.60	**
	Independent double storied house Vs. Duplex	-0.93	-1.50	ns
	Apartment/Flat Vs. Duplex	2.00	3.28	**

Highly significant mean difference in design of windows was found between (i) Independent house and apartment/flat (ii) Independent double storied house and apartment/flat and (iii) Apartment/Flat and duplex.

Respondents with (i) Independent houses differed with apartment/flat (ii) Independent double storied house differed with apartment/flat and duplex and (iii) Apartment/Flat differed with duplex in the adoption of standard design guidelines in designing windows

There were limitations in window design in apartments. Window design in apartment/flat depend on many factors such as orientation of the building as a whole, orientation of apartment placement of other rooms in the apartment.

While adopting standard design guidelines the apartment type of houses had limitations with reference to the design of cross ventilation, ventilation in long and dark Corridors, deciding on height of the Window from floor level, opening of the Window of Bathroom and Kitchen.

Conclusion

The single major variable that was contributing towards the design of existing windows was type of the house. The design guidelines related to height of the window from floor level in living areas, the opening of the window of bathroom and kitchen from the floor, windows with controls at proper height that permits the use of wheelchair users, window sills height were as per the standard design guidelines.

Author’s contributions: This work was carried out in collaboration among all authors. Author Rupanagudi Unesha Fareq has carried out the proposed research work as part of Post Graduate thesis, drafted the thesis and performed the statistical analysis. Author Neeraja has designed the research work and monitored the overall research work carried out. Author Prasuna has contributed in article preparation and analysis. All authors read and approved the final manuscript.

All authors have read and agreed to the published version of the manuscript.

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