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Architectural Barriers and Accessibility in Public Buildings of Pakistan: A User Perspective

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ABSTRACT

Accessibility and environmental design are necessities that shape community participation possibilities for individuals. becoming the parameter that restricts individuals' mobility and activities. this study aims to propose strategies for improving building design and functionality and provide recommendations for creating environments accessible to all. Despite existing accessibility legislation, a significant research gap remains due to the lack of building-level accessibility assessments in major civic buildings of Karachi and Hyderabad, Pakistan. A cross-sectional study design was employed to assess 1000 people visiting Civic Centre Karachi, Hyderabad and Shahbaz Building Hyderabad, Pakistan, using non-probability convenience sampling. The questionnaire comprised a demographic sheet and 19 indicators of physical barriers on a 5-point Likert scale. Descriptive statistics and Chi-square tests in SPSS were used to analyse the responses. Most of the visitors of the public buildings disagreed with the easy accessibility of the entrance, appropriate ramp designs, clear signage, automatic doors, space for manoeuvring, seating area, handrails, etc. Nevertheless, over 50% visitors agreed that there were no steps or even, non-slip surfaces in the entrance area, and the lighting was adequate. There were significant associations between key accessibility features presence of ramps and wide entrance doors ($p < .001$), between automatic doors for entry and exit and visitors' satisfaction ($p < .001$), and appropriate ramps ,space for manoeuvring ($p < .001$). The findings support policymakers and design professionals in improving accessibility,

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enhancing compliance, and promoting inclusive public buildings. Legislated accessibility standards must be enforced to achieve universal, inclusive architectural design of public spaces.

Keywords: Architectural barriers, accessibility, disabled people, physical barriers, public buildings

INTRODUCTION

Accessibility is familiar as a basic necessity for any individual. It shapes social and community participation possibilities for individuals. Further, it encompasses around Environment design too. The Environmental design refers to the planning and design of the built environment in ways that promote accessibility, safety, usability, and inclusion for individuals of all ages and abilities. It involves architectural layouts, circulation systems, entrances, ramps, lighting and signage that influence how people interact with buildings. Well-designed environments support Universal Design principles by minimising physical barriers and maximising independent access for everyone. It becomes the parameter that promotes or restricts individuals' mobility and activities. The factors that become barriers can vary depending on the type of disability. For example, stairs can become a restriction for individuals using wheelchairs. Similarly, less visual information can be problematic for people with hearing impairments (Carlsson et al., 2022).

More than 15% of the urban population has a moderate or severe disability. The World Report on Disability highlights that 60% of disabled people face difficulties accessing buildings due to architectural barriers (Mirza et al., 2023). Each resident has equivalent freedoms and commitments to get a respectable living; however, handicaps have not yet felt the uniformity of privileges. Numerous public offices have not thought about the necessities and accommodations of people with disabilities, particularly wheelchair users. This issue makes it challenging for wheelchair clients to get to public offices, so they can't take an interest completely in public activity (Lianto et al., 2021).

Most of the public office buildings do not have inclines, balustrades, or any other support systems. Passageways, lavatories, and restrooms are often so narrow or insignificant that they are difficult to access. This makes the majority of public structures, the sick bay, and departments unapproachable. The implementation of universal design, or building for everyone, depends on various contextual factors, such as structure, functionality, environment, and socio-economic factors. The usability of public buildings can be enhanced if buildings are designed keeping in mind the factors of age, ability, or disability of individuals. This promotes convenience, accessibility, usability, pleasure, ease of use, and overall benefits all. Therefore, it is necessary to explore the impact of barriers in public buildings and to identify the challenges faced by users (David, 2008) and

later design public areas to meet the diverse needs of the public (National Disability Authority, 2026).

Civic Centre Karachi, Civic Centre Hyderabad, and Shahbaz Building Hyderabad were selected as representative case studies because they are major government public buildings with high public footfall, making them appropriate settings for evaluating accessibility barriers experienced by diverse users. Such barriers might limit the mobility of persons with different needs of mobility, such as wheelchair users, people with strollers, pregnant women, and others with temporary or permanent disabilities. Circulation problems, inadequately designed ramps, curbs, parking facilities, and lack of orientation systems usually hinder access, which means that the effectiveness of the public spaces is compromised. Solving the problem of accessibility is vital for ensuring that everyone uses the building effectively and independently. Universal Design provides a framework for overcoming such obstacles by promoting the usability of environments and products for the widest range of individuals, regardless of age, size, ability, or other differences. As Story et al. (1998) emphasised, Universal Design focuses on the creation of spaces that accommodate diverse abilities and needs. Practical applications of these principles include ramps and elevators to facilitate vertical circulation, lighting that accounts for sensory differences, and clear signage or wayfinding systems that enhance navigation. Integrating such principles into building design promotes inclusivity, enhances usability, and supports sustainable environments for all users.

The research intends to offer recommendations for creating environments that will enable equal access for everyone. However, despite already existing legislation on accessibility, such as Pakistan Engineering Council (2021)and Pakistan Engineering Council (2006), a noticeable gap in research persists due to the absence of an assessment of accessibility on a building level in large civic buildings in Karachi and Hyderabad, Pakistan. Moreover, there is insufficient knowledge about perceptions of architectural obstacles by users and the effect of those obstacles on accessibility in different public buildings. Through combining users' perceptions with the assessment of certain architectural aspects of accessibility, this study adds evidence which goes beyond the boundaries of geography and will help to develop better accessibility policies and approaches to designing public buildings.

Research Objectives

This study was intended to discover and analyse physical elements affecting the accessibility of public buildings, focusing on elements preventing movement and usability. This study is intended to analyse public buildings in the cities of Hyderabad and Karachi in respect to the availability and dimensions of ramps, elevators, sensors, and compliance with accessibility requirements. The research is intended to analyse how much public buildings comply with the Universal Design concept and possible

challenges users may face while using these buildings.

Significance of the Study

This research will shed light on Architectural barriers and their overall impact on accessibility within public structures. By analysing the effects of such barriers in terms of their physiological, safety, environmental, and design considerations, the research is hoped to proposed strategies to improve building design and functionality. Eventually, the research intends to offer recommendations for creating environments that allow access to every individual, regardless of mobility limitations, thereby fostering inclusive and user-friendly public spaces for all members of society.

Organisation of the Paper

This article is organised into six sections. Section one, Introduction, provided the background of the topic under study and the current problem under consideration, while defining study objectives and the significance of the study. Section two, literature review, sheds light on the available literature, highlighting gaps present in the research area. Section three, methods, explains the research design and tools along with the procedure of data collection for this study. Section four summarises the research data while presenting the results of the analyses applied to the collected data. Section five, discussion, explains the study findings in accordance with the aims and objectives of the study. Lastly, section six, conclusion, summarises the findings along with study implications and recommendations for future researchers.

LITERATURE REVIEW

Architectural Barriers

According to Goldsmith (2000), independent and comfortable access by people of different abilities is important. In most cases, architectural barriers result as a consequence of design decisions that mainly focus on efficiently providing accessibility to abled individuals at the expense of those with disabilities, older people, children, and temporarily disabled people. In many cases, architectural barriers are common in existing public structures that were not accessible during the design and construction phases.

Typical examples of architectural barriers include:

- Absence or improper design of ramps and slopes
- Narrow entrance doors and corridors
- Steps, non-slip or slippery floor surfaces
- Lack of handrails, tactile paving, and non-slip materials
- Weak signage and wayfinding systems
- Inadequate lighting and manoeuvring space
- Inaccessible toilets, seating areas, parking, and emergency exits

Such barriers limit mobility, orientation, safety, and dignity, often resulting in exclusion from essential public services and social participation (Goldsmith, 2000).

Accessibility and Inclusiveness

Inclusiveness as a concept is closely related to accessibility, universal design, and design for all. The real definition of inclusiveness means that it is the quality of aiming to include and integrate all people and groups in activities, organisations, political processes, etc., especially people who are disadvantaged or marginalised, who have suffered discrimination, or are living with disabilities. Today, we can read very often about inclusive design as a synonym for universal design or design for all. These different concepts mean the same thing, but they are used in different ways in different countries in the world. For example, the concept "inclusive design" is used in Great Britain, while in several European and Scandinavian countries, the concept "design for all" is commonly used. America, as the country where the concept "universal design" originated, uses the terms inclusive and universal is interchangeable (Eddy, 2017). Additionally, In Nigeria, even though there have been attempts at introducing the Discrimination against Persons with Disabilities (Prohibition) Act 2018, there is still the issue of accessibility barriers that exists. According to (Amucheazi & Nwankwo, 2020), there has been construction of public infrastructures like schools, hospitals, transport facilities and others without proper regard for the people with disabilities. Moreover, it is important to note that, while the law requires for accessibility features like ramps, lifts, and other mobility aids in public infrastructures, there have not been proper implementation and enforcement which therefore hinder the ability for persons with disabilities to access the public places (Amucheazi & Nwankwo, 2020).

In Turkey, (Çubıkcı, 2019) examined the accessibility of public buildings in Konya city which included the train station, training and research hospital and metropolitan municipality building. This was done using accessibility criteria which were set out according to the national legislation and universal design principles. This was done to look at access to, entry into and use of the public buildings. There was found to be major inadequacies in the implementation of the accessibility in Turkey despite the legislative frameworks put in place. Accessibility to public facilities is a fundamental human right that which enables inclusion in society. In a study undertaken in Khulna, Bangladesh, the facility accessibility of public buildings like educational institutions, governmental offices, hospitals, and banks for persons with physical disabilities was examined. While the accessibility features were introduced in the Government of Bangladesh (2008), these features were poorly implemented. Only 12% of the studied buildings had elevator access and ramps, although most multi-story public buildings did not have any elevators. Even though there was an admissions quota for disabled students, many government universities were not wheelchair accessible and none of the buildings had proper accessibility signboards. Out of the total 75 public buildings, only one hospital was fully wheelchair accessible, while seven additional buildings could achieve

accessibility with minor modifications. The study concluded that improvements such as installing appropriate signage, widening doorways, redesigning toilets and water closets, providing ramps with handrails, and ensuring access to drinking water facilities could substantially enhance accessibility for people with physical disabilities (Farzana, 2018). Another case study conducted in Nepal revealed similar findings. The accessibility of both new and old buildings was assessed using eighty-five indicators related to lifts, elevators, railings, ramps, stairs, entry, doors, parking, restrooms, and corridors. Most of the public buildings did not fully conform to the required measures for ensuring accessibility to people with disabilities. Suitable facilities to bring comfort to the disabled individuals were not available. Those public buildings that were newly constructed were comparatively more compliant. Accessibility was found to be highest in a public school. A hospital was seventy-five percent compliant owing to the fact that it was relatively old, with no renovations and poor maintenance. The lowest accessibility percentage was reported to be around forty-four percent. Such studies serve as a guide to urban planners, engineers, and architects to design considering the factors of accessibility, inclusivity, and safety of all kinds of public (Nakarmi & Shrestha, 2022).

Public Buildings and Architectural Barriers

Public buildings play a crucial role in community life, yet accessibility remains a persistent challenge, particularly for individuals with disabilities (Burns et al., 2024; Fuentes-del-Burgo et al., 2021). Despite this, universal design principles aim at creating spaces that people from all backgrounds and age groups can access (Olodeoku et al., 2024), but architectural barriers such as stairways, irregular surfaces, difficult entrance access, poor lighting, and lack of handrails remain common (Carlsson et al., 2022; Hammel et al., 2015). Research conducted in Ghana (Kportufe), Turkey (Baris & Uslu, 2009), and Zambia (Chilufya) has found that architecture is a major impediment to mobility, autonomy, and participation in society for people with impairments. This has led to exclusion and a lack of dignity for people with impairments (Baris & Uslu, 2009; Chilufya, 2013; Kportufe, 2015). Pakistan, despite the legislation in existence, along with an increase in awareness about these issues at the global level, there have been no comprehensive assessments of current structures at the architectural level. This marked deficiency in implementation indicates that an acute need exists for assessments to be based on realities. Such an assessment would be useful for implementing SDG 10 and SDG 11, which both align with reducing inequality and ensuring access to safe spaces.

Table 1 presents a synthesis of the important architectural barriers to universal accessibility in public buildings that were reported within recent international literature. The table indicates the physical

and environmental barriers that limit the independent use of buildings on the part of people with disabilities, older people, and other members. All the barriers reported have at least three scholarly publications within peer-reviewed journals. The observation indicates that problematic entrance design, ill-functional circulation, non-functional ramps, and lacking supportive aspects still feature significantly. Overall, the literature emphasises the need for comprehensive implementation of universal design principles to enhance accessibility and user satisfaction in existing public buildings.

Table 1
Literature-based synthesis of architectural barriers influencing accessibility in public buildings

Architectural Barriers	Citation (Author, year)
Easily identifiable entrance	Chidiac and Reda (2025); Marín et al. (2023); and Olodeoku et al. (2024)
Free from obstacles	Carlsson et al. (2022); Burns et al. (2024); and Olodeoku et al. (2024)
Ramps and slopes for users	Anunobi et al. (2015); Nakarmi and Shrestha (2022); and Chidiac and Reda (2025)
Appropriate to use ramps	Anunobi et al. (2015); Burns et al. (2024); and Olodeoku et al. (2024)
Wide entrance doors	Carlsson et al. (2022); Burns et al. (2024); and Marín et al. (2023)
Well-designed entrance	Chidiac and Reda (2025); Marín et al. (2023); and Olodeoku et al. (2024)
Clear signs of ramps and elevators	Baris and Uslu (2009); Marín et al. (2023); and Burns et al. (2024)
Space for manoeuvring	Carlsson et al. (2022); Burns et al. (2024); and Olodeoku et al. (2024)
Automatic doors	Duman and Uzunoğlu (2021); Burns et al. (2024); and Chidiac and Reda (2025)
Handrails for support	Anunobi et al. (2015); Nakarmi and Shrestha (2022); Chidiac and Reda (2025)
Seating area	Chilufya (2013); Olodeoku et al. (2024); and Burns et al. (2024)
Emergency evacuation	Chidiac and Reda (2025); Burns et al. (2024); and Carlsson et al. (2022)
Security personnel	Carlsson et al. (2022); Burns et al. (2024); and Olodeoku et al. (2024)
Parking for senior citizens	Olodeoku et al. (2024); Burns et al. (2024); and Marín et al. (2023)
Even, non-slip surfaces	Olodeoku et al. (2024); Burns et al. (2024); and Nakarmi and Shrestha (2022)
Public transport stops near the entrance	Levison and Wu (2024) ; Marín et al. (2023); and Carlsson et al. (2022)
Absence of even, non-slip surfaces	Olodeoku et al. (2024); Burns et al. (2024); and Nakarmi and Shrestha (2022)
Adequate lighting	Kportufe (2015); Olodeoku et al. (2024); and Burns et al. (2024)
Overall satisfaction with accessibility	Carlsson et al. (2022); Burns et al. (2024); and Chidiac and Reda (2025)

Public buildings represent a major share of the real estate market overall (Fuentes-del-Burgo et al., 2021) and should be open to accessibility for every person living in the community (Burns et al., 2024). The achievement of accessibility could be difficult, as sometimes the issue related to accessibility is not thoroughly considered during the building design (Burns et al., 2024). Universal design passes the standard requirements for buildings to be fully accessible to everyone. The goal of universal design is to provide accommodations for people without considering age, gender, culture, ability, or disabilities. There are diverse quality parameters dealing with universal design, covering social, physical, security, as well as private parameters, along with the requirements for navigation, understanding, environmental conditions, comfort, well-being, and social participation requirements (Olodeoku et al., 2024). Accessibility refers to the ability to make the environment usable fully by the target users generally. The availability or lack of accessibility of the built environment either facilitates or obstructs users, depending on the degree to which the users can accomplish the desired or necessary activities (Olodeoku et al., 2024). Many factors can result in the lack of accessibility. Architectural barriers are one of them. It refers to an environmental and/or physical barrier that limits the entrance to a site or a building for some people. But the actual environmental factors that act as a barrier to accessibility depend on the functional limitation of the person. For instance, factors such as stairs and steps can be a barrier to people using wheelchairs, but this is not the case for people with hearing impairments. On the contrary, hearing-impaired people have different environmental issues to withstand, such as the absence of visual information in an auditory environment. As such, the issue of accessibility is relative, and it is described by the interaction of a person's functional capabilities and the needs of the physical environment (Carlsson et al., 2022).

It is often difficult for professionals to navigate the complexities involved in designing accessible spaces. Even a single environmental element (such as the absence of a ramp, visual indicators, or hearing loops) can be sufficient to restrict an individual's activities. While removing barriers in the built environment is important, it does not address every individual's needs (Hammel et al., 2015). It is because the functional capacity of individuals varies throughout life and typically declines with age. It leads to more frequent functional limitations. These limitations reflect reduced ability to perform essential physical and mental tasks required for daily living (Carlsson et al., 2022).

Consequently, it is very important that an environment where access barriers do not exist is created to ensure that all individuals, irrespective of their level of ability, can have equal access to the built environment. Therefore, accessibility can be increased with well-informed urban planning to enhance the built environment in a way that fosters inclusivity and engagement from all members of the community (Levison & Wu, 2024; MacDonald, 2024).

Research conducted in Ghana in the context of the accessibility of disabled people to public buildings concluded that public buildings are not designed from a disabled people's perspective. Approximately 80% of people complained about access, floor, corridors, etc., because a lift or ramp for disabled people is not available for access to the building facilities. Most people complained about the lack of light in the building (Kportufe, 2015). Research work was also done in Turkey, focusing on vision-impaired people and people with mobility disabilities. It was also concluded in the research that disabled people encounter many physical barriers while trying to access buildings. These physical barriers in the urban environment restrict a person's freedom of movement, hence inhibiting social communication, culminating in social exclusion or isolation (Baris & Uslu, 2009).

Chilufya (2013) interviewed to evaluate the public buildings of Lusaka, Zambia. The data showed that these buildings do not include ramps, lifts, handrails, accessible restrooms, and other facilities, without which any person with disabilities cannot navigate a building consistently or with ease. This has resulted in various practical problems that are humiliating for the senior or disabled individuals to access the services located in those buildings. Consequently, it is a question of their equality rights and human dignity. In contrast, several developed countries have successfully addressed accessibility challenges by embedding inclusive design principles into legislation, building regulations, and planning policies. In the United States, the Americans with Disabilities Act (ADA) of 1990 and the 2010 ADA Standards for Accessible Design mandate accessible entrances, ramps, elevators, parking spaces, toilets, signage, and circulation routes in public buildings, with compliance enforced through legal mechanisms (U.S. Department of Justice, 2010). To evaluate the public buildings' situation in Pakistan, this research was designed to find out the architectural barriers linked to public buildings' accessibility in Sindh province, and the facilitation design of these facilities in the face of challenges presented by individuals.

Despite countries' legislation and the international community's understanding of inclusive design, no detailed building-level assessment has been done in these civic buildings for the main metropolitan cities in the region. These buildings serve thousands of citizens on a daily basis. It would provide an innovative contribution to the existing body of knowledge to address the gap in accessibility in civic buildings, specifically in Karachi and Hyderabad, for the first time, using the perspective of accessibility for the buildings 'Shahbaz Building' in Hyderabad, 'Civic Centre' in Karachi, Pakistan. Rather than exploring legislation about accessibility in buildings, the issue would address barriers for both differently abled citizens, as well as abled ones, in these civic buildings. It would provide an idea about the gap in terms of implementing by-laws about accessibility to assist in addressing the gap that remains in policy, rather than

practice, for the sake of sustainable social inclusion in Pakistani urban governance. Sustainable Development Goals (SDGs) also promote equality and inclusivity. For example, SDG 10, inequality reduction, and its sub-points focus on limiting all types of inequality, including those based on sex, ethnicity, race, religion, economics, or even disability. With reference to equality for people with disabilities, this goal promotes equitable access to civic services and infrastructure for persons with disabilities, along with people who are fully able and functional. Moreover, SDG 11 of "Sustainable Cities and Communities" also focuses on promoting inclusion, resilience, and safety for individuals from all backgrounds. Furthermore, the 11.7 target of this SDG emphasises universal access to safe, inclusive, and accessible public spaces. Therefore, the aim is to ensure ease, accessibility, equality, and inclusivity for all (United Nations, 2015).

METHODS

Research Design

This study employed a cross-sectional study design to assess the Architectural barriers in three public buildings located in Sindh province, Pakistan. A total of 1000 people were recruited in the study using a non-probability convenience sampling technique.

Participants

The participants were frequent visitors of Civic Centre Karachi (n = 500), Shahbaz Building Hyderabad (n = 250), and Civic Centre Hyderabad (n = 250), Pakistan.

Study Tool

The study utilised a structured questionnaire consisting of two sections. Section I (Demographic Information) comprised eight questions that collected respondents' background characteristics, including gender, age, marital status, physical disability or mobility challenges, frequency of visits to public buildings, purpose of visit, frequency of visits to the selected public building, and mode of transport. Section II (Physical Barriers to Ingress Accessibility) consisted of 19 indicators assessing users' perceptions of the physical accessibility of public building entrances. The indicators evaluated various aspects of ingress accessibility, including entrance visibility, obstacle-free pathways, ramps and slopes, door width, entrance safety, accessibility signage, manoeuvring space, lighting, automatic doors, handrails, seating facilities, emergency evacuation information, staff assistance, designated parking, even, non-slip surfaces, accessibility from public transportation, and visitors' satisfaction with entrance accessibility. All indicators were measured using a 5-point Likert scale, ranging from 1 = Strongly Disagree to 5 = Strongly Agree. The face and content validity of the tool was done by field experts, and the reliability analysis was also conducted. The reliability coefficient of the tool indicated excellent internal consistency ($\alpha = .958$).

Study Procedure and Ethical Considerations

The visitors were approached and were asked to participate in the study voluntarily. The agreed visitors gave written consent and completed the questionnaire.

Data Analysis

The collected questionnaires were coded and entered into statistical software SPSS version 26, and the results were analysed. Frequency distribution, means, and standard deviations were calculated to assess the responses. To determine the association between the indicators, Chi-square tests were utilised.

RESULTS

Demographic Profile of Participants

Table 2 shows the demographic characteristics of visitors to three different public buildings. Out of 500 Civic Centre Karachi visitors, seventy percent were males, and almost 31% were aged between 41 and 50 years. Around 80% of the visitors were married. Almost three-fourths of them had no physical disability. Three-fifths of the visitors visit this centre daily, and 63.6% have jobs in this centre, while 25% visit for information. Lastly, more than forty percent of the people use a car as the mode of transport, and 38.2% use a motorcycle. Out of 250 visitors of the Shahbaz building and Civic centre Hyderabad, more than seventy percent of the participants were males, more than one-third were 51-60 years old, and almost two-thirds were married. Around 70% of the visitors had no physical disability. More than 55% of the people visit these buildings daily for work. Lastly, the most frequently used mode of transport is the motorcycle by more than 43% of people, and one-fourth of people use public transport to visit these two buildings.

Table 2
Demographic profile of visitors

Indicators	Responses	Civic Centre Karachi N = 500 n (%)	Shahbaz Building Hyderabad N = 250 n (%)	Civic Centre Hyderabad N = 250 n (%)
Gender	Male	353 (70.6)	181 (72.4)	177 (70.8)
	Female	147 (29.4)	69 (27.6)	73 (29.2)
Age	20-30	41 (8.2)	37 (14.8)	37 (14.8)
	31-40	92 (18.4)	56 (22.4)	53 (21.2)
	41-50	154 (30.8)	50 (20.0)	51 (20.4)
	51-60	126 (25.2)	89 (35.6)	91 (36.4)
	Above 60	87 (17.4)	18 (7.2)	18 (7.2)
Marital status	Single	52 (10.4)	59 (23.6)	59 (23.6)
	Married	399 (79.8)	159 (63.6)	159 (63.6)
	Divorced	4 (0.8)	25 (10.0)	25 (10.0)
	Widowed	45 (9.0)	7 (2.8)	7 (2.8)

Table 2 (*continued*)

Indicators	Responses	Civic Centre Karachi N = 500 n (%)	Shahbaz Building Hyderabad N = 250 n (%)	Civic Centre Hyderabad N = 250 n (%)
Physical disability	Yes	131 (26.2)	74 (29.6)	77 (30.8)
	No	369 (73.8)	176 (70.4)	173 (69.2)
Frequency of visits to public buildings	Daily	302 (60.4)	141 (56.4)	141 (56.4)
	Weekly	52 (10.4)	49 (19.6)	49 (19.6)
	Monthly	117 (23.4)	45 (18.0)	45 (18.0)
	Rarely	29 (5.8)	15 (6.0)	15 (6.0)
Frequency of visits to this centre	Daily	302 (60.4)	141 (56.4)	141 (56.4)
	Weekly	32 (6.4)	49 (19.6)	49 (19.6)
	Monthly	137 (27.4)	45 (18.0)	45 (18.0)
	Rarely	29 (5.8)	15 (6.0)	15 (6.0)
Reason to visit	For job	318 (63.6)	141 (56.4)	141 (56.4)
	For information	125 (25.0)	84 (33.6)	84 (33.6)
	Other	57 (11.4)	25 (10.0)	25 (10.0)
Mode of transport	Walk	25 (5.0)	28 (11.2)	28 (11.2)
	Motorcycle	191 (38.2)	111(44.4)	108 (43.2)
	Car	212 (42.2)	49 (19.6)	51 (20.4)
	Public transport	72 (14.4)	62 (24.8)	63 (25.2)

Note. n = 1000 visitors

Normality Testing

The normality of the architectural barriers tool was assessed using the Shapiro-Wilk test. The result indicated that the scores were not normally distributed, $W = .76$, $p < .001$, with skewness = 1.87 ± .08, and kurtosis = 3.23 ± .16, suggesting a positively skewed and leptokurtic distribution. This reflects that barrier scores are concentrated towards the lower end of the scale with long tails on the right side than a normally distributed data (Figure 1).

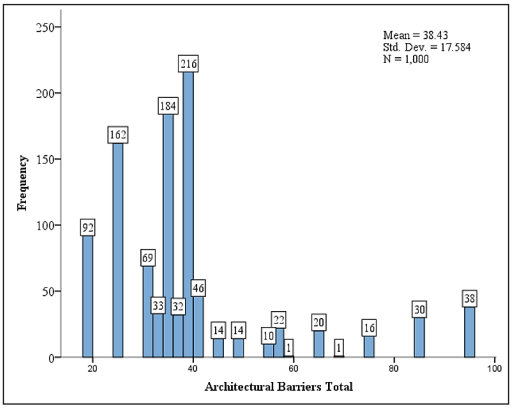

Figure 1. Histogram showing the distribution of architectural barriers scores

Factor Analysis of the Architectural barriers

A Principal Component Analysis (PCA) was conducted on the 19 items of the architectural barriers tool to explore the underlying factor structure. Inspection of the correlation matrix revealed that all items have adequate factor loadings, i.e., ≥ .80. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was .79, and Bartlett's Test of Sphericity was statistically significant, χ^2 (171) = 39034.92, $p < .001$, indicating the suitability of factor analysis.

Initial eigenvalues and scree plot (Figure 2) revealed two factors having eigenvalues above 1, explaining 73.15% and 10.18% of the variance, respectively. The factors explained 83.33% of the overall variance. As the scale items were interconnected, a Promax rotation was performed.

The rotated solution revealed that factor 1 (identifiable entrance, appropriate ramps, automatic doors, emergency evacuation, parking, etc.) reflected structure-related barriers, and factor 2 (non-slip surface and adequate lighting) reflected visibility barriers (Table 3). The two factors were weakly correlated ($r = .10$).

Table 3
Factor analysis of the architectural barriers identified from the study

Architectural Barriers Tool Items	Factor Loadings	
	1	2
Factor 1		
Easily identifiable Entrance	.88	.21
Free from obstacles	.94	.04
Ramps and slopes for users	.85	.00
Appropriate to use ramps	.88	-.02
Wide entrance doors	.95	-.12
Well-designed entrance	.89	.00
Clear signs of ramps and elevators	.87	-.02
Space for manoeuvring	.94	-.07
Automatic doors	.94	-.02
Handrails for support	.81	.20
Seating area	.96	.00
Emergency evacuation	.94	.00
Security personnel	.91	.09
Parking for senior citizens	.81	-.11
Even, non-slip surfaces	.96	-.03
Public transport stops near the entrance	.90	.00
Overall satisfaction with accessibility	.89	-.11
Factor 2		
Absence of even, non-slip surfaces	.08	.94
Adequate lighting	-.11	.96

Note. n = 1000 visitors

A Principal Component Analysis (PCA) was conducted on the 19 items of the architectural barriers tool to explore the underlying factor structure. Inspection of the correlation matrix revealed that all items have adequate factor loadings, i.e., ≥ .80. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was .79, and Bartlett's Test of Sphericity was statistically significant, χ^2 (171) = 39034.92, p < .001, indicating the suitability of factor analysis. Initial eigenvalues and scree plot (Figure 2) revealed two factors having eigenvalues above 1, explaining 73.15% and 10.18% of the variance, respectively. The factors explained 83.33% of the overall variance. As the scale items were interconnected, a Promax rotation was performed. The rotated solution revealed that factor 1 (identifiable entrance, appropriate ramps, automatic doors, emergency evacuation, parking, etc.) reflected structure-related barriers, and factor 2 (absence of even, non-slip surfaces and adequate lighting) reflected visibility barriers. The two factors were weakly correlated (r = .10).

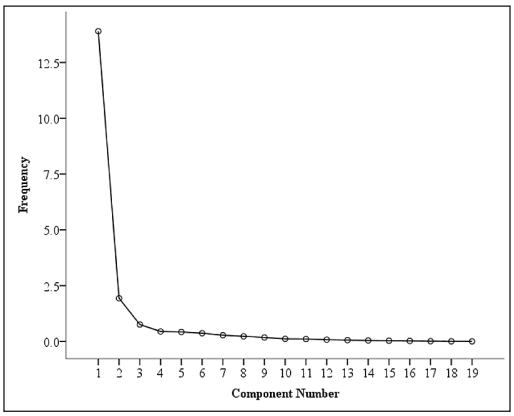

Figure 2. Scree plot

Physical Factors Impacting the Public Accessibility

Most of the visitors of the Civic Centre Karachi reported disagreement on the easy accessibility of the entrance and the facilities available. However, nearly three-fourths of the respondents agreed that there were no physical barriers like steps or even, non-slip surfaces in the entrance area, and around 65% reported that the lighting was adequate, ensuring safety and visibility (Table 4).

Most of the visitors of the Shahbaz Building, Hyderabad, disagreed with the easy accessibility of the entrance, the ramps, design, signs, space for manoeuvring, seating area, handrails, etc. Nevertheless, 60% of the visitors reported the absence of physical barriers in the entrance area, with a mean response of 3.39 ± 1.52. In addition, half of the visitors agreed on adequate lighting in the entrance area (Table 5).

The responses of visitors regarding Civic Centre Hyderabad were between Mean ± S.D 1.81 ± 1.17 to 2.23 ± 1.05 for most of the indicators, like wide entrance doors, appropriate ramps, clear signs, automatic doors, space for manoeuvring, etc. These responses depict overall disagreement regarding the accessibility of the entry. Like the other two buildings, the response of visitors regarding the absence of physical barriers and lighting was better, in which Mean ± S.D 1.70 ± 1.08 and Mean ± S.D 1.76 ± 1.08 people agreed, respectively (Table 6).

Table 4
Physical factors impacting the accessibility of the entry to the Civic Centre, Karachi

Indicators	Strongly Disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly Agree n (%)	Mean ± *SD*
Easily identifiable Entrance	321 (64.2)	95 (19.0)	32 (6.4)	22 (4.4)	30 (6.0)	1.69 ± 1.15
Free from obstacles	206 (41.2)	210 (42.0)	34 (6.8)	20 (4.0)	30 (6.0)	1.92 ± 1.08
Ramps and slopes for users	209 (41.8)	147 (29.4)	94 (18.8)	20 (4.0)	30 (6.0)	2.03 ± 1.14
Appropriate to use ramps	231 (46.2)	152 (30.4)	65 (13.0)	22 (4.4)	30 (6.0)	1.94 ± 1.14
Wide entrance doors	294 (58.8)	122 (24.4)	34 (6.8)	20 (4.0)	30 (6.0)	1.74 ± 1.14
Well-designed entrance	307 (61.4)	96 (19.2)	46 (9.2)	21 (4.2)	30 (6.0)	1.74 ± 1.16
Clear signs of ramps and /or Elevators	286 (57.2)	130 (26.0)	33 (6.6)	21 (4.2)	30 (6.0)	1.76 ± 1.14
Absence of even, non-slip surfaces	45 (9.0)	43 (8.6)	36 (7.2)	258 (51.6)	118 (23.6)	3.72 ± 1.18
Space for manoeuvring	288 (57.6)	122 (24.4)	33 (6.6)	27 (5.4)	30 (6.0)	1.78 ± 1.16
Adequate lighting	45 (9.0)	11 (2.2)	121 (24.2)	252 (50.4)	71 (14.2)	3.59 ± 1.06
Automatic doors	288 (57.6)	128 (25.6)	32 (6.4)	22 (4.4)	30 (6.0)	1.76 ± 1.14
Handrails for support	274 (54.8)	142 (28.4)	33 (6.6)	21 (4.2)	30 (6.0)	1.78 ± 1.13
Seating area	326 (65.2)	90 (18.0)	33 (6.6)	21 (4.2)	30 (6.0)	1.68 ± 1.15
Emergency evacuation	247 (49.4)	169 (33.8)	33 (6.6)	21 (4.2)	30 (6.0)	1.84 ± 1.12
Security personnel	334 (66.8)	82 (16.4)	32 (6.4)	322 (4.4)	30 (6.0)	1.66 ± 1.16
Parking for senior citizens	301 (60.2)	69 (13.8)	65 (13.0)	35 (7.0)	30 (6.0)	1.85 ± 1.24
Even, non-slip surfaces	274 (54.8)	136 (27.2)	39 (7.8)	21 (4.2)	30 (6.0)	1.79 ± 1.14
Public transport stops near the entrance	324 (64.8)	89 (17.8)	36 (7.2)	21 (4.2)	30 (6.0)	1.69 ± 1.16
Visitors' satisfaction with accessibility	328 (65.6)	95 (19.0)	31 (6.2)	16 (3.2)	30 (6.0)	1.65 ± 1.13

Note. n = 500 Visitors

Table 5
Physical factors impacting the accessibility of the entry to the Shahbaz Building, Hyderabad

Indicators	Strongly Disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly Agree n (%)	Mean ± *SD*
Easily identifiable Entrance	55 (22.0)	165 (66.0)	7 (2.8)	15 (6.0)	8 (3.2)	2.02 ± 0.88
Free from obstacles	93 (37.2)	117 (46.8)	17 (6.8)	8 (3.2)	15 (6.0)	1.94 ± 1.05
Ramps and slopes for users	84 (33.6)	129 (51.6)	7 (2.8)	22 (8.8)	8 (3.2)	1.96 ± 1.00
Appropriate to use ramps	135 (54.0)	86 (34.4)	7 (2.8)	7 (2.8)	15 (6.0)	1.72 ± 1.07
Wide entrance doors	150 (60.0)	67 (26.8)	10 (4.0)	15 (6.0)	8 (3.2)	1.66 ± 1.03
Well-designed entrance	44 (17.6)	173 (69.2)	10 (4.0)	8 (3.2)	15 (6.0)	2.11 ± 0.94
Clear signs of ramps and /or Elevators	116 (46.4)	92 (36.8)	20 (8.0)	7 (2.8)	15 (6.0)	1.85 ± 1.09
Absence of even, non-slip surfaces	37 (14.8)	60 (24.0)	10 (4.0)	55 (22.0)	88 (35.2)	3.39 ± 1.52
Space for manoeuvring	143 (57.2)	77 (30.8)	8 (3.2)	7 (2.8)	15 (6.0)	1.70 ± 1.08
Adequate lighting	37 (14.8)	85 (34.0)	0 (0.0)	27 (10.8)	101 (40.4)	3.28 ± 1.61
Automatic doors	126 (50.4)	94 (37.6)	7 (2.8)	15 (6.0)	8 (3.2)	1.74 ± 1.00
Handrails for support	79 (31.6)	130 (52.0)	18 (7.2)	15 (6.0)	8 (3.2)	1.97 ± 0.96
Seating area	128 (51.2)	92 (36.8)	7 (2.8)	8 (3.2)	15 (6.0)	1.76 ± 1.08
Emergency evacuation	94 (37.6)	123 (49.2)	10 (4.0)	8 (3.2)	15 (6.0)	1.91 ± 1.04
Security personnel	79 (31.6)	141 (56.4)	7 (2.8)	8 (3.2)	15 (6.0)	1.96 ± 1.01
Parking for senior citizens	102 (40.8)	115 (46.0)	10 (4.0)	15 (6.0)	8 (3.2)	1.85 ± 0.98
Even, non-slip surfaces	135 (54.0)	85 (34.0)	7 (2.8)	8 (3.2)	15 (6.0)	1.73 ± 1.08
Public transport stops near entrance	126 (50.4)	94 (37.6)	7 (2.8)	8 (3.2)	15 (6.0)	1.77 ± 1.07
Visitors' satisfaction with accessibility	139 (55.6)	78 (31.2)	10 (4.0)	15 (6.0)	8 (3.2)	1.70 ± 1.02

Note. n = 250 Visitors

Table 6
Physical factors impacting the accessibility of the entry to the Civic Centre, Hyderabad

Indicators	Strongly Disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly Agree n (%)	Mean ± *SD*
Easily identifiable Entrance	48 (19.2)	164 (65.6)	7 (2.8)	15 (6.0)	16 (6.4)	2.15 ± 1.01
Free from obstacles	86 (34.4)	116 (46.4)	17 (6.8)	8 (3.2)	23 (9.2)	2.06 ± 1.17
Ramps and slopes for users	69 (27.6)	136 (54.4)	7 (2.8)	22 (8.8)	16 (6.4)	2.12 ± 1.11
Appropriate to use ramps	120 (48.0)	93 (37.2)	7 (2.8)	7 (2.8)	23 (9.2)	1.88 ± 1.20
Wide entrance doors	135 (54.0)	74 (29.6)	10 (4.0)	15 (6.0)	16 (6.4)	1.81 ± 1.17
Well-designed entrance	37 (14.8)	172 (68.8)	10 (4.0)	8 (3.2)	23 (9.2)	2.23 ± 1.05
Clear signs of ramps and/or Elevators	101 (40.4)	99 (39.6)	20 (8.0)	7 (2.8)	23 (9.2)	2.01 ± 1.20
Absence of even, non-slip surfaces	30 (12.0)	67 (26.8)	10 (4.0)	55 (22.0)	88 (35.2)	3.42 ± 1.49
Space for manoeuvring	128 (51.2)	84 (33.6)	8 (3.2)	7 (2.8)	23 (9.2)	1.85 ± 1.21
Adequate lighting	30 (12.0)	92 (36.8)	0 (0.0)	27 (10.8)	101 (40.4)	3.31 ± 1.58
Automatic doors	111(44.4)	101 (40.4)	7 (2.8)	15 (6.0)	16 (6.4)	1.90 ± 1.13
Handrails for support	72 (28.8)	129 (51.6)	18 (7.2)	15 (6.0)	16 (6.4)	2.10 ± 1.08
Seating area	113 (45.2)	99 (39.6)	7 (2.8)	8 (3.2)	23 (9.2)	1.92 ± 1.20
Emergency evacuation	87 (34.8)	122 (48.8)	10 (4.0)	8 (3.2)	23 (9.2)	2.03 ± 1.16
Security personnel	72 (28.8)	140 (56.0)	7 (2.8)	8 (3.2)	23 (9.2)	2.08 ± 1.13
Parking for senior citizens	95 (38.0)	114 (45.6)	10 (4.0)	15 (6.0)	16 (6.4)	1.97 ± 1.11
Even, non-slip surfaces	120 (48.0)	92 (36.8)	7 (2.8)	8 (3.2)	23 (9.2)	1.89 ± 1.21
Public transport stops near entrance	111(44.4)	101 (40.4)	7 (2.8)	8 (3.2)	23 (9.2)	1.92 ± 1.20
Visitors' satisfaction with accessibility	124 (49.6)	85 (34.0)	10 (4.0)	15 (6.0)	16 (6.4)	1.86 ± 1.16

Note. n = 250 Visitors

Table 7
Chi-square tests of three public buildings

Indicators	Civic Centre Karachi		Shahbaz Building Hyderabad		Civic Centre Hyderabad	
	χ^2 (16)	*p*	χ^2 (16)	*p*	χ^2 (16)	*p*
Slopes for users × Wide entrance doors	1384.98	<.001***	508.77	<.001***	503.30	<.001***
Automatic doors × Overall satisfaction	964.55	<.001***	628.65	<.001***	629.58	<.001***
Appropriate to use ramps × Space for manoeuvring	1211.95	<.001***	718.29	<.001***	717.80	<.001***

Note. n = 1000 Visitors

Table 7 represents the results of the Chi-square tests for three public buildings. A significant association was found between the presence of ramps or slopes for users and wide entrance doors with $p < .001$, which means that in the building architecture, wide doors should be constructed if there is an associated ramp. There was also a significant association between automatic doors for entry and exit and the overall satisfaction of the visitors ($p < .001$), which depicts that automatic doors improve the overall satisfaction regarding the building accessibility. Lastly, it was found that appropriate ramps and space for manoeuvring were significantly associated ($p < .001$).

Association of Different Factors Impacting the Accessibility

Overall, the findings extend beyond descriptive statistics by incorporating reliability and inferential statistical analyses to provide a comprehensive assessment of architectural accessibility. The internal consistency of the questionnaire was confirmed by an excellent Cronbach's alpha coefficient ($\alpha = .958$). The suitability of the data for factor analysis was established through the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity. Principal Component Analysis (PCA) with Promax rotation identified two underlying dimensions of architectural barriers, namely structure-related barriers and visibility barriers. Furthermore, chi-square analyses revealed statistically significant associations between ramps and wide entrance doors, automatic doors and overall user satisfaction, and appropriate ramps and manoeuvring space across all three public buildings (all $p < .001$). These findings demonstrate that accessibility is influenced by interrelated architectural features rather than isolated design elements, providing robust empirical evidence to support accessibility planning, Universal Design implementation, and evidence-based policy development.

DISCUSSION

Use of public facilities is a common practice in the community. The extent of their

utilisation determines the accessibility of these public spaces and buildings. As a result, universal design and ease of access are considered significant in such architectural planning to serve people with different abilities equitably. As public spaces serve individuals with diverse abilities, their physical features must ensure ease of access and movement for everyone. Features such as ramps, doors, floor surfaces, and signage play a direct role in shaping how individuals perceive and navigate these areas. Evaluation of these features in public buildings offers valuable insight into the effectiveness of the existing infrastructure and whether it supports accessibility and universal usability in real-world settings. The findings demonstrate that architectural barriers continue to restrict equitable access to public buildings despite the availability of accessibility regulations and Universal Design principles. The results indicate that deficiencies in ramps, entrances, circulation space, signage, automatic doors, handrails, and parking facilities remain widespread across the three public buildings investigated.

The results shows that demographic profile of the respondents, indicating that the accessibility perceptions reported in this study primarily reflect the experiences of predominantly male, married, middle-aged visitors with Around one-third of the visitors at the Civic Centre, Karachi, were between the ages of forty-one to fifty years. Similarly, approximately one-third of the visitors at the Shahbaz building and the Civic Centre Hyderabad had an age of fifty-one to sixty years. Moreover, in all three buildings, around thirty percent of the participants reported having physical disabilities.

The results regarding physical barriers from all three buildings showed that out of all the barriers, the two least common barriers reported by the study respondents were the even, non-slip surfaces at the entrance and lighting. These findings are consistent with previous research conducted in Nepal on public buildings (Nakarmi & Shrestha, 2022). As countries work towards equality, fairness, diversity, and inclusion, it is also essential to establish accessible environments, including public facilities (Chidiac & Reda, 2025).

Moreover, the mean scores indicated that respondents perceived the entrances as not being well-designed, easily identifiable, or free from obstacles, and they also perceived the provision of ramps and appropriate slopes as inadequate. The entrance doors were narrow, with the unavailability of automatic doors and handrails for support, and non-slip surface flooring. There was no clear signage of ramps and elevators. Space for manoeuvring, seating area, parking for senior citizens, emergency evacuation, and security personnel were limited in the public buildings under consideration. Moreover, public transport stops near the entrance were also missing. These barriers were the most commonly perceived across all three buildings, consistent with the findings of (Kportufe, 2015), who reported that inaccessible entrances, inadequate ramps, and other physical barriers were common accessibility challenges in public buildings.

The study found that architectural barriers hinder accessibility for individuals with differing needs. Their results showed that architectural and physical barriers related to access, undetectable obstacles, signage, door mechanisms, staircases, ramps, and many others exist in more than three-fourths of the 25 public buildings (Marín et al., 2023).

Furthermore, the results of the Chi-square tests showed a significant association between the wide entrance doors and the presence of ramps or slopes for three public buildings. This signifies that wide doors should be constructed when there are associated ramps at the entrance of the buildings. The entrance doors with ramps must be wider, given their numerous uses. A ramp is suitable for individuals who struggle with stairs for numerous reasons, whether for carrying heavy items between floors, using a stroller for a child, or due to a physical limitation and or disability. The presence of both stairs and ramps enables individuals to select the option that meets their specific requirements, leading to a more adaptable, versatile, and universally accessible design. This clarifies the benefits of ramps in public architecture. Moreover, ramps, whether external or internal, must be carefully designed to ensure they provide genuine practical value. The ramps should have a clear width greater than 1050mm. Likewise, the door widths that are associated with ramps should ideally be no less than 1000 mM (Anunobi et al., 2015).

Additionally, automatic building doors have a significant association with overall visitor satisfaction and tend to improve overall satisfaction regarding building accessibility. This is possibly because automatic sliding doors have an impact on a building's appearance, user experience, and accessibility. They offer both practical advantages and aesthetic appeal while conserving space and allowing for more adaptable layouts. Their smooth operation and space-efficient nature contribute to a positive user experience while enhancing accessibility for individuals using mobility aids. This also increases the public's satisfaction levels. They facilitate hands-free entry and exit, making movement easy. A large number of people can pass through them efficiently, which also minimises the risk of germ transmission, ensuring a healthy environment. Therefore, their design, being space-efficient, energy-saving, and user-friendly, makes them an excellent choice for public buildings that prioritise visitor convenience. This makes circulation easier for all kinds of users (Duman & Uzunoğlu, 2021). Nevertheless, a small amount of literature is available in this regard, particularly with respect to visitor satisfaction with automatic doors in public buildings.

Lastly, an association between manoeuvring space and appropriate ramps was found. Ramps in public buildings that are poorly designed with steep angles, slippery surfaces, insufficient railings, unsuitable locations, and excessive lengths without landings can lead to issues with manoeuvrability and circulation. In these cases, individuals with physical challenges

may find these inadequately designed ramps inconvenient or difficult to use, often opting for stairs despite the associated risks when they are available. The U.S. Access Board (2015) emphasised that ramps, both exterior and interior, that connect different levels should be thoughtfully designed and constructed to provide genuine practical benefits. Running slopes greater than 1:12 can be dangerous even for individuals in good physical condition. Therefore, appropriate ramps with handrails should be designed (Anunobi et al., 2015).

CONCLUSION

Adapting or building accessible environments is not just a matter of convenience or preference; it is a matter of equal rights and accessibility, not just about people with disabilities, but it benefits everyone, including the elderly, parents with strollers, and people with temporary injuries. Therefore, creating accessible environments should be a priority for all developers and key actors involved in the proposal and creation of buildings and public spaces. The findings of the study demonstrated that public buildings had various barriers that affect the accessibility of people and their mobility. In this study, mobility is defined as the ability of individuals to move safely, independently, and efficiently within and around public buildings without being hindered by architectural barriers. Therefore, it is essential to recognise the importance of accessibility and work to create inclusive environments for everyone. This requires a shift in mindset, a commitment to accessibility standards, and the implementation of legislation and regulations that prioritise accessibility.

The findings demonstrate that major public buildings in Karachi and Hyderabad continue to contain numerous architectural barriers that restrict accessibility for persons with disabilities as well as other users, including older adults, parents with strollers, and individuals with temporary mobility limitations. The most prominent barriers identified include poorly designed entrances, ramps, narrow doors, insufficient manoeuvring space, lack of automatic doors, inadequate signage, limited seating, handrails, emergency evacuation facilities, and parking provisions. Although existing accessibility standards and Universal Design principles provide appropriate guidance, their implementation remains inadequate. Improving compliance with accessibility regulations, integrating Universal Design into future developments, and upgrading existing public infrastructure are essential for creating inclusive, equitable, and sustainable public environments that promote independent access for all members of society. Incorporating these guidelines can reduce the number of challenges. However, proposing standard solutions is challenging as each facility, and its requirements are distinct and unique.

IMPLICATION OF THE STUDY

One of the practical implications of this study is that it can be helpful for departments responsible for the built environment, as they can take steps to eliminate barriers that can

prevent individuals with varying abilities from engaging with the physical environment. This can lead to policy improvements by informing the development and revision of accessibility standards and design guidelines, as well as supporting the effective implementation of the *Building Code of Pakistan 2021*, particularly the accessibility provisions in Chapter 11, together with the *Accessibility Code of Pakistan* (Pakistan Engineering Council, 2006, 2021) and the relevant Sindh Building Control Authority regulations (Sindh Building Control Authority, 2002). This study can also help local government bodies re-analyse the compliance of public building on the standards put forward by these bodies to ensure public ease. This would re-emphasise the proper evaluation and monitoring of the infrastructure of buildings.

Furthermore, the findings of this research can be utilised by the organisations representing people with disabilities. They can highlight the importance of creating standards and norms for accessibility for all on government platforms, leading to consideration and /or amendments in construction and accessibility policies by reframing accessibility as a right of all. Moreover, in light of this study, professionals such as architects, construction engineers, planners, building inspectors, and others involved in designing and constructing the physical environment can especially include accessibility and universal design principles in their construction projects as a core element, instead of focusing on just beauty and cost-effectiveness.

LIMITATION AND RECOMMENDATIONS FOR FUTURE RESEARCH

This study has a few limitations that should be taken into consideration. As the study was cross-sectional in nature, it represents only a one-time association between the variables and cannot determine the cause and effect or longitudinal relationships. Additionally, the disabled participants who took part in the study were not asked whether their disability was congenital or acquired. Similarly, the conclusions cannot be drawn regarding the involvement of the participants in the community activities before disability. Lastly, as this study was conducted on a specific geographical location of two metropolitan cities in the Sindh province, generalising this study's findings to other regions should be done with caution.

The future research can focus on gathering data from individuals with disabilities and highlight their perspective about the public buildings. This step can generate valuable insights, as there can be differences in the observations and viewpoints of individuals with and without disabilities. In addition, researchers can expand the geographical location of the study and can also include other public spaces like bus and train stations, hospitals, etc., to improve the generalizability of findings.

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REFERENCES

Anunobi, A., Adedayo, O., Ayuba, P., Oyetola, S., & Godwin, O. (2015). An assessment of ramp designs as barrier-free accesses in public buildings in Abuja, Nigeria. *Humanities and Social Sciences*, *3*(2), 75-82. https://doi.org/10.11648/j.hss.20150302.12

Amucheazi, C., & Nwankwo, C. M. (2020). *Accessibility to infrastructure and disability rights in Nigeria: An analysis of the potential of the Discrimination Against Persons with Disability (Prohibition) Act 2018*. *Commonwealth Law Bulletin, 46*(4), 689-710. https://doi.org/10.1080/03050718.2020.1781674

Baris, M. E., & Uslu, A. (2009). Accessibility for the disabled people to the built environment in Ankara, Turkey. *African Journal of Agricultural Research*, *4*(9), 801-814.

Burns, S. P., Mendonca, R. J., & Smith, R. O. (2024). Accessibility of public buildings in the United States: a cross-sectional survey. *Disability & Society*, *39*(11), 2988-3003. https://doi.org/10.1080/09687599.2023.2239996

Carlsson, G., Slaug, B., Schmidt, S. M., Norin, L., Ronchi, E., & Gefenaite, G. (2022). A scoping review of public building accessibility. *Disability and Health Journal*, *15*(2), Article 101227. https://doi.org/10.1016/j.dhjo.2021.101227

Chidiac, S. E., & Reda, M. A. (2025). "True" accessibility barriers of heritage buildings. *Buildings*, *15*(9), Article 1528. https://doi.org/10.3390/buildings15091528

Chilufya, M. M. (2013). *Accessibility of public buildings to disabled persons* [Doctoral dissertation, University of Zambia]. UNZA Repository. https://dspace.unza.zm/server/api/core/bitstreams/b65bee5b-2fff-4cac-9bb9-3f8a10a2ac10/content

Çubıkcı, M. (2019). *Evaluation of accessibility for all in public buildings: Konya case* (Master's thesis, Middle East Technical University, Graduate School of Natural and Applied Sciences). https://hdl.handle.net/11511/43418

David, V. (2008). *How to build an accessible environment in developing countries: Manual# 1-Introduction & accessibility standards*. Handicap International France. https://miusa.globaldisabilityrightsnow.org/wpcontent/uploads/2016/03/Access_Standards.pdf

Duman, Ü., & Uzunoğlu, K. (2021). The importance of universal design for the disabled in public buildings: A public building in Northern Cyprus as a case study. *Civil Engineering and Architecture*, *9*(3), 690-707. https://doi.org/10.13189/cea.2021.090312

Eddy, M. B. (2017). *Universal accessibility: On the need of an empathy-based architecture* [Doctoral dissertation, Universitat Politècnica de Catalunya]. UPCommons. https://upcommons.upc.edu/entities/publication/79c24ee4-6f08-4cda-97c6-8525318e2cda

Fuentes-del-Burgo, J., Navarro-Astor, E., Ramos, N. M. M., & Martins, J. P. (2021). Exploring the critical barriers to the implementation of renewable technologies in existing university buildings. *Sustainability*, *13*(22), Article 12662. https://doi.org/10.3390/su132212662

Farzana, F. (2018). Accessibility of public buildings in Khulna, Bangladesh, for wheelchair users. *Disability, CBR & Inclusive Development, 29*(4), 83-97. https://doi.org/10.5463/DCID.v29i4.785

Government of Bangladesh. (2008). Bangladesh National Building Code (BNBC) (Part 3). Bangladesh Government Press

Goldsmith, S. (2000). *Universal design: A manual of practical guidance for architects*. Architectural Press.

Hammel, J., Magasi, S., Heinemann, A., Gray, D. B., Stark, S., Kisala, P., Carlozzi, N. E., Tulsky, D., Garcia, S. F., & Hahn, E. A. (2015).

Environmental barriers and supports to everyday participation: A qualitative insider perspective from people with disabilities. *Archives of Physical Medicine and Rehabilitation*, *96*(4), 578-588. https://doi.org/10.1016/j.apmr.2014.12.008

Hyderabad Development Authority. (n.d.). *Building Control Regulations.* Government of Sindh.

Kportufe, G. S. (2015). Assessment on the accessibility of public buildings and its facilities to the disabled in Ghana. *Civil and Environmental Research*, *7*(10), 78-90.

Levison, D., & Wu, H. (2024). Access, the built environment, and behavior. In D. Protoglou & J. Spinney (Eds.), *Handbook of Travel Behaviour* (pp. 256-278). Edward Elgar Publishing. https://doi.org/10.4337/9781839105746.00022

Lianto, F., Marizar, E. S., William, & Budiyanto, F. (2021). Wheelchair-accessible toilet at Gambir station. *Proceedings of the International Conference on Economics, Business, Social, and Humanities (ICEBSH 2021)*, *570*, 299-304.

MacDonald, D. (2024). *Exploring the accessibility knowledge of professional planners* [Master's thesis, Toronto Metropolitan University]. Toronto Metropolitan University Research Repository. https://rshare.library.torontomu.ca/articles/thesis/Exploring_the_Accessibility_Knowledge_of_Professional_Planners/25417426

Marín, J., Sáez-Pérez, M., Tajani, F., & Sica, F. (2023). Analysis of the accessibility improvement index in urban areas through heritage buildings used as museums—Case studies in the region of Murcia (Spain). *Sustainability*, *15*(18), Article 13517. https://doi.org/10.3390/su151813517

Mirza, M., Goyal, T., & Goyal, L. (2023). Barrier-free healthcare design for patients with disabilities. In D. Bhatia, P. K. Chaudhari, B. Chaudhary, S. Sharma, & K. Dhingra (Eds.), *A Guide to Hospital Administration and Planning* (pp. 251-266). Springer Nature Singapore. https://doi.org/10.1007/978-981-19-6692-7_14

Nakarmi, S., & Shrestha, S. (2022). Accessibility in public buildings for people with disability: A case of Patan, Nepal. *Proceedings of the 12th IOE Graduate Conference*, *12*, 244-252.

National Disability Authority. (2026). *Universal design*. Centre for Excellence in Universal Design. https://universaldesign.ie/about-universal-design

Olodeoku, M., Alokun, A., Alagbe, O., Egwabor, J., & Buseri, J. (2024). Exploring universal design principles in the built environment: An empirical review. *African Journal of Environmental Sciences and Renewable Energy*, *16*(1), 84-98. https://doi.org/10.62154/ajesre.2024.016.010352

Pakistan Engineering Council. (2006). Accessibility code of Pakistan. Pakistan Engineering Council.

Pakistan Engineering Council. (2021). *Building Code of Pakistan 2021 (Building Accessibility Provisions, Chapter 11).* Pakistan Engineering Council.

Story, M. F., Mueller, J. L., & Mace, R. L. (1998). *The universal design file: Designing for people of all ages and abilities*. NC State University, Centre for Universal Design.

Sindh Building Control Authority. (2002). *Karachi Building and Town Planning Regulations, 2002.* Sindh Building Control Authority

U.S. Access Board. (2015). *Guide to the ABA accessibility standards*. https://www.access-board.gov/aba/guides/chapter-4-ramps-and-curb-ramps/

U.S. Department of Justice. (2010). *2010 ADA standards for accessible design*. https://www.ada.gov/assets/pdfs/2010-design-standards.pdf

United Nations. (2015). *Transforming our world: The 2030 agenda for sustainable development.* https://sdgs.un.org/goals