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Original Article

A Study to Analyze the Current Scenario of Barrier Free Access in Gwalior Smart City Primary Health Centre

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Abstract

Background: Barrier- free access is very important for people with disabilities (PwD)**. Objectives:** The main objective of the current study focuses on analyzing the present situation in 15 disability prepared Primary Health Centres (PHCs) in the Smart City Gwalior in Madhya Pradesh, India. **Methods**: During the present research, a live accessibility audit was carried out on site by preparing a questionnaire before the direct audit and was divided into four categories of functional space, namely (i) Parking area and external access, (ii) Barrier-free entrance and internal atmosphere, (iii) Doors and openings, & (iv) Proper toilets. Field data, in the form of primary and secondary data, is analyzed for frequency and percentage, and the necessary statistical analysis is carried out. As far as the results are concerned, it was found that access to building space depends on the inclusiveness of its external conditions, direction taken and progress in urban areas have many limitations and needs. **Results**: The findings show that ease of accessibility for the elderly and disabled varies across functional spaces and there is an urgent need to improve this situation. Current research indicates that there is a great need for a holistic approach that can be used to design and plan smart urban settlements to create sustainable and accessible built environments. **Conclusion**: It can be concluded that all Community Health Centre areas and buildings need to provide a more accessible and barrier-free environment that can meet the demands of a wider range of users, including the elderly and disabled.

Keywords: *Access Audit, Inclusivity, Primary Health Care Centres, Smart City*

Introduction

Accessibility for everyone and a barrier-free environment are needed for equal opportunities and independent living in a world that welcomes everyone, now and in the future. Accessibility to the physical environment is very important for everyone, including people with disabilities (Person Disabilities) (Abhishek, Garg & Keshri, 2024). India is a signatory to the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD), which was established in 2006 with the aim of enhancing administrative, legislative, and policy measures to protect the rights of persons with disabilities. All services, especially emergency services, information, transportation, physical environment, and communication technology, are among them (Addas, 2023).

Researchers have previously used closed-ended questions to study accessibility issues for people with disabilities. Accessibility audits report problems and barriers that hinder their access to basic medical care. However, neither India nor other countries like India have considered on-site evaluation of health facilities for audits of health facility access. (Bello *et al*., 2024). The aim of this study was to use the checklist from the CPWD Harmonized Universal Accessibility Guidelines 2021 to assess the physical accessibility of Primary Health Care Centres for people with disabilities in the Gwalior city area. This

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study shows that wheelchairs, touchways, ramps, fences, toilets, and signs are significant accessibility barriers for people with disabilities in Community Health Centres (Bjørner, 2021). The conclusions of this study can be used as input for future national surveys as well as a logical list for all types of health centers. Barrier-free access to primary healthcare for PwDs in India can be properly realized, even though there are many needs and few resources (Breton *et al., 2021*).

It is very important for the government to implement Universal Design Standards in health care facilities for the elderly and people with disabilities. The study's results will demonstrate to the public that the government is making every effort to ensure the welfare and growth of individuals with disabilities. People with disabilities no longer feel alone when they're around other disabled people, and it's getting harder for businesses to grow without facilities that are just for them and their full potential (Del-Real, Ward & Sartipi, *2023*)**.**

It is difficult for people with disabilities to access health facilities independently due to obstacles in urban environments, such as poor transportation and inadequate accessibility. Inadequate encounters with caring are the result of attitudinal barriers (Di Napoli *et al., 2022*).

The findings of this facility-based analysis indicate that Community Health Centres are not fully focused on meeting the needs of people with disabilities. AIC audit checklists are very long, have a lot of questions, and can be different for each facility, even secondary and tertiary level healthcare facilities. Therefore, it has been evaluated and examined some of the most surprising research findings. Discussions suggest that the current study will offer a more comprehensive overview of various national initiatives. It is difficult to compare or contrast the findings of this study because no similar research has been conducted at home or abroad (Fernández-Díaz *et al., 2023*).

The National Health Mission created the Indian Public Health Standards (IPHS), which serve as guidelines for public health facilities. But apart from ramps and handrails, the guidelines themselves do not include explicit criteria regarding people with disabilities. Important issues including the accessibility of entrances, hallways, outpatient consultation rooms, toilets, the requirement for height-adjustable examination tables, and the height of placement of health education materials on walls have not been addressed in these guidelines (Woodland 2023). The World Bank report cites the following issues as the main causes of limited access of people with disabilities to health services: lack of systems to identify and certify disabilities, lack of knowledge of people with disabilities, attitudes of society and the health system towards them, and financial barriers**.** Because these conditions are more severe in rural areas, this study emphasizes the need to modify the architectural environment in public health institutions to accommodate people with disabilities (Garnelo *et al., 2020*).

The South India Disability Evidence (SIDE) study found that people with disabilities had higher rates of being hospitalized before, a higher risk of diabetes and depression, and major problems getting medical care. Access to health services is only about 2% to 3% in other countries in the same region. However, a community-based survey in Karnataka, South India, found that more than 6% of people with disabilities (PwD) got some kind of medical or surgical treatment. Elderly people, whose movements are particularly impaired, may experience these problems with greater intensity.

(Kolotouchkina, Barroso & Sánchez*, 2022*).

Primary health care is an essential health care service that is based on practical, scientifically sound, and socially acceptable methods and technology that is made available to all individuals and families in the community. PwD are an important component of these communities, and primary health care centres (PHCs) that are not disability friendly can prevent approximately 2% of these community members from getting basic health services (Li *et al.,* 2023).

Previously, accessibility difficulties in people with disabilities were investigated utilising qualitative interviews and focus group discussions. Individuals with disabilities describe a various issues and experiences that limit their ability to obtain essential health care services. However, there has been no research into on-site assessments of health institutions for accessibility audits in India or other similar nations (Moraes *et al., 2024*)

Material and Methods

This study was conducted in Madhya Pradesh, with 15 operational community health centers in the Gwalior District of India (Table 1). This district has a physical area of 4,560 km² and a population of 2,032,036 people. It is in the northern region of Madhya Pradesh in Central India between 26.2124° N and 78.1772° E *(2011 census).* A district hospital, four civil hospitals, two community health centers, fifteen primary health centers, and 101 auxiliary health centers constitute the public health facilities in the district (Leal Sobral *et al., 2023*).

These questions and the accessibility audit checklist come from the "Harmonized Guidelines & Standards for Universal Accessibility in India 2021" that the Ministry of Housing & Urban Affairs, Government of India, and CPWD put together. There are four main parameters, and five questions are chosen for each one. Each question has a rating on a scale from 1 to 5 (Ministry of Housing & Urban Affairs 2021) .

Here, the function of the "access audit" in generating new forms of embodied involvement has been experimented with, technical competence has been observed, and visions of what a modern Indian city should have been observed. The examination focused on how disability activists establish a connection between subjective body sensations and objective knowledge. It also looked into how to make a professional access auditing system that is based on technical standards. Because neither volunteer nor professional access audits result in significant architectural or structural adjustments, it is highly significant to understand the additional consequences and effects produced by these audits, as well as the discursive authority claims of inaccessibility (Ulpiani *et al., 2023*).

The practice of "access audits" by grassroots and professional disability rights activists and organisations in metropolitan India has been closely monitored. One could argue that access audits, while highly targeted, yield minimal impact. Auditors ignore the relevance of programmatic and policy initiatives, as well as the need for a more collective, contested politics, by focusing solely on physical and technological access (Wolniak & Stecuła, 2024). The current research shows that the controversial area of access auditing is stopping the creation of a unified disability coalition. Auditors should also think about the idea of "access" and the political, economic, and social systems that support it.

Statistical Analysis of Data

Microsoft Excel and SPSS 20 statistical software were used for data entry and statistical analysis. Descriptive statistics and frequencies are run to check normality and see if any skewness or kurtosis is occurring. Descriptive statistics consisting of frequencies and percentages, mean and standard deviation were also calculated for quantitative variables. The Kruskal-Wallis *H* test (non-parametric) was run to check the significance of the results for each parameter individually. The level of significance (P value) for all statistical tests is set at 0.05, which is 5%.

Reliability

Cronbach's Alpha Coefficient method is used to measure the reliability of the questionnaire between each field and the average of all questionnaire fields. The normal range of Cronbach coefficient alpha values is between 0.0 and + 1.0 and higher values reflect a higher level of internal consistency. The results are in the range of 0.8330 and 0.9282**,** this range is relatively high; The results guarantee the reliability of the questionnaire.

Ethical Consideration

The ethical clearance was obtained from Research Ethics Committee, Amity University Gwalior, India vide reference number AUMP/DRP/2025/001 dated15th January 2025.

Result

During December 2022 to March 2024, the main investigator made direct visits to each Community Health Centre. There are four blocks under Gwalior district comprising of 15 Health care Centres which

gives a detailed view of infrastructure (Table 1). The Access Audit Checklist created by AIC is used for data collection. The accessibility percentage of community health centres of Smart City Gwalior has been recorded (Fig1) based on four different parameters.

Table 1: List of Community Health Centres in Gwalior District

Block Names/Rural Population	Regional Hospital/Bed	Civil Hospital/Bed	CHC/ Bed	Health Centre/ Bed	Number of SHC
1	**2**	**3**	**4**	**5**	**6**
Murar - 105149	DH 100	CH Gwalior - 48		Hastinapur - 6	21
		Rumah Kasih CH - 40		Veerpur	
		CH Hemsingh ki - 20		useful	
				Parsen	
Ghatigaon - 106417			Mohana - 30	Barai - 6	21
				Patay	
				Kulait	
Dabra - 135428		CH Dabra - 60		Shukalhari	
				Pichore	
				Kariawati	29
				Salbai	
				Bilowa	
Bhitarwar - 132526			Bhitarwar - 30	Antari - 6	30
				Mohangarh	
				China	
Total	**1/100**	**4/168**	**2/60**	**15/18**	**101**

(Source: Census of India 2011)

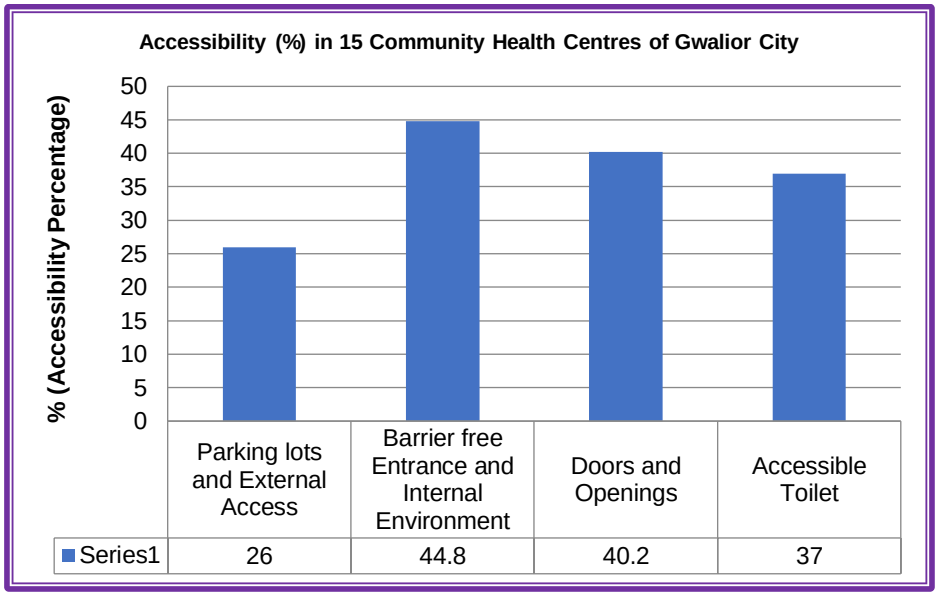

Figure 1: Percentage of Accessibility in 15 Community Health Centres in Gwalior City

The study findings were broken down into four main parameters: (A) Parking and external access (Table 2), (B) Barrier-free entrances and interior ambiance (Table 3), (C) Doors and openings (Table 4), and (D) Accessible Restrooms (Table 5). The table does not include results that are consistently lacking in all Community Health Centres

Table 2: Kruskal-Wallis H Test for (A) Parking Lot and External Environment

A1 rating	A2 rating	A3 rating	A4 rating	A5 rating
48	15.5	70.5	15.5	48
70.5	48	48	15.5	15.5
70.5	48	48	15.5	15.5
70.5	15.5	48	48	15.5
48	15.5	15.5	48	15.5
48	15.5	15.5	48	48
48	48	15.5	15.5	48
48	48	48	48	70.5
48	48	70.5	15.5	15.5
48	15.5	48	48	15.5
48	15.5	48	48	15.5
48	15.5	48	48	15.5
70.5	15.5	48	15.5	48
48	15.5	70.5	15.5	15.5
70.5	15.5	70.5	48	15.5
Q: 832.5	395	712.5	492.5	417
n: 15	15	15	15	15

Calculation Summary
H = (12/(N(N+1)) * (∑T2/n) - 3(N+1)
H = 0.002*118240 - 228
H = 20.9263
The H statistic is 20.9263 (4, N = 75).
The *p* value is 0.00033. The results are significant at $p < 0.05$

Table 3: Kruskal-Wallis H Test for (B) Barrier-Free Entrance and Internal Environment

Rank B1	Rank B2	B3 rating	B4 rating	B5 rating
5	17.5	17.5	59	71.5
5	38	17.5	38	71.5
38	17.5	17.5	59	59
17.5	17.5	17.5	71.5	71.5
38	59	5	71.5	71.5
3 8	38	38	59	39
59	38	38	38	59
38	38	38	17.5	71.5
17.5	5	17.5	38	59
38	17.5	38	38	59
59	5	17.5	17.5	71.5
38	5	38	5	38
59	5	59	59	38
59	17.5	17.5	38	59
38	38	5	59	59
Q: 547	356.5	381.5	668	897
n : 15	15	15	15	15

Calculation Summary
H = (12/(N(N+1)) * (∑T2/n) - 3(N+1)
H = 0.002*121511.767 - 228
H = 27.8142
The H statistic is 27.8142 (4, N = 75).
The *p* value is 0.00001. The results are significant at $p < 0.05$

Table 4: Kruskal-Wallis H Test for (C) Doors and Openings

Rank C1	Rank C2	C3 rating	C4 rating	Rank C5
69.5	11	56	11	11
69.5	11	56	11	32
69.5	11	69.5	11	11
56	32	69.5	32	11
56	11	69.5	32	11
69.5	11	56	32	32
56	11	56	45.5	11
69.5	11	69.5	32	32
56	32	56	11	32
56	32	69.5	32	45.5
69.5	32	45.5	32	32
45.5	32	45.5	32	32
56	11	56	11	45.5
56	32	69.5	32	32
56	11	56	11	11
Q: 910.5	291	900	367.5	381
n: 15	15	15	15	15

Calculation Summary
H = (12/(N(N+1)) * (∑T2/n) - 3(N+1)
H = 0.002 * 133593.9 - 228
H = 53.2503
The H statistic is 53.2503 (4, N = 75).
The *p* value is 0.00001. The results are significant at $p < 0.05$

Table 5: Kruskal-Wallis *H* Test for (D) Accessible Toilets

Rank D1	Rank D2	Rank D3	Rank D4	Rank D5
30.5	8.5	73.5	8.5	30.5
52	30.5	65.5	30.5	8.5
30.5	30.5	65.5	30.5	8.5
30.5	52	73.5	8.5	30.5
30.5	52	65.5	8.5	30.5
52	52	65.5	8.5	30.5
52	8.5	73.5	30.5	8.5
8.5	52	52	8.5	8.5
30.5	65.5	65.5	30.5	8.5
52	52	52	30.5	30.5
30.5	52	65.5	52	30.5
30.5	30.5	65.5	30.5	8.5
52	65.5	65.5	30.5	30.5
30.5	65.5	73.5	8.5	8.5
30.5	52	65.5	30.5	30.5
Q: 543	669	987.5	347	303.5
n: 15	15	15	15	15

Calculation Summary
H = (12/(N(N+1)) * (∑T2/n) - 3(N+1)
H = 0.002*128672.5 - 228
H = 42.8895
The H statistic is 42.8895 (4, N = 75)
The *p* value is 0.00001. The results are significant at $p < 0.05$

Discussion

According to the tables, this study found that all four main factors—parking and access from the outside, barrier-free entrances and the atmosphere inside, doors and openings, and accessible bathrooms—that were used for the Kruskal-Wallis H Test were significant.

The right to accessibility safeguards individual autonomy. In this way, it is important to look at how disabled people move around in health services, taking into account their freedom, comfort, and safety

when using existing rooms, tools, and furniture. As Yaroshenko et al. (2024) say, primary health care settings are the first-place people with physical disabilities interact with the health system. It is important to make sure that everyone can get health services in a way that is acceptable, affordable, and includes their full participation. This report describes the current state of readiness of community health centers for persons with disabilities in Gwalior Smart City, Madhya Pradesh. Madhya Pradesh has not been the subject of any research addressing this topic. The results of this analysis show that the Community Health Centre is not fully focused on meeting the needs of patients with disabilities and the elderly. Similarly, in other healthcare facilities, it is doubtful that AIC audit checklists can be completed due to their length, many questions, and variables (Ye *et al., 2024*).

Disadvantages and Challenges

Although there are several legislative provisions, plans, and government initiatives to improve the accessibility of PWDs to PHCs, their implementation has become a significant problem in almost all CHCs in the Gwalior region. Despite recommendations from the Accessible India campaign, most community health centers are not easily accessible to people with disabilities, which is a matter of concern (Mutambik 2024).

Along with a lack of awareness of universal design guidelines, when constructing Community Health Centre buildings, very few patients with disabilities have appropriate access to assistive devices and technology (*Pinto et al., 2021*).

The high poverty rate among people with disabilities is also caused by a lack of access to education and has an impact on reduced employment opportunities.

Most people think that people with disabilities are unhygienic because of the disabilities they have. Therefore, people with disabilities have to face disrespect, prejudice, and inequality in many situations when receiving care at primary health centres (Reichenberger *et al., 2024*).

Therefore, an evaluation and examination of some of the most surprising research findings have been conducted. Discussions have suggested that the conclusions of this study should take into account the wider context of various national initiatives. The Indian Public Health Standards (IPHS) were made by the National Health Mission. They tell public health agencies what they need to do. However, the standard itself does not include specific requirements for disabled people, apart from ramps and fences *(Zhang, Sun & Yao, 2024).*

People with disabilities have worse health than the general population. They are more likely to die, get sick, and have limited abilities. Many of the poor health outcomes encountered by individuals with disabilities are not due to an underlying health disease or impairment but rather to health disparities caused by unfair societal and health-care system conditions. A review of evidence from around the world is needed to find the factors that make it harder for people with disabilities to get the same access to healthcare services as other people, as well as ways to get rid of these barriers and encourage disability inclusion (Siedner *et al., 2020*).

Limitations & Future Scope of Work

Unplanned development and growth in Indian settlements pose significant challenges for disabled and elderly individuals. The situation of elderly individuals and individuals with disabilities in the Indian built environment is even worse, as they are restricted to rooms on ground floors due to the inaccessible designs of houses, the inaccessible external built environment, and the inaccessible networks of the city. Settlements and the built environments in Madhya Pradesh are facing significant accessibility challenges.

There is an urgent need to improve these situations, and there is an immense need for a holistic approach through which the design and planning of smart city settlements can be taken care of to create sustainable and accessible built environments. The future scope is to create a procedure by which a comprehensive access audit can be taken to a next level from rather being merely a checklist only as per existing access audit systems until date, which is what we have.

Conclusion

There is an urgent need to upgrade and renovate primary health centers in and around Gwalior with appropriate accessibility features and facilities that will be used by the disabled and elderly. Now is the right time to rectify this situation. It is also very important to have a complete method for creating smart urban settlements that are sustainable and easy for everyone to access. For every built or open space, the current research aims to create standardized, accessible, and universal design solutions. It also aims to create a method for comprehensive access audits that go beyond simple checklists, as they are now. Examine the current state of the audit system, particularly in the healthcare sector. This research will focus on barrier-free access to primary healthcare centers and developing activity spaces within urban social spaces in the Indian context and people with specific disabilities.

Based on an access audit of 15 Gwalior City Health Centers for this study, it can be said that there are still not many parking spots available (34.7%). Upgrade these spaces to a satisfactory level. All building entrances (59.7%) should have accessible ramps at the desired ratio and end with handrails of standard height. Only 53.6% of the doors met accessibility standards, necessitating a change in their width. Toilets are a critical element in any health care center, but unfortunately less than 49.3% of them are accessible in PHCs in Gwalior city.

The only point of this study is to show how the Gwalior Smart City Health Centre is doing right now based on how easy it is to get to. The results of this study are below the acceptable level for all access audit parameters. More work needs to be done on similar research projects, which will require more time and financial reserves in the form of research funds. Several other types of public buildings also need to be audited first, and then standard retrofit procedures must be improved so that existing buildings can be accessed. Gwalior smart city needs to be created in such a way that other upcoming smart cities in Madhya Pradesh as well as other states of India can learn and adapt methods, technologies, and procedures to build an accessible, inclusive, and sustainable smart city for the future.

Conflict of Interest

The authors declare that they have no competing interests.

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