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Environmental Barriers Perceived by Wheelchair Bound Persons with Spinal Cord Injury Reporting To a Tertiary Care Rehabilitation Centre: A Cross-Sectional Study

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ABSTRACT

BACKGROUND: Individuals with Spinal Cord Injury (SCI) who use wheelchairs encounter various environmental barriers that can affect their lives. This study evaluated perceived environmental barriers experienced by wheelchair users with SCI.

PURPOSE: Individual with SCI who are wheelchair bound face environmental barriers that restrict their reintegration and community participation. This study aims to evaluate the environmental barriers with the use of the valid & reliable tool - the Craig Hospital Inventory of Environmental Factors - Long Form (CHIEF - LF) questionnaire.

METHOD: A convenience sample of 30 wheelchair users aged 18- 60 years with Spinal Cord Injury admitted to a tertiary care hospital in Mumbai participated in this study. The CHIEF - LF questionnaire was administered to each participant to assess perceived environmental barriers. It consisted of multiple questions pertaining to the five components of environmental barriers faced by SCI wheelchair users: Accessibility, Accommodation, Resource Availability, Support and Equality. Percentage values for the responses for each component were calculated.

RESULTS: The findings indicated that 63% of participants perceived accessibility as a major environmental barrier. Accommodation was perceived as a major barrier by 36.99 % of participants, while 48.3% reported resource availability as a major barrier. Social support was perceived as a major barrier by 34.47% of participants, and equality-related barriers were reported as a major concern by 33.61% of participants.

CONCLUSION: Wheelchair users with SCI experience environmental barriers across multiple domains, with accessibility emerging as the most frequently reported major barrier. Rehabilitation professionals, particularly Occupational therapists, should identify and address these barriers to facilitate community integration and social participation. This may help Occupational therapists to reduce the environmental barrier, thus facilitating occupational justice for individuals with SCI.

Keywords: *Craig Hospital Inventory of Environmental Factors (Long Form), Environmental Barriers, Spinal Cord Injury*

INTRODUCTION

Spinal Cord Injury (SCI) is a life-altering condition caused by traumatic (road traffic accidents, falls, etc) or non-traumatic (tumours, tuberculosis, etc) damage to the spinal cord, resulting in partial or complete loss of motor and/or sensory function (1). SCI is one of the major causes of long-term disability, significantly affecting independence, quality of life, and community participation. Most individuals with SCI rely on wheelchairs for mobility and experience complications such as bladder and bowel dysfunction, pressure sores, and other secondary health problems, leading to dependence in activities of daily living (2).

According to the World Health Organisation (WHO),2024, over 15 million people are living with SCI globally. In India, approximately 1.5 million people live with SCI, with nearly 20,000 new cases reported annually, of which 60–70% are from rural areas. The majority are males aged 16–30 years, representing the most active and productive population of society (2).

Despite rehabilitation, individuals with SCI continue to face physical, psychological, and social limitations due to environmental barriers (3). Inaccessible buildings, transportation, inadequate services, and negative societal attitudes restrict occupational performance and community reintegration (2). Removal of environmental barriers is considered the first step toward successful rehabilitation, as environmental conditions significantly influence the quality of life of persons with disabilities (4).

The International Classification of Functioning, Disability and Health (ICF) recognise that disability results from the interaction between a person's health condition and environmental barriers, including physical infrastructure, assistive technology, services, systems, policies, and social attitudes. Addressing these barriers is essential for equitable participation (1).

As Occupational Therapists, our primary goal is to enable individuals to participate in meaningful occupations across self-care, productivity, and leisure. However, environmental barriers continue to limit independence and community reintegration of wheelchair users with SCI despite comprehensive rehabilitation. (3, 5) Although initiatives such as the Rights of Persons with Disabilities Act, 2016, and the Accessible India Campaign (Sugamya Bharat Abhiyan) aim to improve accessibility, limited Indian evidence exists on environmental barriers and the magnitude of the different environmental barriers and how they are affecting their lives from an Occupational Therapy perspective, highlighting the need for further research (2).

NEED OF STUDY

Occupational Therapists play a key role in identifying environmental barriers that affect participation. As limited research exists on environmental barriers among wheelchair users with Spinal Cord Injury, this study aims to identify these barriers using the Craig Hospital Inventory of Environmental Factors (CHIEF-LF) questionnaire.

OBJECTIVE OF STUDY

Primary objectives: To identify the perceived environmental barriers experienced by wheelchair-bound individuals with spinal cord injury

Secondary objectives:

1. To assess the Frequency of Perceived Environmental barriers by Wheelchair bound users with Spinal Cord Injury.

2. To assess the Magnitude of Perceived Environmental barriers by Wheelchair bound users with Spinal Cord Injury.

OPERATIONAL DEFINITIONS:

- Occupational Performance: The ability to choose, organise, and satisfactorily perform meaningful activities (occupations) within the environment.
- Environmental Barriers: As per WHO, include features of the physical, social, and attitudinal environment that hinder full participation.
- Accessibility: The degree to which environments enable independence and participation as per UNCRPD principles.

METHODOLOGY

- Study Design: - Cross-sectional study
- Place of studies: - Occupational therapy department of a tertiary health care centre in Mumbai
- Duration of study: 6 months
- Duration of Assessment: One time - 45 minutes interview per participant
- Study population: All OPD and IPD Spinal Cord Injury Wheelchair Patients reporting to the Hospital
- Sample Size calculation: 30
- Sampling Technique: Convenient Sampling

Method of selection of Subjects: (Eligibility Criteria)

INCLUSION CRITERIA:

Wheelchair bound users with Spinal Cord Injury

- With disability over 12 months
- Age group between 18 - 60 years
- Cooperative, communicative and literate

EXCLUSION CRITERIA:

Wheelchair bound users with Spinal Cord Injury with

- Any Cognitive impairment
- Any Psychiatric problems or on antidepressants
- With Secondary complications

INSTRUMENT: CHIEF-LF (Craig Hospital Inventory of Environmental Factors - Long Form). This questionnaire has 25 questions in 5 Components as follows:

1. Accessibility
2. Accommodation
3. Resource Availability
4. Social Support
5. Equality

DATA COLLECTION:

- Questionnaire to be administered in Hindi or English language
- Response scored on frequency, magnitude and impact scale

DATA ANALYSIS:

Descriptive statistics were used to analyse the results of the data regarding environmental barriers in all 5 components. Frequency & Magnitude distribution of barriers such as:

1. Accessibility
2. Accommodation
3. Resource Availability
4. Social Support
5. Equality

Score was analysed to identify the frequency and magnitude of Barriers encountered. Microsoft Word and Excel were used to generate graphs and tables and calculate the frequency & magnitude of Environmental Barriers faced by Wheelchair users with SCI in each of the 5 components of the CHIEF-LF questionnaire. Higher scores indicate greater environmental restrictions.

OUTCOME MEASURE:

Participation restrictions will be measured using CHIEF - LF

CHIEF - LF has 25 questions and 5 Components in the Questionnaire as follows:

1. Accessibility
2. Accommodation
3. Resource Availability
4. Social Support
5. Equality

STUDY PROCEDURE:

- Approval from the Ethics Committee was obtained before the initiation of the study.
- Prior permission of each participant was obtained , informed consent was obtained in the language spoken by the participant in English, Hindi or Marathi. Data was collected using a structured questionnaire.

DATA ANALYSIS: This data captures demographic, medical, environmental, and societal dimensions to support research, policy**,** and intervention planning. It contains data and insights regarding individuals with SCI who are wheelchair-bound. The data were analyzed using descriptive statistics, including frequencies, percentages, and overall impact scores. Since the data were ordinal and no inferential statistical analyses were performed, testing for normality was not required.

RESULTS

The findings collectively indicate that Accessibility and Accommodation are the most critical components affecting environmental participation, whereas Equality barriers, though less frequent, still require systemic attention. The weighted frequency highlights how often barriers are faced, while the magnitude reveals how severely they impact individuals when encountered.

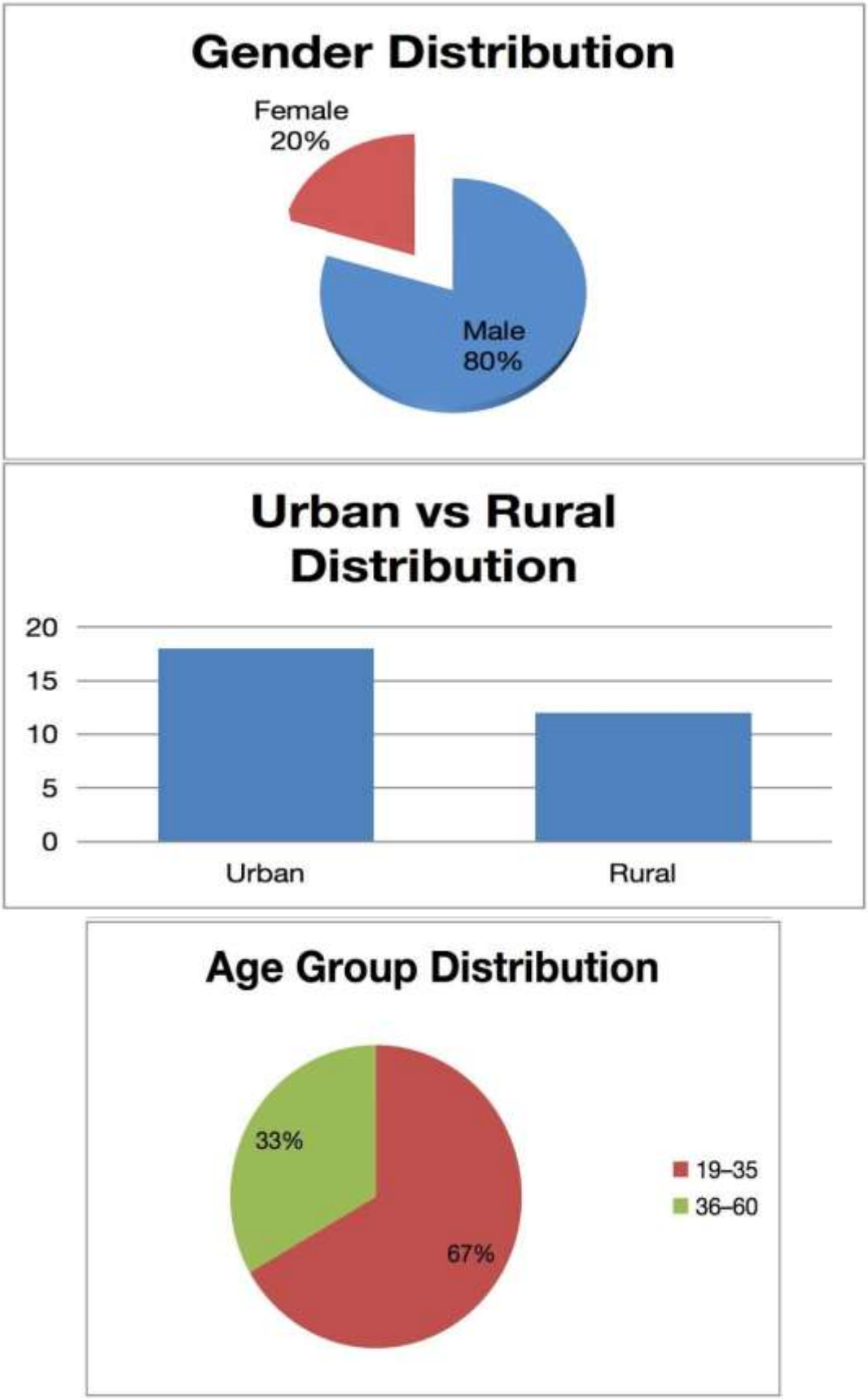


Fig 4: Frequency of Environmental Barrier Component

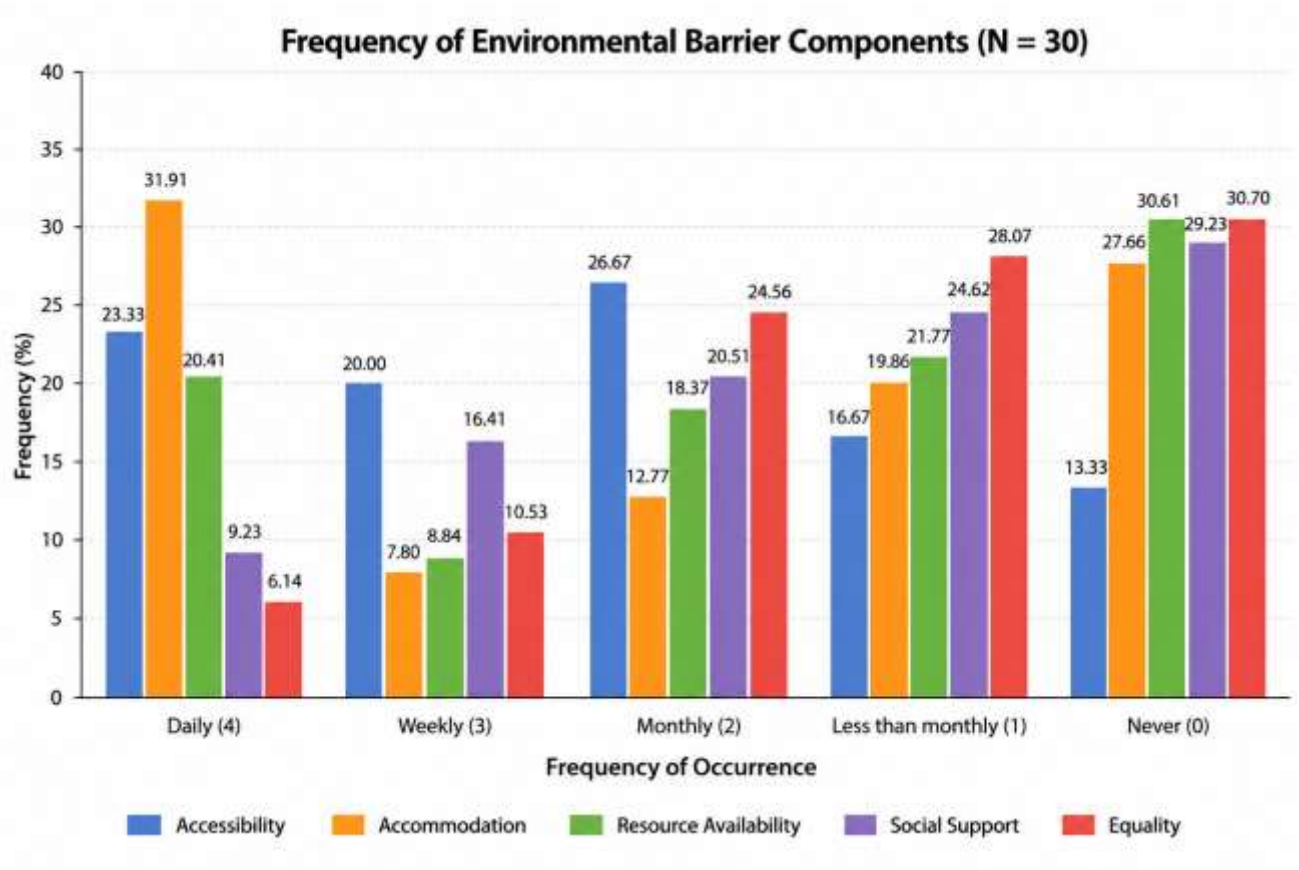


Fig 5: Magnitude of Environmental Barrier components

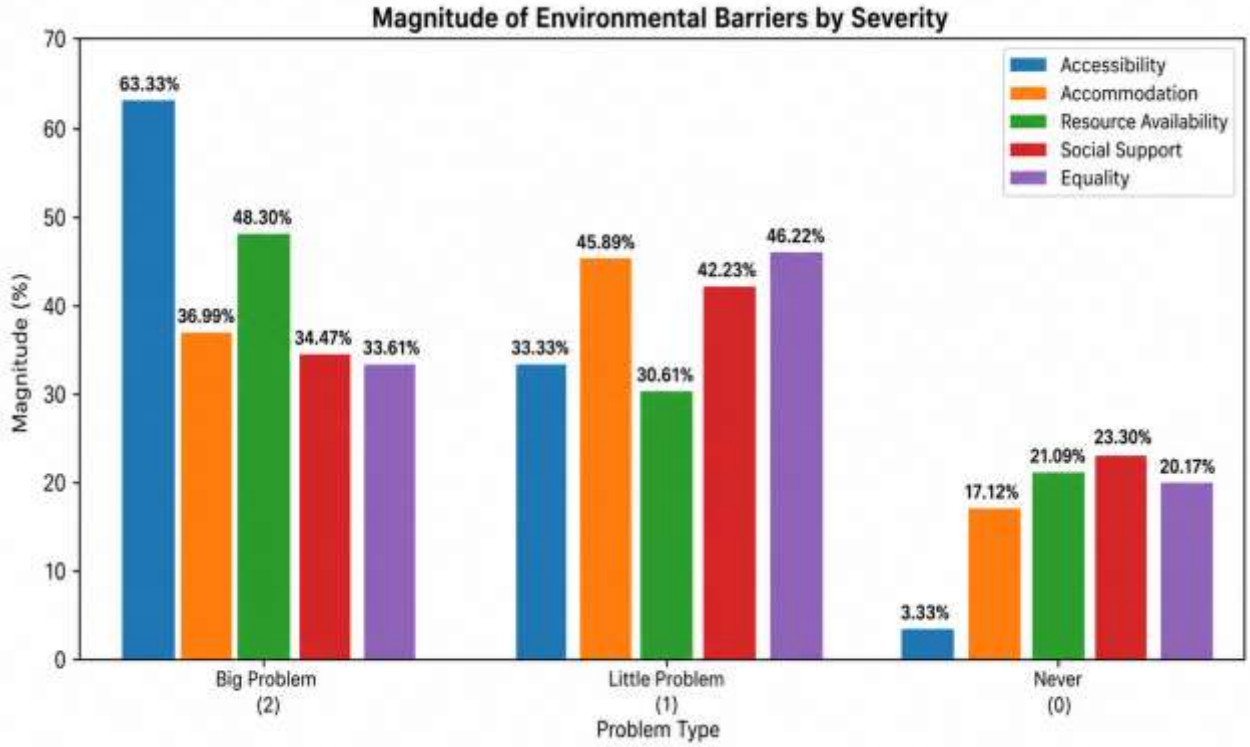
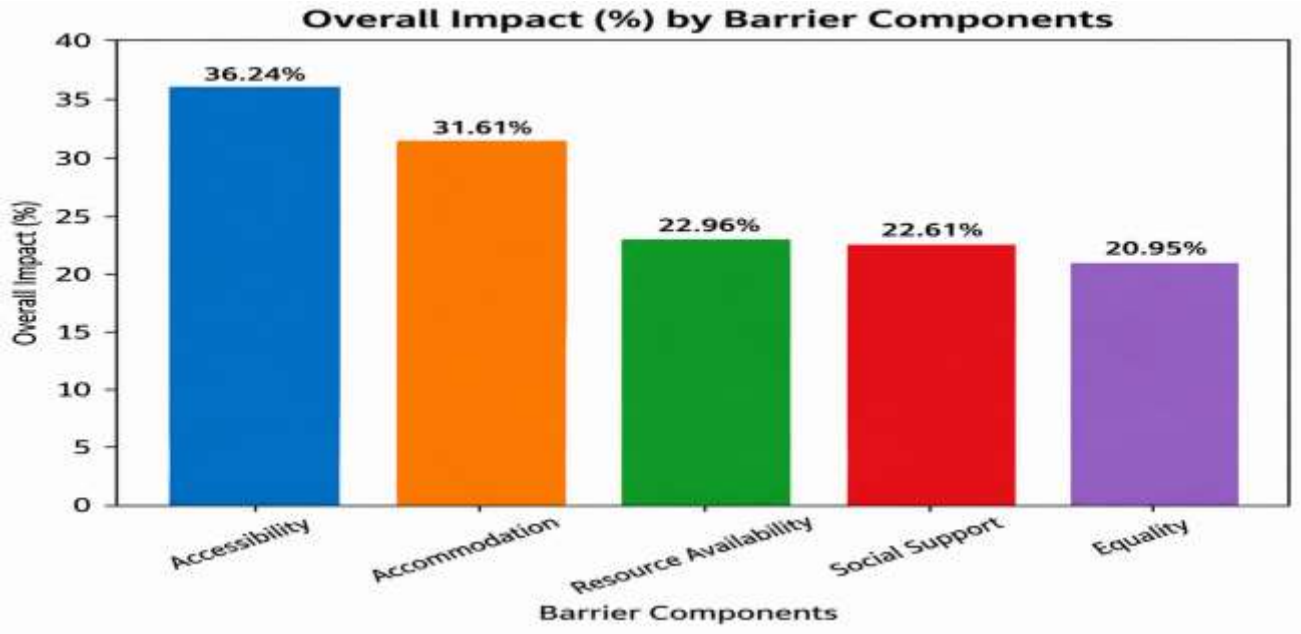


Fig 6: Interpretation of Weighted Frequency, Magnitude, and Overall Impact of Environmental Barriers



Accessibility shows the highest overall impact (36.24%) — indicating major physical and infrastructural challenges for wheelchair users.

Accommodation (31.61%) — inadequate adjustments in living and working environments, independence and participation.

Resource Availability (22.96%) — limited access to assistive devices, repair services and maintenance support

Social Support (22.61%) — moderate barriers due to community attitudes, lack of inclusion or limited peer interaction.

Equality (20.95%) — persistent disparities in participation, rights, and access to services.

DISCUSSION

The Craig Hospital Inventory of Environmental Factors–Long Form (CHIEF-LF) is a comprehensive instrument used to assess environmental barriers experienced by individuals with disabilities. The Hindi-translated version of the CHIEF-LF was used in the present study, making it suitable for assessing environmental barriers among the Indian population.

The present study found that 80% of participants were male and 20% were female, consistent with the retrospective study by Chhabra et al. (2012), in which males constituted the majority of individuals with spinal cord injury (SCI) (6). The higher prevalence of SCI among males may be attributed to occupational hazards such as falls from working heights, inadequate workplace safety measures, and road traffic accidents. In contrast, females commonly sustained SCI due to falls from trees and from home balconies or terraces without adequate protective fencing. With respect to age distribution, 67% of the participants belonged to the 19–35 years age group, while 33% were between 36–60 years, indicating that SCI predominantly affects individuals during their most productive years. In the study, 18 participants were from urban areas and 12 from rural areas, suggesting greater access to tertiary rehabilitation services in urban settings, whereas individuals residing in rural areas may have limited access to specialized SCI care and rehabilitation services.

Among all environmental domains, Accessibility demonstrated the highest overall impact (36.24%), indicating that physical and infrastructural barriers have the greatest influence on participation among wheelchair users with SCI. Furthermore, 63.33% of participants perceived accessibility barriers as a "big

problem."

Participants reported inaccessible public and private infrastructure, including buildings, transportation systems, and community spaces, which significantly restricted mobility and community participation. These findings are consistent with the study by Reinhardt et al. (5), who also identified inaccessible infrastructure as a major environmental barrier for individuals with SCI. A recent article published in the Times of India highlighted inadequate accessibility provisions for wheelchair users in the newly developed Mumbai Metro, emphasising that accessibility remains a significant challenge despite infrastructure development. Such findings reinforce the need for universal design principles and accessible public infrastructure.

Accommodation refers to barriers related to the design and layout of homes, workplaces, educational institutions, and the natural environment, including climate, terrain, and temperature. The present study reported an overall impact of 31.61% for accommodation barriers, with 36.99% of participants identifying these barriers as a major problem. Participants experienced inadequate accommodation within their homes and workplaces, which limited independence and restricted participation in daily activities. These findings are consistent with those reported by Roop Singh et al. (2). One participant reported being unable to continue higher education because the college building lacked a lift, while classrooms and restrooms were located on the second floor, making them inaccessible. Similarly, Reinhardt et al. (Swiss SCI Cohort Study) (5) reported that, despite Switzerland's advanced healthcare and social security systems, environmental barriers continued to limit participation among individuals with SCI. Climatic conditions such as snow and cold weather were identified as significant barriers. Although natural environmental factors cannot be modified, physical infrastructure can be adapted to minimise their impact. Participants in the present study also reported narrow passageways, uneven or poorly paved pathways, and bulky wheelchairs as barriers affecting both accessibility and accommodation. Additionally, several participants described excessive heat and humidity as contributing to sweating, skin ulceration, and infections, thereby limiting community participation.

Resource Availability refers to barriers associated with access to personal equipment, assistive devices, rehabilitation services, healthcare, education, vocational training, and maintenance services. The present study demonstrated an overall impact of 22.96%, indicating moderate barriers related to resource availability. Participants reported limited access to assistive devices, wheelchair repair services, maintenance facilities, and rehabilitation resources. These findings are comparable with the qualitative study conducted in Mongolia by Dorjbal et al. (4), which reported inadequate rehabilitation services, insufficient medical resources, and poor access to assistive technologies among individuals with SCI. Many participants depended heavily on family members for financial support, resulting in unmet needs for assistive devices and adaptive equipment because of the economic burden on their families. One participant, who had previously been the sole earning member of the household, reported that he avoided requesting additional assistive devices because he felt guilty about imposing further financial strain on his family.

Social Support includes barriers arising from attitudes, acceptance, and support received from family members, peers, and the community. The present study found an overall impact of 22.61%, indicating that although social support barriers were less prominent than physical barriers, they continued to influence participation through negative community attitudes, social exclusion, and limited peer interactions. One participant expressed dissatisfaction with the commonly used term "wheelchair-bound," stating that a wheelchair should be viewed as a means of mobility and independence rather than a symbol of restriction.

This observation is consistent with the findings of Bokel et al. (7), who reported that social support barriers generally have a comparatively lower impact than physical environmental barriers among individuals with SCI.

Equality includes barriers related to access to government policies, employment rights, educational opportunities, financial benefits, and organizational support. The present study reported an overall impact of 20.95%, while 33.61% of participants perceived equality-related barriers as a major problem. One participant employed in a government organization reported that he was not adequately informed about salary continuation, employment benefits, or financial assistance following SCI. Consequently, the absence of timely information prevented him from accessing appropriate medical care and rehabilitation services. Similarly, a qualitative study by Dorjbal et al. (2020) (4) identified inequality in employment opportunities and reduced work participation as major environmental barriers experienced by individuals with SCI.

Limitations

The present study had several limitations.

- The sample size was relatively small (N = 30), and participants were recruited from a single tertiary care rehabilitation centre in urban India. Therefore, the findings cannot be generalised to the broader SCI population across different regions of India.
- Most participants had adequate literacy and were able to complete the Hindi version of the CHIEF-LF questionnaire. Consequently, environmental barriers experienced by individuals with limited literacy or those unable to independently respond to the questionnaire may not be adequately represented.
- The study included participants aged 18–60 years only. Individuals older than 60 years were excluded; therefore, environmental barriers associated with ageing and long-term living with SCI were not captured.
- As this was a cross-sectional study, causal relationships between environmental barriers and participation could not be established.

Recommendations

- Future studies should include larger sample sizes from multiple rehabilitation centres across different geographical regions of India to improve the generalizability of findings.
- Individuals from rural, semi-urban, and underserved communities should be adequately represented to better understand regional differences in environmental barriers.
- Future research should include older adults (>60 years) with SCI to evaluate age-related environmental challenges.
- Longitudinal studies are recommended to examine changes in environmental barriers over time and their influence on participation and quality of life.

CONCLUSION

People living with SCI who are participants of the study in a tertiary care centre in Mumbai experience a substantial number of environmental barriers that adversely impact their daily lives and community participation. Understanding and addressing the challenges of the environmental barriers faced by SCI wheelchair users at local, rural, state, and national levels can help to strengthen existing policies, improve accessibility and ultimately enhance quality of life and participation of wheelchair users with SCI. This will build a culture of inclusion via

public audits and stakeholder collaborations. The findings collectively indicate that Accessibility and Accommodation are the most critical components affecting environmental participation, whereas Equality barriers, though less frequent, still require systemic attention. Furthermore, the weighted frequency highlights how often barriers are faced, while the magnitude reveals how severely they impact individuals when encountered. These finding provide valuable evidence to guide policy development, accessibility planning, and targeted interventions aimed to create more inclusive and barrier-free environment for individuals with SCI

REFERENCE

1. World Health Organization. Spinal cord injury (Internet). Who.int. World Health Organization: WHO; 2024. Available from: https://www.who.int/news- room/fact-sheets/detail/spinal-cord-injury
2. Singh, R., Yadav, S.S., & Meena, V.S. Community reintegration post spinal cord injury: Indian scenario. Journal of Orthopaedics and Allied Sciences, 5, 15- 20. (2017).
3. Yang, Y., Gong, Z., Reinhardt, J. D., Xu, G., Xu, Z., & Li, J. Environmental barriers and participation restrictions in community-dwelling individuals with spinal cord injury in Jiangsu and Sichuan Provinces of China: Results from a cross-sectional survey. The journal of spinal cord medicine, (2023).
4. Dorjbal D, Prodinger B, Zanini C, Avirmed B, Stucki G, Rubinelli S. Living with spinal cord injury in Mongolia: A qualitative study on perceived environmental barriers. The Journal of Spinal Cord Medicine. 2019 Jan 11;1–14.
5. Reinhardt JD, Fellinghauer CS, Post MWM. Change in environmental barriers experienced over a 5-year period by people living with spinal cord injury in Switzerland: a prospective cohort study. Spinal Cord. 2020.
6. Demographic profile of traumatic spinal cord injuries admitted at Indian Spinal Injuries Centre with special emaphisis on mode of injury:A retrospective study.Harvinder Singh Chabbra,Mohit Arora(May 2012).Koski J, Vainionpää A, Kallinen M, et al. Environmental barriers perceived by the Finnish population with spinal cord injury: a cross-sectional survey. Spinal cord (Internet). 2024
7. Bökel, A., Dierks, M. L., Gutenbrunner, C., Weidner, N., Geng, V., Kalke, Y. B., Liebscher, T., Abel, F. R., & Sturm, C. Perceived environmental barriers for people with spinal cord injury in Germany and their influence on quality of life. (2020).