

# Evaluation of Environmental Barriers faced by Wheelchair Users in India

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## ABSTRACT

**Purpose:** *Environmental factors restrict the extent to which people with disabilities can participate in society. The reduction of environmental barriers will increase their participation in the social, educational and vocational spheres of life. With the use of a valid and reliable tool - the Craig Hospital Inventory of Environmental Factors (CHIEF) questionnaire - this study aimed to evaluate the environmental barriers faced by wheelchair users in Bangalore city, India.*

**Method:** *A convenience sample of 100 wheelchair users, between 16 and 40 years of age, and working in different institutions in Bangalore, participated in the study. The CHIEF questionnaire was administered to each participant. It consisted of multiple questions pertaining to the 5 components of environmental barriers faced by wheelchair users: Accessibility, Accommodation, Resource availability, Social support and Equality. Percentage values for the responses in each component were calculated.*

**Results:** *The results showed that 52% of wheelchair users faced problems in Accessibility on a daily basis, and 77% of them felt the problem was big. With respect to Accommodation, 41% faced problems once a month and 50% of them felt that this was a big problem. The maximum percentage of participants did not face problems in Resource availability (43%), Social support (50%) and Equality (59%), and therefore these aspects were not felt to be a big problem.*

**Conclusion:** *An understanding of the environmental barriers faced by wheelchair users can provide guidance in mapping policies and strengthening laws which would help to improve their quality of life.*

**Key words:** *environmental barriers, wheelchair users, Craig Hospital Inventory of Environmental Factors*

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## INTRODUCTION

People with disabilities face different types of barriers such as physical, social, communication, education and environmental barriers (O'Sullivan, 2000).

According to Wiman et al (2002), an estimated 84.7% of persons with disabilities reported environmental barriers which include social isolation, trouble in obtaining resource information, accommodation, equality, transportation and attitude of the people towards them.

Environmental modifications play an important role in improving the quality of life (QOL) of persons with disabilities, especially wheelchair users. The more the environmental barriers are reduced, the more a person with impairment will be able to participate in social, educational and vocational aspects of life (Chaves et al, 2004).

On the basis of the impact on persons with disabilities, Whiteneck and colleagues (2004) have categorised environmental barriers as Accessibility, Accommodation, Resource availability, Social support, and Equality.

Accessibility is defined in terms of physical access as well as accessibility of transportation (Whiteneck et al, 2004). Accommodation is that aspect of the environment that either restricts or facilitates an individual's ability to participate in an activity once he or she is at the location of the activity. Resource availability is referred to as the availability and provision of services and resources necessary for a particular disability. These may include medical care and personal assistant services. Social support is defined as the attitudes that encourage community integration to flourish. Social support may be provided by family and friends, employers and teachers, neighbours and peers, and community members. Equality is the degree to which the policies and regulations of governments and institutions ensure equal opportunities for persons with disabilities. Included in this category are discrimination, financial disincentives and legislative mandates, to name a few (Whiteneck et al, 2004).

There are at present few studies which have specifically evaluated or quantified problems faced by wheelchair users. Therefore this study was undertaken, using the Craig Hospital Inventory of Environmental Factors (CHIEF) questionnaire, to evaluate the environmental barriers faced by wheelchair users. The CHIEF questionnaire was felt to be an ideal instrument to quantify the environmental barriers as they affect the functioning of persons with disabilities. It should be

noted that this tool does not measure environments and their characteristics objectively, but elicits a characterisation of the severity of perceived barriers to social participation as reported by the individual with a disability.

## METHOD

This was a cross-sectional study conducted on 100 wheelchair users who work at 3 organisations in Bangalore: Mobility India, Association of People with Disability (APD), and the Leonard Cheshire Bangalore Unit.

### **Inclusion criteria:**

- 1) Wheelchair users with disability for 1 year at the minimum
- 2) Age group between 16 and 40 years
- 3) Wheelchair users who are employed in various institutions.

### **Exclusion criteria:**

- 1) People using motorised wheelchairs
- 2) Wheelchair users who did not understand English
- 3) Wheelchair users with cognitive problems.

Prior permission to conduct the study was taken from the head of each organisation, and informed consent was obtained from the participants. The Craig Hospital Inventory of Environmental Factors (CHIEF) questionnaire was administered to each of the study participants.

The questionnaire consists of 5 components - Accessibility, Accommodation, Resource availability, Social support and Equality ( Appendix 1).

- One question assessed Accessibility (availability of transportation).
- Five questions assessed Accommodation (barriers due to design and layout of homes and community, school/workplace, natural environment).
- Five questions assessed Resource availability (barriers due to lack of personal equipment and adaptive devices, accessing information, availability of education and training, health and medical care services).
- Nine questions assessed Social support (attitudinal problems faced by the person with disability at home and in the community).

- Five questions assessed Equality (barriers in acquiring knowledge about government policies and programmes, rules of business and organisations, education and employment programmes and services).

Each component consisted of 2 parts, namely, assessments of Frequency and Magnitude. To assess the frequency with which persons with disabilities faced barriers, respondents were first asked if they faced the problems daily, weekly, monthly, less than monthly or never. They were then asked to rate the perceived problems as big, little or never a problem, in order to assess the magnitude.

Statistical software SPSS 11.0 and Systat 8.0 were used to analyse the data, and Microsoft Word and Excel were used to generate graphs and Tables.

Descriptive statistics which were used to analyse results of the data regarding environmental barriers in all the 5 components, have been reported through percentage enumeration.

## RESULTS

**Table 1: Frequency (%) of environmental barriers faced by wheelchair users in each of the 5 components of the CHIEF questionnaire**

Q no.	Components	Frequency in % (N – 100)				
		Daily	Weekly	Monthly	Less than monthly	Never
1	Availability of transportation (Accessibility)	52	5	3	28	12
2	Accommodation	26	3	7	41	23
3	Resource availability	16	3	6	32	43
4	Social support	17	3	4	26	50
5	Equality	2	3	10	26	59

It was inferred from Table 1 that the maximum percentage of wheelchair users frequently face problems of **Accessibility** and **Accommodation**.

**Table 2: Magnitude (%) of environmental barriers faced by wheelchair users in each of the 5 components of the CHIEF questionnaire**

Q no.	Components	Magnitude in % Total no. of subjects – 100		
		Never	Little problem	Big problem
	Barriers due to			
1	Availability of transportation (Accessibility)	12	11	77
2	Accommodation	25	25	50
3	Resource availability	43	19	38
4	Social support	50	15	35
5	Equality	59	15	26

It was inferred from Table 2 that the maximum percentage of wheelchair users frequently regard issues of **Accessibility** and **Accommodation** as a big problem.

## DISCUSSION

The CHIEF questionnaire is a comprehensive tool to assess environmental barriers faced by persons with disabilities. The measurements of Frequency and Magnitude of environmental barriers rely on the perceptions of the respondents, and have been classified into 5 broad categories: Accessibility, Accommodation, Resource availability, Social support and Equality.

Analysis of the Accessibility issue among wheelchair users revealed that the maximum percentage (52%) perceived barriers in transportation on a daily basis, and felt it was a big problem. Since the study participants resided in and around Bangalore city, it can be inferred that an integrated system of wheelchair accessible vehicles for transportation is not available in this city. At the same time, uneven road surfaces and unpaved or poorly maintained sidewalks have made it difficult for wheelchair users to travel from one place to another. Similar findings reported by Venter et al (2002) suggested that vehicle design of the public transportation system such as high-floor buses, and surfaces like uneven roads and steep slopes, created barriers for persons with disabilities.

Accommodation issues dealt with barriers faced by wheelchair users due to

- Design and layout of their homes and community
- Design and layout of their school/workplace
- Natural environment(climate, terrain, temperature

Maximum number of wheelchair users (41%) in this study perceived that barriers were caused by the design and layout of their homes and community on a daily basis. They felt the problems were big. Their perceptions were based on the lack of railings and disabled-friendly toilets at home, and lack of lifts and ramps in their community. Most of the study participants were from lower socio-economic groups, and hence could probably not afford to make the changes and modifications necessary for their individual needs. The results of this study were similar to those of White et al (1995) in which the lack of affordable, accessible housing was cited as the top concern among persons with disabilities. It was also stated that the removal of environmental barriers would decrease the response requirements to gain access to home and community but would not answer the question as to whether affected individuals would experience greater contact and integration within their community (White et al, 1995).

On the other hand, most of the wheelchair users did not perceive barriers due to design and layout of their school/workplace. Due to increased awareness about the needs of persons with disabilities, many educational and corporate institutions have modified their environments by putting up ramps, railings and constructing disabled-friendly toilets.

Most of the study population perceived barriers due to natural environment (i.e., climate, terrain, temperature) less frequently. This was because there were not many changes in the natural environment and most wheelchair users had adjusted to their environment. However, the barriers created by changes in the natural environment and other aspects of the surroundings – such as lighting, noise and crowds - were a big problem for them. The reason could be the effort required for safe wheelchair propulsion would vary with demands imposed by different ground conditions, temperature and climate. With all these shortfalls, the wheelchair users were not able to participate fully in their community as well as perform their household activities (Hurd et al, 2009).

Under Resource availability, the barriers faced by wheelchair users are due to

- Lack of personal equipment and adaptive devices
- Barriers in accessing information, availability of education and training, health and medical care services :

Maximum number of wheelchair users (43%) in this study perceived barriers due to lack of personal equipment and adaptive devices less frequently, but felt that it was a big problem. This was because most persons with disabilities are forced to continue with their daily routine whenever their equipment (wheelchair parts like the spokes, foot-rests, tyres, special switches, assistive listening systems and alternate communications systems) is sent for repair.

Maximum number of wheelchair users did not perceive barriers to obtaining information in the desired format or due to lack of knowledge of computer technology, and in the availability of education and training, health and medical care services because most of them received information easily through their institutes. A study done by Fukasawa et al (2001) revealed that NGOs, social welfare associations and volunteers have provided better information by publishing guide books for persons with disabilities and also by helping them to access the internet.

The issue of Social support, deals with barriers due to attitudinal problems faced by wheelchair users at home and in the community. Most of the wheelchair users (50%) did not perceive barriers at home as they received help, support and encouragement from their family members and did not face attitudinal problems. However they perceived barriers regarding the above issues on a daily basis in their community and found it a big problem. This could be due to lack of acceptance by their community, with neither support nor encouragement to do what they want or need. Similarly, a study done by Jinming Zhang (2007) has shown that persons with disabilities tend to be confined to their homes because they are not accepted by the community and are humiliated if they attempt to play more active roles.

The component of Equality deals with barriers in acquiring knowledge about government policies and programmes, rules of business and organisations, education and employment programmes and services. The maximum number of wheelchair users (59%) in this study did not perceive barriers in acquiring knowledge about these policies, programmes and services. The explanation

could be that a growing number of NGOs and institutes for persons with disabilities give proper guidance and information to this population. In India, these organisations also consistently try to sensitise the corporate world about employing persons with disabilities, thus helping in creating awareness and job opportunities among them (Sridhar, 2003).

## CONCLUSION

This study found that wheelchair users face the maximum number of environmental barriers in the component of Accessibility. The next highest number of barriers is found in the component of Accommodation, especially in areas such as the design and layout of home, design and layout of buildings and places in the community, natural environment (temperature, terrain and climate) and aspects of surroundings ( lighting, noise and crowds).

Wheelchair users face fewer barriers in the fields of education and job opportunities, and in most aspects pertaining to Resource availability, Social support and Equality. This is most probably due to better communication between NGOs, the government and persons with disabilities.

These insights into the environmental barriers faced by wheelchair users can provide guidelines for mapping policies and strengthening laws which would help to improve their quality of life.

## REFERENCES

- Chaves ES, Boninger ML, Cooper R, Fitzgerald SG, Gray DB, Cooper RA (2004). Assessing the influence of wheelchair technology on perception of participation in spinal cord injury. *Archives of Physical Medicine and Rehabilitation*; 85 (11): 1854-8. <http://dx.doi.org/10.1016/j.apmr.2004.03.033> PMID:15520981
- Fukasawa N, Matsubara H, Goto K (2001). Information service for wheelchair users. *Quarterly Reports of Railway Technical Research Institute*; 42 (4): 207-212. Available from: [https://www.jstage.jst.go.jp/article/rtriqr/42/4/42\\_4\\_207/\\_pdf](https://www.jstage.jst.go.jp/article/rtriqr/42/4/42_4_207/_pdf) <http://dx.doi.org/10.2219/rtriqr.42.207>
- Hurd WJ, Morrow MMB, Kaufman KR, An KN (2009). Wheelchair propulsion demands during outdoor community ambulation. *Journal of Electromyography and Kinesiology*; 19 (5): 942-947. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2752950/pdf/nihms-146055.pdf> <http://dx.doi.org/10.1016/j.jelekin.2008.05.001> PMID:18590967 PMCid:PMC2752950
- O'Sullivan SB, Schmitz TJ (2000). *Physical rehabilitation: assessment and treatment*. Philadelphia: F A Davis Company, 4th edition.

Sridhar L (2003). The importance of advocacy, Stories of change. InfoChange Disabilities News & Features development on disabilities in India, InfoChange India, November. Available from: [www.infochangeindia.org/disabilitiesstory.jsp?recordo=2639&section\\_idv=19](http://www.infochangeindia.org/disabilitiesstory.jsp?recordo=2639&section_idv=19)

Venter CJ, Bogopane H, Rickert TE, Camba J, Venkatesh A, Mulikita N, Maunder DAC, Savill T (2002). Improving accessibility for people with disabilities in urban areas. Proceedings CODATU X Urban Transport Conference, Lome, Togo. 12 - 15 November.

White GW, Paine-Andrews A, Mathews RM, Fawcett SB (1995). Home access modifications: effects on community visits by people with physical disabilities; *Journal of Applied Behaviour Analysis*; 28 (4): 457-63. <http://dx.doi.org/10.1901/jaba.1995.28-457> PMID:8557620 PMCID:PMC1279851

Whiteneck GG, Harrison-Felix CL, Mellick DC, Brooks CA, Charlifue SB, Gerhart KA (2004). Quantifying environmental factors: a measure of physical, attitudinal, service, productivity, and policy barriers. *Arch Phys Med Rehabil*; 85: 1324-35. Available from: [https://enablemob.wustl.edu/OT572D-01/RequiredArticles/Whiteneck\\_QuantifyingEnvFactors.pdf](https://enablemob.wustl.edu/OT572D-01/RequiredArticles/Whiteneck_QuantifyingEnvFactors.pdf) <http://dx.doi.org/10.1016/j.apmr.2003.09.027> PMID:15295760

Wiman R, Helander E, Westland J (2002), Meeting the needs of people with disabilities - New approaches in the health sector: A technical note; The World Bank. Available from: [http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2003/09/09/000012009\\_20030909095620/Rendered/PDF/266920WP0Meeti1le0with0disabilities.pdf](http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2003/09/09/000012009_20030909095620/Rendered/PDF/266920WP0Meeti1le0with0disabilities.pdf)

Zhang J (2007). A survey of the needs of and services for persons with physical disability in China. *Asia Pacific Disability Rehabilitation Journal*; 18 (2): 49-85.

## APPENDIX 1

### CRAIG HOSPITAL INVENTORY OF ENVIRONMENTAL FACTORS (CHIEF) QUESTIONNAIRE:

Being an active, productive member of society includes participating in such things as working, going to school, taking care of your home, and being involved with family and friends in social, recreational and civic activities while other factors can act as barriers and limit participation.

First, please tell me how often each of the following has been a barrier to your own participation in the activities that matter to you. Think about the past year, and tell me whether each item on the list below has been a problem daily, weekly, monthly, less than monthly, or never. If the item occurs, then answer the question as to how big a problem the item is with regard to your participation in the activities that matter to you. (Note: If a question asks specifically about school or work and you neither work nor attend school, check not applicable.)

	Daily	Weekly	Monthly	Less than monthly	Never	Never	Big problem	Little problem
<b>ACCESSIBILITY</b>								
1.a) In the past 12 months, how often has the availability of transportation been a problem for you?								
b) When a problem occurs, has it been a big problem or a little problem?								
<b>ACCOMMODATION</b>								
2.a) In the past 12 months, how often has the design and layout of your home made it difficult to do what you want or need to do?								
b) When a problem occurs, has it been a big problem or a little problem?								

<p>3.a) In the past 12 months, how often has the design and layout of the buildings and places you use at school or work made it difficult to do what you want or need to do?</p> <p>b) When a problem occurs, has it been a big problem or a little problem?</p>	<table border="1"> <tr> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>												
<p>4.a) In the past 12 months, how often has the design and layout of buildings and places you use in your community made it difficult to do what you want or need to do?</p> <p>b) When a problem occurs, has it been a big problem or a little problem?</p>	<table border="1"> <tr> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>												
<p>5.a) In the past 12 months, how often has the natural environment - temperature, terrain, climate - made it difficult to do what you want or need to do?</p> <p>b) When a problem occurs, has it been a big problem or a little problem?</p>	<table border="1"> <tr> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>												
<p>6.a) In the past 12 months, how often have other aspects of surroundings - lighting, noise, crowds, etc - made it difficult to do what you want or need to do?</p> <p>b) When a problem occurs, has it been a big problem or a little problem?</p>	<table border="1"> <tr> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>												
<p><b>RESOURCE AVAILABILITY</b></p> <p>7.a) In the past 12 months, how often has the information you wanted or needed not been available in a format you can use or understand?</p> <p>b) When this problem occurs, has it been a big problem or a little problem?</p>	<table border="1"> <tr> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>												
<p>8.a) In the past 12 months, how often has the availability of the education and training you needed been a problem for you?</p> <p>b) When this problem occurs, has it been a big problem or a little problem?</p>	<table border="1"> <tr> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>												

9.a) In the past 12 months, how often has the availability of healthcare services and medical care been a problem for you?								
b) When this problem occurs, has it been a big problem or a little problem?								
10.a) In the past 12 months, how often has the lack of personal equipment or special adapted devices been a problem for you? Examples might include hearing aids, eyeglasses or wheelchairs.								
b) When this problem occurs, has it been a big problem or a little problem?								
11.a) In the past 12 months, how often has the lack of computer technology been a problem for you?								
b) When this problem occurs, has it been a big problem or a little problem?								
<b>SOCIAL SUPPORT</b>								
12a) In the past 12 months, how often did you need someone else's help in your home and could not get it easily?								
b) When this problem occurs, has it been a big problem or a little problem?								
13a) In the past 12 months, how often did you need someone else's help at school or work and could not get it easily?								
b) When this problem occurs, has it been a big problem or a little problem?								
14 a) In the past 12 months, how often did you need someone else's help in your community and could not get it easily?								
b) When this problem occurs, has it been a big problem or a little problem?								
15a) In the past 12 months, how often have other people's attitudes towards you been a problem at home?								
b) When this problem occurs, has it been a big problem or a little problem?								

<p>16a) In the past 12 months, how often have other people's attitudes towards you been a problem at school or work?</p> <p>b) When this problem occurs, has it been a big problem or a little problem?</p>	<table border="1"> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>														
<p>17.a) In the past 12 months, how often have other people's attitudes towards you been a problem in the community?</p> <p>b) When this problem occurs, has it been a big problem or a little problem?</p>	<table border="1"> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>														
<p>18.a) In the past 12 months, how often has a lack of support and encouragement from others in your home been a problem?</p> <p>b) When this problem occurs, has it been a big problem or a little problem?</p>	<table border="1"> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>														
<p>19.a) In the past 12 months, how often has a lack of support and encouragement from others at school or work been a problem?</p> <p>b) When this problem occurs, has it been a big problem or a little problem?</p>	<table border="1"> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>														
<p>20.a) In the past 12 months, how often has a lack of support and encouragement from others in your community been a problem?</p> <p>b) When this problem occurs has it been a big problem or a little problem?</p>	<table border="1"> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>														
<p><b>EQUALITY</b></p> <p>21.a) In the past 12 months, how did you experience prejudice or discrimination?</p> <p>b) When this problem occurs, has it been a big problem or a little problem?</p>	<table border="1"> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>														
<p>22.a) In the past 12 month, how often has the lack of programmes and services in the community been a problem?</p> <p>b) When this problem occurs, has it been a big problem or a little problem?</p>	<table border="1"> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>														

<p>23.a) In the past 12 months, how often did the policies and rules of business and organisations make problems for you?</p> <p>b) When this problem occurs, has it been a big problem or a little problem?</p>						
<p>24.a) In the past 12 months, how often did education and employment programmes and policies make it difficult to do what you want or need to do?</p> <p>b) When this problem occurs, has it been a big problem or a little problem?</p>						
<p>25.a) In the past 12 months, how often did government programmes and policies make it difficult to do what you want or need to do?</p> <p>b) When this problem occurs, has it been a big problem or a little problem?</p>						