Review Article

Manual Wheelchair: Physical Barrier in Community Participation for Paraplegic in tough Hilly Terrains

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ABSTRACT

Community participation is a complicated and complex issue with apparent impediments which effect the person’s ability to involve in gathering in community. Slopes or slants are not only environmental or architectural barriers but they also reveal a biodiversity of public and private spaces or buildings hindering their social integration and participation. A manual wheelchair is the accelerator to increase independence in social and cultural integration by minimising the barriers. Manual wheelchair not only provides mobility to physical disabled but also improves the general health and quality of life. Many disabled persons live in poor accessible situations or surroundings due to geographical conditions in hilly areas. These hilly terrains are often occupied by snow and curvy roads, posing a great difficulty to persons having limited mobility. Such environmental impediments place additional requirements on the strength and durability of wheelchairs. Keeping in mind all difficulties to these mobility chair, generally will be the provision of an motorized wheelchair. This case study basically emphasised on manual wheelchairs as barrier on hilly sloppy roads rather than on plain levelled wheeled mobility.

Introduction

For manual wheel chair users, slopes or slants are not only environmental or architectural barriers but they also reveal a biodiversity of public and private spaces or buildings which facilitates their social integration and participation. A total of 65 million persons with locomotor disability need wheelchair mobility for their surroundings which is 10% of such disabled populations all over the world. Access to appropriate wheelchairs allows persons with locomotor disabilities to work and involve in mainstream that will reduce their poverty. A wheelchair is not only the sitting on the
chair but wheelchair mobility enables the child to go to school or even to find employment. Providing the wheelchair to such persons with disabilities not only help to move in their limitations of home dwellings but encourages them to participate in society and community life. Most of manual wheelchairs approx. 90% are push-rim and hand propelled type which challenges the muscular system of persons during mobility and sometimes can lead to repetitive strain injuries in upper limbs and eventually to secondary complications. A motorized wheelchair will reduce exercise to a level of close to 0%, and thus stimulate the process of de-conditioning even more.

**Patient History**

A 24 year old girl diagnosed with T9 paraplegia was admitted to Composite Regional Centre (CRC) for tertiary care rehabilitation after getting discharge from IGMC Shimla. She got paraplegic when a bus fell into gorge in Dist. Mandi, Himachal Pradesh. She was basically an Anganwari worker. She managed to walk and perform her daily chores with help of manual wheelchair. What she was complaining after getting mobility on wheel chair, as she joined her job again, she was getting problem in accessing the Anganwari and community due to inaccessibility of these manual wheelchair into community due to hilly roads/terrains as barrier. She felt embarrassed when she was abstained from many social /community activities due to this manual wheelchair as getting difficulties to move the wheelchair onto upslope hilly area. But now she has a care giver at home for assistance in the morning and evenings to assist her in ADLs and community work. The surrounding environment is paved and sloppy. The patient's goals were to improve her skills in both basic and instrumental chores of daily living to a level of maximum independence and to walk in community after all physical and environmental impediments. Manual mobility has become more difficult as her pain increases during propulsion of wheelchair on such kind of hilly up and down sloppy roads. Keeping all these points, she preferred an electrical wheelchair rather than manual wheelchair for community participation. She herself and even family members felt that this manual wheelchair is a barrier in such sloppy hilly areas rather than facilitator.

**Examination**

Her musculoskeletal & neurological examination revealed 5/5 bilateral deltoid, 5/5 bilateral biceps, 4/5 wrist extension, 4/5 finger extension, and 1/5 hip flexion, 0/5 knee flexion, 0/5 hip extension, poor control in bladder and bowel system and poor sensations down the limbs. She was given a performa to asses community environment and surroundings by Home and Community Environment (HACE) survey as Community mobility barriers and transportation facilitators. The findings obtained were as:

See Table 1 & Fig. 1.

The home mobility variables are summed to represent a total score ranging from 0 to 10 points, with higher scores indicating more obstacles for home mobility. In the community mobility domain each item is scored to reflect the presence or absence of a factor and summed across the 5 items. Scores range from 0 to 5, with higher scores indicating more obstacles. To compute basic mobility devices 9 items are scored to record the number of available mobility assistive technologies, ranging from 0 to 9 assistive devices. In similar fashion, a communication devices score consists of the sum of 4 communication items, with higher scores indicating more communication technologies available to the subject. The transportation variable includes 2 items pertaining to driving, 2 items pertaining to public transportation and 1
pertaining to disabled people’s parking. Scores range from 0 transportation opportunities available to 5, with higher scores indicating more transportation opportunities available. To calculate an attitudes variable, responses for each of 4 attitudinal items are scored as 1 for the absence of a negative community attitude towards persons with limitations in daily activities. Scores are summed and range from 0 to 4 negative community attitudes toward persons with limitations present.

Community participation & powered mobility

Studies have revealed that severity of injury indirectly affects societal life through its influence on community participation. Although severity of disability can influence participation, there may be psychosocial barriers that because the experience of living with disability is often a function of a person’s unique personal characteristics expressed through environment. Previous research studies have shown that for mobility, the physical and social environments are noticed as the predictors of community participation. A study by Chaves et al. found that persons living with Spinal Cord Injuries like paraplegias or quadriplegias perceived wheelchairs as being the most significant factor limiting participation—even greater than their impairment. Essentially, it is this combination of lack of ability of such persons and environmental factors that may affect participation in society and community. Level of community participation valued by a person is not affected in favorable conditions like appropriate environmental adaptations and good social support, and then it is likely that subjective well-being will not be affected, regardless of severity of injury. Integration and involvement in society and community is widely recognized as an important rehabilitation end goal. According to the World Health Organization, use of assistive technology such as provision of a motorized wheelchair, help and enables individuals with mobility impairments and disability to involve in their basic and instrumental activities like shopping to increase social participation. Other participation outcomes reported as meeting up with friends and family, going for a walk, sports, household activities, library/cinema, gardening, attending appointments, post office and cafes/ restaurants. Participation and integration may be limited by physical or environmental barriers such as inaccessible buildings, uneven paths, curbs, stairs, hills and slopes, crowded places, access to public transport, cold weather etc. An smart motorized wheelchair is one solution to improve the chances of mobility after such environmental challenges and the activities in which they choose to participate. Efficient mobility methods are a necessity for maximum participation in home and surrounding community environments. Similarly, areas of natural beauty such as lochs and mountains are often inaccessible by their very nature. Only 2% of the people around the globe say that historic monuments and areas of natural beauty were always accessible. The Americans with Disabilities Act (ADA) specifies that accessible routes to a building including sidewalks, ramps and accessible parking spaces have cross slopes no greater than 1.1°. Study done by Brubaker et al revealed that metabolic demand for a single manual wheelchair user pushing at 3 and 4km/h for periods of 5 minutes. The subject consistently had higher oxygen consumption when pushing on the cross slope. Community integration and participation is a complex issue, with environmental impediments which can limit their involvement in society. Promoting accessibility in terms of both physical and
societal can put a major impact on the ability of people with Spinal cord injuries to continue and resume their many roles as they were before injury conditions. Mobility barriers and limitations are clearly present in the community. Wheelchairs are used to enhance function, to improve independence at home and in the community. On the other hand, a wheelchair may be perceived as psychological barrier which puts the negative perceptions in person’s life if it does not enable him/her to participate fully in social and community activities. The wheelchair is the most important mobility device of persons with Spinal cord injuries yet it is also most associated with barriers. Wheelchair is good means of mobility for paraplegic in this case offering patient the ability to lead a normal life and to perform most of their daily activities. This also makes the person to involve and participate and competing in sporting events. Although being one of the most used for mobility, the wheelchair, the most common mobility devices is preference of users and considered as the main limiting factor in community participation. Selecting a wheelchair either manual or motor is complex decision for people with limited mobility. People with SCI rely on manual and power wheelchairs to compensate for mobility needs to accomplish daily activities. For Rehabilitation of such persons and to make them independent, the wheelchair is one of the most usable mobility aids. According to Wiman et al, an estimated 84.7% of disabled population reported environmental barriers which include social isolation, trouble in obtaining resource information, accommodation, equality, transportation and attitude of the people towards them. By modifying the conditions like environmental situations, basic skills of such persons and related quality of life can be improved.

Conclusion

Persons independency in terms of basic and instrumental life skill activities can be increased by reducing environmental impediments and increasing chances to participate in social, educational and vocational aspects of life. Manual wheelchair skill performance of persons with spinal cord injury is positively associated to participation. During initial rehabilitation, it is important to implement training and therapies aimed at achieving an optimal level of wheelchair skill performance especially in different terrains for active community and social participation. But when it comes to tough hilly terrain, it becomes a barrier rather than a facilitator or we can say it is just community exposure not community participation in hilly slopped areas and diverse conditions.

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Conflict of interest

There are no conflicts of interest to share and all the funding for this article is by researchers involved in the study.
References


Table 1: Different domains score of HACE survey

<table>
<thead>
<tr>
<th>Domains</th>
<th>Normal/Max. score</th>
<th>obtained score</th>
<th>Relative score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home mobility</td>
<td>0-10</td>
<td>6</td>
<td>6/10</td>
</tr>
<tr>
<td>Community mobility</td>
<td>0-5</td>
<td>4</td>
<td>4/5</td>
</tr>
<tr>
<td>Basic mobility device</td>
<td>0-9</td>
<td>3</td>
<td>3/9</td>
</tr>
<tr>
<td>Transportation variables</td>
<td>0-5</td>
<td>1</td>
<td>1/5</td>
</tr>
<tr>
<td>Attitudes variables</td>
<td>0-4</td>
<td>4</td>
<td>4/4</td>
</tr>
</tbody>
</table>

Fig. 1: Relative scores for different domains