

Accessibility Barriers in Low-Floor Buses and User Perspective on Portable Ramp Solutions

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ABSTRACT

The issues regarding accessibility in public transport should be considered so that PWDs may equally participate. Although low-floor buses with ramps were initially launched, their effectiveness has continued to be restricted. This preliminary study explored challenges faced by wheelchair users in accessing low-floor buses in Lucknow, India, through semi-structured interviews with four participants and field observations at a major bus stop. Findings revealed major operational and infrastructural barriers: (1) frequent mechanical failures due to poor ramp maintenance, and (2) difficulties reaching bus stops, often linked to high costs. Participants strongly supported a lightweight, foldable portable ramp to increase independence and reduce reliance on bus staff. In response, the study proposes a conceptual multi-fold ramp made from composite materials for stability and portability. Although it is a small-sample and single-site study, it mostly notes the gap between policy and practice, hence recommending the suggested ramp as a cost-effective solution alongside other

programs that may assist in promoting overall mobility.

Keywords: Accessibility, Portable Ramp, Low Floor Buses, Inclusive Mobility

INTRODUCTION

The term accessibility must be seen as fundamental to ensure that all individuals should get equal chances to participate in society, because without complete inclusion, there cannot be access for anyone. Everyday opportunities involve accessibility, including the ability to participate in outdoor activities. However, in the case of public transportation, poor accessibility in bus terminals still causes trouble and frequently hampers the movement of people with disabilities [1]. These findings match international evidence, which shows that people with disabilities encounter various physical and social obstacles throughout their travel, including a lack of ramps, inaccessible stops, communication issues, and negative attitudes from staff and fellow passengers [2]. Public transport, especially public buses, remains an effective and cheap means of transport for wheelchairs and scooters users, affording them an

opportunity to have independence when going through their daily and social interactions. The introduction of low-floor buses with kneeling features has also increased accessibility among the elderly, people with mobility disability, and parents with young children, but despite all these advancements, users of wheelchairs and scooters still face challenges, and research has shown accidents and injuries during boarding and alighting from buses [3]. One of the most common solutions to address these challenges has been the installation of ramps. Ramps are among the most common accessibility elements, functioning as inclined planes that are placed in addition to or instead of stairs. They allow wheelchair users, as well as others who push strollers, carts, or other wheeled items, to more conveniently access buildings and move between spaces of varying height [4]. Compared with many other accessibility features, ramps have a relatively simple mechanism, are minimal in design and low maintenance with respect to their durability. In public transportation, they allow wheelchair users to board rapidly without having to leave their seats, and are equally convenient to use. In addition to users of wheelchairs, ramp facilities also assist travelers with mobility restrictions, stroller-pushing parents, and commuters with loads, so that they can board more efficiently and safely [5]. Although integrated ramps are still widely used in public transportation buses, portable ramps have emerged as an alternative solution, with the advantage of greater mobility and independence. Portable ramps are commonly used as short-term tools to act as a temporary easing of access to individuals with wheelchairs, being transportable, lightweight, and manageable. Depending on deployment mechanisms, they are generally divided into telescopic, rollable, foldable, or scissor-foldable. Foldable models typically contain hinged panels that enable jackknife-like opening and closure. Most ramps are manufactured from Lightweight aluminum although some composite models available, varying in

material, weight, expense, and durability [6].

Despite the development of fixed ramps with the aim to boost the accessibility of buses, significant gap remains in daily practice. As has been discussed in a recent systematic review that sustainable transport infrastructures of buses have a tendency to neglect the actual needs of persons with locomotor disability, as insensitive stops, non-functional ramps, and poor implementation of policies make them ineffective. The review further stresses that without the incorporation of universal design, technical support, and better implementation frameworks, policies of accessibility are likely to remain illustrative and non-functional [7]. In the fast-urbanizing context of India, these issues are further increased, so there is a strong requirement to develop context-specific, user-oriented solutions.

In this direction, the present study investigates the accessibility barriers faced by wheelchair users in low-floor buses in Lucknow, Uttar Pradesh, India through on-site surveys and user interviews. By documenting both observed infrastructural shortcomings and lived experiences of users, the study provides preliminary evidence to guide future design and policy interventions aimed at improving bus accessibility. This study also aims to uncover those specific operation and design factors preventing individuals from travelling independently, and those which enable them to be independent. There are many practical areas where minor changes can drastically improve safety, comfort and usability for wheelchair users. Ultimately, it is hoped that the result of this research will assist transport authorities and designers in their evidence - based decisions when developing inclusive public bus system.

MATERIALS & METHODS

Participants

Four wheelchair users with locomotor disabilities took part in the study. All were students from Dr. Shakuntala Misra

National Rehabilitation University, Lucknow. All of them were wheelchair users from last 10 to 12 years and all of them have a great experience of travelling outside with their wheelchair and also without it. The basic personal information was noted and the purpose of the study was explained to them, and interview was recorded only after they gave written consent.

METHODOLOGY

This study followed a field-based exploratory method. It used semi-structured interview along with direct field observations. The fieldwork was done in Lucknow, Uttar Pradesh, with a focus on the Rajaji Puram city bus stop where low-floor buses with ramps are in service. To keep the setting easy and accessible, the interview was carried out within the university

campus. An interview guide was used to cover key topics such as awareness about low-floor buses, problems in reaching bus stops, experiences with bus staff, and views on ramp usability. Participants were also asked about the idea of a portable, user-controlled ramp.

Field surveys were also done at Rajaji Puram bus stop to see the actual condition of low-floor buses. Observations included the availability and working of ramps, as well as staff knowledge of ramp use. Short informal talks were also held with bus staff to know their opinion on ramp handling and maintenance. All interview notes and site observations were recorded carefully and compared. Instead of detailed coding, the focus was on finding common issues and user suggestions. These insights, along with field observations, were used to shape the proposal for a portable ramp solution.



Fig 1. Ramp Malfunction



Fig 2. PWD Seating Space



Fig 3. Interview with PWDs

RESULTS

Mobility Challenges and Dependence on Assistance

Many important and positive aspects emerged during the interview with wheelchair users. Understanding and discussing these experiences can provide simple solutions to many common everyday problems faced by PWDs. Issues such as difficulties and involuntary consideration encountered during travel were discussed openly. The interviews identified common repetitive issues in the use of public bus

services. It emerged that wheelchair users often have limited mobility due to lack of proper travel facilities. One participant explained that even though they are capable of going outside with their aids, they must seek help from someone, whenever they wish to travel by bus or any other form of public transport. Another user mentioned that reaching the bus stand itself is a difficult task, and boarding or alighting from the bus with a wheelchair becomes even more challenging. Due to all these reasons, despite being capable in

themselves, they continue to feel dependent on others. Such dependence not only restricts physical movement but also affects psychological confidence.

Economic Burden of Intermediate Transport Access

A major challenge reported by all participants was the cost of accessing bus terminals, which required the use of intermediate transport mode such as rickshaw. These rickshaws often demand excessively high fares, thereby raising the overall cost of travel and significantly hindering the affordability of the bus system. This economic strain acts as an additional barrier, particularly for the users who rely on daily or frequent travel to work, education, or social participation.

User Perception Toward a Portable Ramp Solution

Despite the various barriers encountered, all participants express a strong and consistent positive attitude toward the concept of foldable, lightweight, portable ramp. They collectively highlighted that such a device would enhance personal independence, reduce reliance on bus staff, and increase accessibility across multiple transport contexts. This response indicates a clear user preference for assistive solutions that promote autonomy rather than dependence on external assistance.

Infrastructure Limitations and Operational Negligence

Field visit at Rajaji Puram city bus stop confirms findings from the user interviews, revealing critical gaps in both infrastructure maintenance and staff awareness. Observations showed minimal staff training in ramp use, and informal discussion with personnel indicated that built-in ramps were rarely utilised in practice. The primary reason cited was the non-functional condition of the available bus ramp. Several units were rusted, stuck, or otherwise non-operational due to poor maintenance and prolonged exposure to environmental

elements such as rain. Independent deployment tests conducted during the site survey confirmed these severe limitations, and in one instance, a staff member was unable to fully deploy a ramp due to faults. These highlights underline issues not only in the durability of the installed equipment but also in the lack of accountability for a regular operational check.

DISCUSSION

Fixing the public transport system like buses or vehicles alone will not solve the problems. The real need is to make the entire environment accessible. When places like roads, footpaths, bus stands, toilets, government offices, markets etc. are easily accessible, only then a person, whether he has a disability or not, will be able to carry out his daily activities independently. If the environment itself is not convenient for him, then improving only one place will not be of much benefit. Therefore, it is necessary that along with the transport, the entire infrastructure of the surrounding area should also be made such that it can be used at all times without anyone's help.

This research has identified some of the issues experienced while traveling on low-floor buses by wheelchair users in Lucknow. One of the key results was that the bus staff were unfamiliar with the availability and proper functioning of the ramps. This suggests that infrastructure is insufficient on its own to achieve accessibility unless awareness drives and staff education programs are conducted. Another constant problem was the poor condition of ramps, with several units rusted or stuck due to service. Similar concerns were reported by Lenker et al. who highlighted that while ramps are technically simple, their effectiveness in public transport depends heavily on maintenance and trained personnel [5]. The current findings confirm this, highlighting the importance of consistent maintenance and frequent usage.

However, participants strongly favored the provision of a lightweight, foldable portable

ramp, as this would boost independence while reducing dependence on staff during transport on the buses. This is consistent with previous explanations for portable ramp designs by Kumtepe et al. who highlight their usefulness as small, easy-to-use and easy to handle [6]. Although previous studies focused on technical classification and materials, the current findings highlighted user adoption in India, a country where such devices are not commonly used. Ultimately, these findings relate to broader issues of sustainable transportation systems. Kinjawadekar et al. (2025) argued that the transportation systems of rapidly growing cities neglect the accessibility issues faced by individuals with mobility impairments [7].

Recent qualitative research has provided additional support for these conclusions. Velho pointed out that wheelchair users continue to struggle with previous barriers on real trips even where low floor buses and other accessible modes of transport are provided. Their list of obstacles includes not only physical ones like broken ramps, limited space inside buses and the gap between platform and vehicle but also social ones like poor passenger attitudes, disputes over spaces for wheelchair, and uneven help from workers. What is very important is that Velho points out that access problems are add-on and many times happen in one trip making it stressful, anxious and in some cases leading to the unwillingness to travel for social reasons. Therefore, accessibility is not only a matter of vehicle design but also the use of supportive infrastructure and reliability in maintenance plus good driver and passenger interaction [8].

By showcasing local user perspectives and operational challenges, this study offers provisionally relevant data and promotes creative, user-centred solutions like the proposed portable ramp.

CONCLUSION

This research established major challenges of wheelchair users in accessing low-floor buses in Lucknow. Interviews revealed that

many users could not access ramp facilities on buses, while staff members lacked the skills or ability to utilize them properly. Field observations also established that the ramps were often non-operational because they were poorly maintained and rarely used. In spite of these challenges, there was significant support for a lightweight, foldable portable ramp increasing independence and minimizing staff dependency on buses. These results highlight the value of improving existing features to be more efficient in design and maintenance as well as introducing user-oriented solutions. Future investigations must involve more participants and more diverse user groups so as to capture a wider accessibility challenge range. Longer, more comprehensive interviews might yield richer data on the everyday travel problems of users of wheelchairs. Accordingly, longer site surveys across different bus stops and times-of-day visits would capture a more. Depending on the issues faced, additional work can also consider working on the creation and planning of a light, easy-to-handle, and easy-to-carry portable ramp. This ramp can serve as a solution for users while long-term modifications to the bus infrastructure are being carried out. However, the present study mainly focuses on user interviews and site observations, and the ramp idea is suggested only as a direction for further exploration.

LIMITATIONS

This study has several limitations. The sample size was very small with only four users of wheelchairs, and the field survey sampled only a single spot in Lucknow, i.e., a single bus stop. Consequently, the results are not generalizable to all users of wheelchairs or all urban buses. The research relies mainly on qualitative methods such as interviews and observation. Although rich in information, these lack statistical data on a broader scale. The data collected is self-reported experiences and field notes, yet they do not capture all the difficulties of daily challenges faced while traveling.

Finally, the study took a short time duration, during which there was little chance to examine buses across a series of time frames or across a series of routes. Consequently, the findings should be regarded as preliminary and a starting point for more comprehensive and extensive research.

Declaration by Authors

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