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Enhancing Accessibility for Persons with Disabilities in Public Transportation of Rewa City

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A B S T R A C T :

Transportation has a major impact on social engagement and participation, subjective well-being, and overall quality of life. If they have fewer options for private mobility, people with disabilities can become more dependent on public transit systems. Despite an increase in use, people with disabilities continue to experience challenges when utilizing public transportation networks. Remarkably little is known about these challenges at the regional transportation district level. Subjective well-being, general quality of life, and social engagement and participation are all significantly impacted by transportation. People with impairments may become more reliant on public transportation systems if their own mobility options are reduced. People with impairments still face obstacles when using public transportation systems, even though usage has increased. At the level of regional transportation districts, remarkably little is known about these difficulties. Accessibility is a major problem with transit systems, especially for those who are disabled. The decision-making process for enhancing the accessibility of public transit involves various authorities; therefore, collaboration amongst all parties concerned is necessary to achieve the desired outcome. The goal of this research was to gain a deeper understanding of the perceived accessibility and obstacles to the public transport system for residents with disabilities who live in the service area.

Keywords: accessibility, disabilities, public transportation, impairments

1. Introduction

Access to employment, healthcare, education, shopping, and other facets of complete community inclusion depend on transportation. Some populations, such people with impairments, can become increasingly reliant on public transportation systems if there are less options for private mobility. People with disabilities continue to experience difficulties when using public transportation, even though its use has increased. Many factors, such as quality, limitations, alternatives, and trip cost, are taken into account when assessing public transit accessibility. Cooperation amongst all stakeholders is necessary to obtain the desired outcome because authorities from various regions make judgments regarding enhancing public transit accessibility. Every citizen's demands ought to be taken into account. The needs of individuals with mobility problems should be considered while developing public transportation in metropolitan areas. Regretfully, decisions like this are not often taken hastily. Some populations, such people with impairments, can become increasingly reliant on public transportation systems if there are less options for private mobility. People with disabilities are frequently dependent on cars for many reasons, such as the high cost of car ownership or difficulties related to their own condition.

2. Literature Review

In 2011, Tomer and associates Promoting the use of public transportation is a crucial tactic for preserving the viability of transportation networks. This is accurate given the many advantages of public transportation, such as reduced traffic and a cleaner environment due to its lower energy consumption and emissions of greenhouse gases and other pollutants into the air, land, and water. Public transit may improve public health in addition to other active modes of transportation like walking and bicycling. The author makes the case that increasing bus stop accessibility will also increase work accessibility through transportation, as occupations have a significant impact on people's daily mobility.

One proposal, according to Suzuki et al. (2013), is for drivers to pay a congestion fee in order to cover the expenses of endangering the environment and public health. In addition to a gasoline tax that would encourage more drivers to take the bus rather than their cars, the money could then be utilized to enhance public transit. Buses, trains, and trams are the most common forms of public transportation that require payment and/or ticket admission. Generally speaking, group travel along designated routes is made possible by public transit. As a result, public transit is essential for towns.

According to Widener et al. (2015), people's access to supermarkets is limited by space. A large percentage of people in Cincinnati, Ohio, discovered that they had easier access to supermarkets when they went shopping on their way home from work than when they left, according a data

analysis. In addition to estimating the particular time and space constraints on public transportation travel for people departing from work sites, this study employed an interaction potential measure that was generated by using an equivalent measure where journeys to the grocery began from the home location. Traveling flow data was used to offer statistics on how residents moved from their homes to their workplaces and back.

Wong (2013) used the General Transit Feed Specification (GTFS) to quantify transit performance. According to the main objectives, "GTFS feeds are an efficient data source for calculating key transit service metrics and to evaluate the validity of published GTFS feeds as a data source." This was verified through batch processing and comparison with measures in the National Transit Database (NTD). To help future transit analyzers and researchers understand the limitations and uses of the GTFS data, the results were compared. His final findings indicate that well-structured GTFS feeds adequately depict transport networks, and that transit agencies can measure metrics effectively and quickly by using the combination technique outlined in his study.

3. Objectives

1.The Understanding the perceived accessibility and barriers to public transportation for those with disabilities living in the service area was the aim of this study.
2.One of the main goals of this study was to evaluate how people with limited physical mobility travel to these places and to their places of employment.
3.Bus stations that need to be improved to provide better access and greater independence to people with limited mobility were then prioritized by the research.
4.This study examines wheelchair-accessible bus stops and jobs that are accessible by walking and public transportation in order to gauge employment accessibility.

4. Methodology

Step 1: - The existing literature is reviewed with the finding that there seems to be a gap within the field of Urban Studies on this subject.

Step 2: - Presents the methods used for conducting research on this topic of temporary inaccessibility.

Step 3: - Introduces the problem of accessibility within the public built environment for people with disabilities and asks how a temporal analysis of physical barriers can help us to understand and re-evaluate accessibility. This work is based on explanatory study. This work was done to analyzed relationship between the barriers in accessibility and the five factors. The five factors selected are infrastructure, pedestrian environment, information, vehicle design and planning. These factors were used in our study as independent variables (IVs) with the relationship of accessibility of disabled people in bus terminal, dependent variable (DV) as shown in Figure. Quantitative research method will be carried out to justify the dependent and independent variables of the barriers in accessibility for the disabled.

Step 4: - Presents the setting for the case studies and argues that this setting can be considered a critical case. Following this, the findings of the case studies will be presented in the form of narratives, photographs and model.

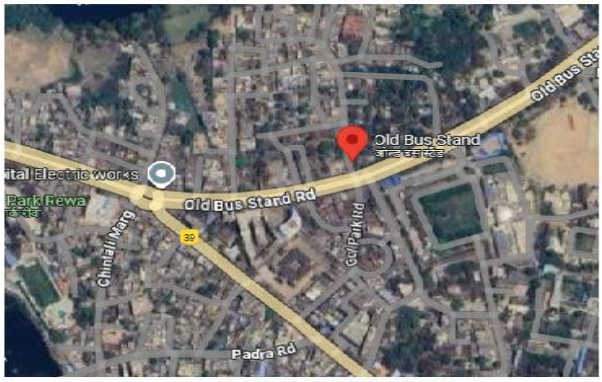
Step 5: - Discusses the findings of the case studies which include a lack of consideration for the access needs of people with disabilities during construction activities, as well as the proposals of alternative solutions to some of the accessibility problems encountered.

Step 6: - This is followed by a conclusion which proposes a re-conceptualization of accessibility as an always-ongoing process.

5. Selection of Study Area

With latitude 24.5362° N and longitude 81.3037° E, Rewa is a city in the northeastern region of the Indian state of Madhya Pradesh. Rewa district is a maximum of 125 km long from east to west and 96 km long from north to south. The Vindhyachal mountains cut across the center of the district, and the Kaimur hills encircle this region to the south.

Image of Old Bus Stand



Google image of old bus stand

Image of New Bus Stand

Google Image of New Bus Stand

QUESTIONNAIRE FORMATION:
A questionnaire with a total of 6 variables is developed to measure pedestrian perception in different areas:
a. Sidewalks, curb ramps, or crosswalks width on the way to the bus stop (Infrastructure)
b. I can overtake other pedestrians easily &flow of pedestrians is minimum (Pedestrian Environment)
c. Information about potential barriers on the way to the bus stop (Information)
d. Having enough accessible seats on the bus (Vehicle design)
e. Bus Route Planning, Service quality & Personal safety (Planning)
f. Accessibility of disabled people in bus stops

A questionnaire will be used to collect all relevant information from the intended respondent. This study uses a quantitative approach since we typically examine the connection between accessibility barriers and five components at the bus station. Primary data was collected using a survey. Most of the secondary data collected and used in this study concerns the barriers to accessibility that people with disabilities encounter at bus terminals. The study will focus on people with disabilities in Rewa City bus terminals, including those who use wheelchairs, have visual impairments, or have hearing problems, irrespective of their nationality. Additionally, the people that visit the bus stop and utilize its facilities must be the study's participants.

Based on these assumptions, the necessary minimum sample size for this study was calculated as follows (Cohen, 2001):

$n = (\delta/d)2 = (3.42/ . 3)2 = 129.96$

Thus, a sample size of 130 participants would have been sufficient for this study.

6. Result & Discussion

6.1 Normality Test

Table 1. Statistics

		Infrastructure	Pedestrian Environment	Information	Vehicle design	Planning	Accessibility
N	Valid	130	130	130	130	130	130
	Missing	0	0	0	0	0	0
Skewness		.581	.900	.134	.837	.900	.656
Std. Error of Skewness		.212	.212	.212	.212	.212	.212
Kurtosis		.457	.933	.778	.985	.705	.494
Std. Error of Kurtosis		.422	.422	.422	.422	.422	.422

Table shows the outcome for the normality test. In this normality test, based on Table, skewness values as well as the kurtosis values are acceptable between -1 and +1. The skewness as well as the kurtosis of dependent variable Accessibility (DV) is 0.656 and 0.494. For the skewness and kurtosis of infrastructure, the value is 0.581 and 0.457, pedestrian environment is 0.900 and .933, vehicle design is 0.837 and 0.985, planning is 0.900 and 0.705 and, lastly, information is 0.581 and 0.457.

6.2 Pearson Correlation Analysis on Group of Factors

To determine the statistical significance of the main elements influencing pedestrian behavior, Pearson Correlation Analysis was employed. A p-value of 0.05 was used to correspond to a 95% confidence level. Factors with a p-value of less than 0.05 ($p<0.05$) were considered key contributors, whilst variables having a p-value of greater than 0.05 ($p>0.05$) were eliminated. The statistical package for social science (SPSS) was used to perform the Pearson Correlation Analysis. With the exception of driver yielding behavior, every characteristic in the table below was found to have a significant impact on pedestrian behavior, with p-values more than 0.05 ($p>0.05$).

Table 2. Correlations Parameter

		Correlations					
		Infrastructure	Accessibility	Pedestrian Environment	Information	Vehicle design	Planning
Infrastructure	Pearson Correlation	1	.008	.045	.040	.024	.078
	Sig. (2-tailed)		.587	.611	.653	.158	.378
	N	130	130	130	130	130	130
Accessibility	Pearson Correlation	.001	1	.019	.064	.019	.036
	Sig. (2-tailed)	.587		.179	.467	.832	.683
	N	130	130	130	130	130	130
Pedestrian Environment	Pearson Correlation	0.003	.019	1	.005	.006	.006
	Sig. (2-tailed)	.611	.179		.693	.391	.391
	N	130	130	130	130	130	130
Information	Pearson Correlation	.010	.004	.005	1	.003	.009
	Sig. (2-tailed)	.653	.467	.693		.294	.070
	N	130	130	130	130	130	130
Vehicle design	Pearson Correlation	.015	.019	.006	.003	1	.024
	Sig. (2-tailed)	.158	.832	.391	.294		.160
	N	130	130	130	130	130	130
Planning	Pearson Correlation	0.025	.036	.016	.019	.024	1
	Sig. (2-tailed)	.378	.683	.391	.070	.160	
	N	130	130	130	130	130	130

6.3 Analysis of Variance of the model

The F-ratio in the analysis of variance table indicates how well the regression model fits the data overall. The regression model fits the data well, as shown by Table 4.10, which shows that the independent components statistically significantly predict the dependent variable.

Table 3. ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	70.802	5	13.560	39.613	.009[b]
	Residual	44.40	124	.914		
	Total	113.902	129			

a. Dependent Variable: Accessibility

b. Predictors: (Constant), Planning, Pedestrian Environment, Infrastructure, Information, Vehicle design

The coefficient of determination (R-sq) value in the table indicates the proportion of the dependent variable's fluctuation that can be explained by the predictors. The study's coefficient of determination (R-sq) was 0.724, which indicates that the predictors explained 72.4% of the variation in accessibility for impaired individuals, with the remaining 27.6% coming from variables not covered in the study.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
1	.855[a]	.724	.713	.956	124	.0190

Table 4. SPSS Software Coefficients value

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	1.977	.571		3.462	.001		
	Infrastructure	.210	.001	.063	1.696	.008	.977	1.024
	Pedestrian Environment	.185	.094	.028	1.437	.003	.986	1.014
	Information	.140	.018	.063	2.698	.007	.969	1.033
	Vehicle design	.095	.022	.026	2.285	.006	.961	1.040
	Planning	.200	.088	.038	1.413	.001	.955	1.047

a. Dependent Variable: Accessibility

Thus, based on Table, the following model of multiple linear regressions was attained.
$y = \alpha + \beta 1$ (Infrastructure) + $\beta 2$ (Pedestrian Environment) + $\beta 3$ (Vehicle Design) + $\beta 4$ (Planning) + $\beta 5$ (Information) + ε

y= 1.977 + 0.210 (Infrastructure) + 0.185 (Pedestrian Environment) + 0.140 (Vehicle Design) + 0.095(Planning) + 0.200 (Information).
From the equation, y represents dependent variable, x represents independent variable and ε represents the error. Besides, the B-value for infrastructure is 0.210, pedestrian environment is 0.185, vehicle design is 0.140, planning is 0.095 and information is 0.200. The results are all positive. For regression constant, it has a value of 1.977. According to this model, prediction explains the total value of dependent variable change as the value of independent variable increases or decreases. Moreover, this equation explains that if infrastructure factor rises by 1 unit, the accessibility of disabled people in bus terminal will increase by 0.070 units. When pedestrian environment factor increases by 1 unit, the accessibility of disabled people in bus terminal will increase by 0.135, when vehicle design factor increases by 1 unit, the accessibility of disabled people in bus terminal will increase by 0.035 units. Besides, when the planning factor increases by 1 unit, the accessibility of disabled people in bus terminal will increase by 0.35 units. Lastly, when the information factor increases by 1 unit, the accessibility of disabled people in bus terminal will increase by 0.082 units.

Old Bus Stand Survey Images

New Bus Stand Survey Images

6.4 Findings & Discussion

The lack of a ramp on the road, cracks, steep slopes, pebbles, uneven surfaces, and trash make it difficult for those with disabilities to get on public transportation. More specifically, they find it difficult and uncomfortable to navigate Rewa City's built environment.

• The road infrastructure's design and structure are inappropriate. The road is devoid of ramps. For people with disabilities, getting on the bus is nearly difficult. Wheelchair users should not utilize the roads.

• Drivers and conductors have a negative attitude toward people with disabilities; they prioritize their own interests over assisting them. When drivers learn that I am intoxicated, they are reluctant to pick us up. Because it takes longer for drivers to transport individuals with disabilities than for others, and because we also require assistance to board the vehicle.

• Disabled individuals in this city may benefit from designated areas, conspicuous labels, and alternate routes in transportation systems. But the current transportation system lacks these.

• There is no distinct level or margin for passengers, no separate passenger shelter, and insufficient lighting. Accessibility for disabled people is hampered by the absence of accurate levelling and signage for designated or alternate locations on transportation infrastructure.

• The road and sidewalk are blocked by vendors, hawkers, and the unorganized sector. Due to the continuous development in the city, building supplies are kept by the side of the road. Because of this, a sizable portion of the road remains inaccessible to those with impairments. People with impairments find it challenging to ride public transit because of these barriers.

• As they board the vehicle, each respondent witnesses mishaps and injuries. They are forced to fight because of the subpar interior automobile design and the incorrect placement of priority seats in this city.

• It is clear from this discussion that their daily journeys were severely hampered by the difficulties they encountered in securing public transportation. In other words, it may be argued that disabled people refuse to leave their houses for their daily commute because of a city's inadequate and inaccessible transit infrastructure.

6. Conclusion

1. Despite an increase in the usage of public transportation, people with disabilities continue to report challenges.

2. This study aims to determine the factors influencing disabled people's accessibility in bus terminals and their satisfaction with accessibility in bus terminals in order to better understand the barriers and perceived accessibility of the public transportation system for individuals with disabilities residing in the service area.

3. Questionnaires have been created for this project in order to better understand the bus terminal's amenities and to facilitate a survey on accessibility barriers for the disabled. The results of the study showed a strong relationship between the accessibility of bus terminals for those with impairments and all independent factors.

4. The accessibility of bus terminals for individuals with disabilities is influenced by five factors: information, planning, vehicle design, pedestrian environment, and infrastructure.

5. Bus terminal accessibility concerns make bus transit problematic for those with impairments. Furthermore, insufficient and ineffective facilities, vehicle designs, and planning by policymakers and bus terminal authorities affect the accessibility of the bus station for disabled individuals and compel them to use other forms of transportation.

6. We put up the barriers that keep them from taking public transit. Therefore, it is our responsibility to make the transportation system more user-friendly, comfortable, and considerate of those with disabilities. Additionally, public transportation providers should work more closely with the key stakeholders in communities of people with disabilities.

7. When a significant section of the population continues to be disadvantaged and marginalized, a sustainable society cannot be established. This exclusion and deprivation can be eliminated by increasing the accessibility and mobility of public transit.

8. Finally, policymakers and authorities need to take into account the needs of those who use bus transit, whether they are disabled or not. It is essential to treat everyone in society equally, and those with disabilities must be treated the same as those without disabilities.

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