

Women perspective for safe and healthy public spaces: Study from Indian city - Vijayawada

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Abstract

Public Spaces play an important role and are vital to communal life and quality of life of citizens. Public spaces are meant to provide benefits to all individuals and groups of people. This study identified the different factors that have an impact on women's safety in public spaces and developed a Women's Safety Index to evaluate the safety levels in public spaces. Firstly, the identified factors were categorized into four categories – social, physical, visual, and functional. Secondly, these factors were analysed using perception surveys to understand how men and women perceive safety in public spaces differently. The index developed is helpful in evaluating the levels of safety of women in public spaces and identifying unsafe public spaces. Inferences from the study are useful to understand the key differences in the perceptions and requirements of men and women with respect to safety in public spaces. This further helps point out the specific areas of improvement and formulate strategies which can be used to design safer and more gender inclusive public spaces. Results of this study also help establish the relationship between varying dimensions of a public space and women safety in public spaces in other cities also.

Keywords

Public spaces, Women Safety Index, Gender sensitive , SDG

1. Introduction

Public spaces are important infrastructures that play a positive role in a citizen's quality of life when it offers diverse activities in a safe, accessible, and inclusive environment. Cities with inadequate, poorly designed, or privatized public spaces become increasingly segregated. Studies in urban planning indicate that the design of public spaces has a greater impact on the daily lives of women than men. This is because women have a much closer relationship with their immediate urban environment. But women are hesitant from using public spaces because of fear of crime or poor design. Women often report higher levels of threat than men in public spaces because of a lack of infrastructure, facilities, etc.

Ramon and Maria, (2004) explain that there are different attitudes considering women's presence in urban spaces which could be categorized into two sets of inclusionary and exclusionary approaches. Analysis has revealed the power of symbolic hierarchical dichotomies of public/private, male/female, and work/home in the planning and designs of built environments, which are intended to reproduce these dichotomies and so emphasize women's exclusion in urban spaces. Feminist scholars' studies on women and their needs have proved the importance of women's presence in urban spaces which is referred to as the "inclusionary approach". Equity is a prerequisite for any action aimed at improving people's quality of life which itself is a comparative issue. Gender equity is not only a question of fundamental human rights and social justice

but is also an instrumental precondition for environmental consideration and human security as mentioned in United Nations report on 'Women's Rights Are Human Rights, 2014 and United nations 2030 Agenda for Sustainable Development Goals on Gender equality and the empowerment of women and girls.

Gender-based violence (GBV) is an everyday phenomenon in public spaces such as streets, parks, markets, and other public venues around the world. Restrictions on movement and accessibility lead to exclusion of women from these spaces. Various factors, including but not limited to social, visual, cultural, functional, and physical indicators of public space (Grodach, 2010; Braun and Malizia, 2015) play a role in affecting the perception of levels of safety of that space by the people using it. Local surveys, studies, and literature on women's safety highlight those women's concerns are entirely different from those of men when they approach public spaces. Females use and perceive cities in a different way than men, they also use public places in a variety of ways (Davis *et al.*, 2020; Roy and Bailey, 2021). Therefore, to make public spaces more accessible and safer for women, it is important to study these spaces from the perspective of women and understand the unique needs of women in public spaces to ensure their safety and equal rights in a city (Carmona, 2019).

Women often report levels of fear of crime that are two to three times higher than men because the public spaces are poorly designed and lack infrastructural facilities and provide a perception of safety among women (Sur, 2014; Mahapatro and Kumar, 2021). Good design is key to creating public spaces that are inclusive, accessible, and safe for everyone in the community. To create these spaces, the design must acknowledge and accommodate the specific needs and experiences of all population groups within the community. Thus, analysis of women's needs helps in the identification of the most important factors affecting women's safety further helping design better & safer public spaces (Khalili and Fallah, 2018).

The aim of the study is to evaluate women safety in public spaces through safety index and suggest planning strategies for women safety and the 4 main objectives are:

- To identify the factors affecting women's safety in public spaces.
- To develop an index to evaluate the levels of Women's Safety in Public Spaces.
- To identify unsafe spaces for women in a public space
- To propose measures for women's safety and inclusion while designing public spaces

The paper describes the case study area, factors for Women safety, development of women safety Index and perception survey results and inferences in the following subsequent sections.

3. 2. Research Methodology

The study was conducted in four phases. The first phase involved developing a framework of factors that impacted the safety of women in public spaces. This is based on an extensive literature review. The second phase covers the perception survey and elimination of factors based on the perception survey results. This will be carried out by conducting online surveys. This phase is important in establishing the differences in perception of safety between men and women. After this phase, the index was ready to be applied to the case study. In phase 3 the Women's Safety Index (WSI) will be applied to public spaces to evaluate the levels of women's safety. The final phase, phase 4 deals with proposals to improve safety levels in the identified unsafe for women spaces and uses regression analysis to establish a relationship between the varying dimensions of public space. The detailed methodological chart is given as Figure 1

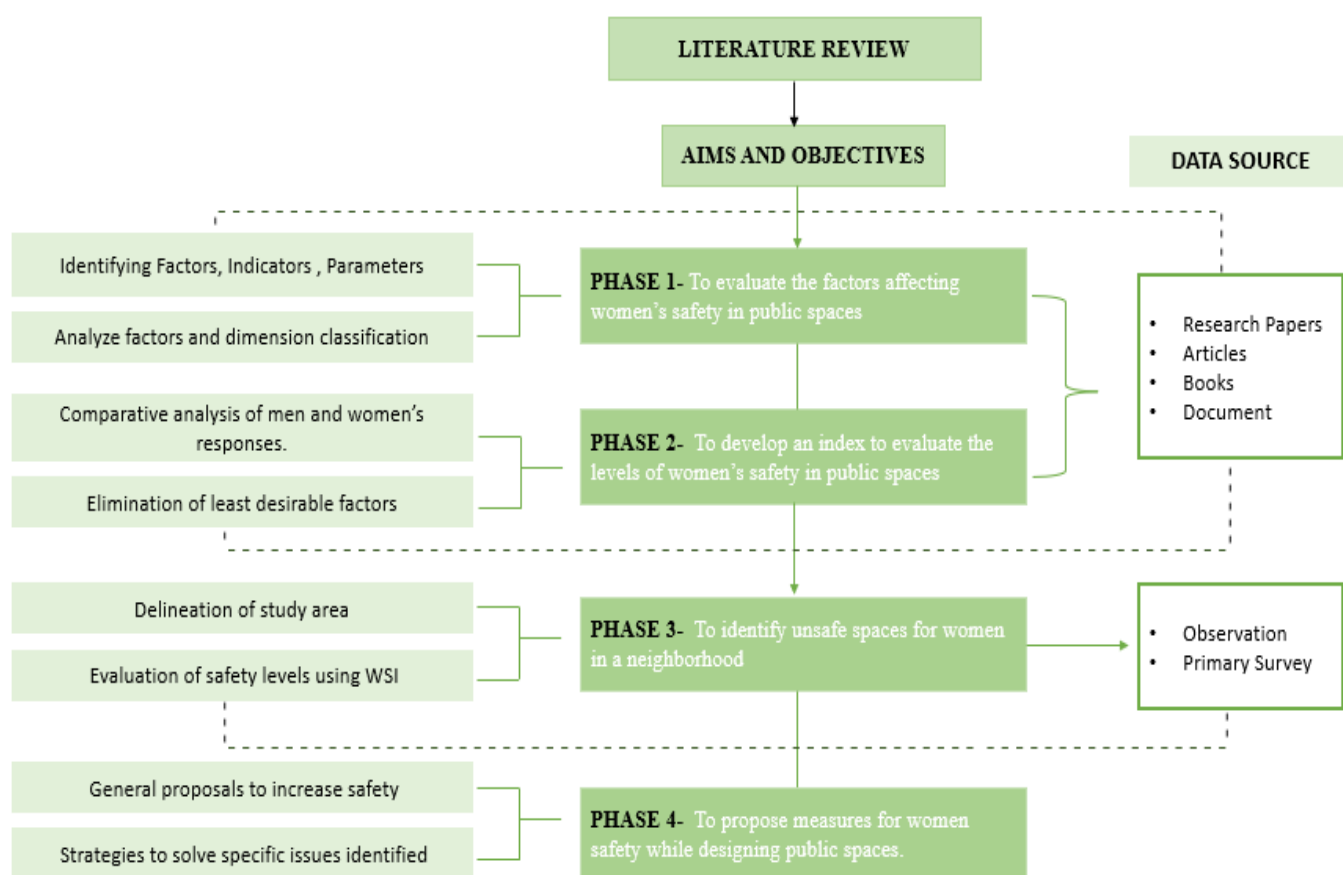


Figure 1: Methodology framework

3. Dimensions of Public Spaces Impacting Women's Safety

Public spaces are very essential for a good quality of life of citizens. For women to access their cultural rights through public spaces, women must have equal access to those public spaces. Equality in and for public space can come from eradicating gender distinctions of public space, allowing for the free movement of women, making public spaces safer by taking into consideration women's needs and experiences. Based on the literature review a total of 30 factors under four dimensions – social, physical, function and visual were identified. These factors will be further analysed to construct Women's Safety Index. Perception of safety is a result of a culmination of multiple factors. These factors are discussed as follows:

3.1 Social Dimension

One of the most important dimensions of public spaces is to create opportunities needed for social interactions. Interaction with other people of the society leads to creating a stronger relationship with the place and society. This factor can be measured by determining the level of different social groups' presence,

formation of social societies, and living in different hours of day and night. Public spaces should accommodate different users, genders, and activities such diversity leads to communal interactions which increase the perception of safety because women are less likely to get attacked or violated in lively active spaces. (Gita Sen, 2007)

3.2 Physical Dimension

Good physical condition and maintenance of public space create a sense of order and comfort and safety for users of public space and help in engaging in a variety of activities and uses of the public space. Within the space syntax theory, it has been argued that the geometric and topologic architecture of the urban grid is the most powerful shaper of urban movement patterns. Physical connectivity of the space and the ease with which one can move from one space to another is a key factor in ensuring safety as women always tend to stay alert and look for alternative paths to take in case of emergencies or case of fear. (Shakti, 2017)

3.3 Visual Dimension

The visual dimension of public spaces has significant importance in creating a strong perception of safety. Maintenance of public spaces regards the cleanliness of an area, including proactively preventing vandalism or repairing damaged property in the public space. Vandalism, such as graffiti or broken attributes in the area, is an important factor that determines the aesthetic value of an area; vandalized areas are less attractive and keep people away. The broken window theory can be applied here: if small crimes such as vandalism are prevented, people perceive the area as neat and orderly, and worse crimes will have less of a chance of happening. Expanding on broken window theory explained by vandalism and lack of cleanliness is linked to increasing the uneasiness people experience in an area (Pandey and Pathak, 2021).

3.4 Functional Dimension

Functional dimension involves factors that determine the functionality of the public spaces that have an impact on women's safety such as range of activities, opening hours of the public spaces. Spaces that are active for longer periods in a day are safer as they are busy with people and activities for longer. In addition, the range of activities a public space can support and the actors it can include may determine its inclusiveness. In many ways, public space may be thought of as 'flexible and ambiguous' ever-changing to accommodate the activities and behaviours of its users. This way of conceptualizing public space is particularly important because sometimes people also invent new activities in public space and often appropriate spaces to activities and behaviours that suit their needs (Grodach, 2010).

Tabel 1 Factors affecting Women's Safety in Public Space

Dimensions	Factors
Social	1. The ratio of women to men pedestrians 2. Communal interactions 3. Restricted Behaviour Signage 4. Perceived Safety from crime 5. Space flexibility to suit user needs 6. Surveillance measures 7. Check on anti-social elements
Physical	8. Ease of movement 9. Sidewalk Accessibility 10. Places to sit 11. Lighting quality after dark 12. Public toilets 13. Connectivity to adjacent streets or Spaces 14. Perceived safety from traffic 15. Physical condition and maintenance
Visual	16. Landscaping 17. Cleanliness 18. Perceived Openness 19. Imageability – Memorable landscape 20. Perceived attractiveness of the space 21. Vandalism 22. Visibility of the space from a distance 23. Location Signage
Functional	24. Range of Activities 25. Opening hours of public space 26. Control of entrance and exit 27. Street furniture and equipment 28. Comfort of space – shade and shelter 29. Variety of businesses and other uses 30. Presence of street vendors

4. Women Safety Index based on Perception Survey

After identification of key factors and dimensions of safety, a perception survey was conducted with the aim of analysing the difference in perception of safety in public spaces between men and women. A perception survey was conducted to study the difference in perception of safety in public spaces between men and women. The respondents of the survey were required to rate each of the 30 factors from a scale of 1 – 3 (1 = doesn't affect safety, 2 = moderately affects safety, 3 = significantly affects safety). Therefore, the maximum score a respondent could attain is 90 and the minimum is 30. Hence, a higher score indicates that the listed factors have a significant importance in their perception of safety in a public space. A total of 200 responses were collected of which 100 were of men and 100 were of women. The details are explained in Table 2.

Results from the perception survey corroborate the findings from the literature review on how aspects of public spaces have a greater impact on women's safety in comparison with that of men's and that women perceive safety differently than their male counterparts. Based on the analysis of results from the perception survey, seven factors (two factors from Social, one factor from Physical, two factors from Functional and two factors from Visual.) that received the lowest scores were eliminated. Remaining 23 factors were used to construct Women's Safety Index (WSI) to evaluate the four dimensions of public space which impact women's safety in public spaces. The 23 factors are rated by the researcher based on their observations of the public space and user ratings. These observations include but are not limited to the interaction between the space and its users. (Refer Table 2)

Table 2 : WSI Factors and measuring criteria

<i>Dimensions</i>		<i>Factors</i>	<i>Measuring Criteria</i>
Social	1.	2. Ratio of women to men pedestrians	1= very limited 2 = low 3 = high
	3.	4. Communal interactions	1= very limited 2 = low 3 = high
	5.	6. Perceived Safety from crime	1= very limited 2 = moderate 3 = high
	7.	8. Surveillance measures	1= none 2 = few 3 = many
	9.	10. Check on anti-social elements	1= very limited 2 = low 3 = high
Social Subindex (Sd) = (S1 + S2 + S3 + S4 + S5) / 5			
		6. Ease of movement	1= very limited 2 = low 3 = high

Physical		7. Sidewalk Accessibility	1= very limited 2 = low 3 = high
		8. Lighting quality after dark	1= very limited 2 = low 3 = high
		9. Public toilets	1 = Absent 2 = poorly maintained 3 = well maintained
		10. Connectivity to adjacent streets or Spaces	1 = almost none 2 = moderately connected 3 = very well connected
		11. Perceived safety from traffic	1 = unsafe 2 = somewhat safe 3 = very safe
		12. Physical condition and maintenance	1 = poor condition 2 = moderate condition 3 = good condition
Physical Subindex (Pd) = (P1 + P2 + P3 + P4 + P5 + P6 + P7) / 7			
Visual		13. Landscaping	1= very limited 2 = low 3= high
		14. Cleanliness	1= very limited 2 = low 3= high
		15. Perceived Openness	1 = not at all 2 = mostly 3= completely
		16. Vandalism	1 = very high 2 = moderate 3= very limited
		17. Visibility of the space from a distance	1= very limited 2 = low 3= high
		18. Location Signage	1 = absent 2 = moderately present 3 = adequately present
Visual Subindex (Vd) = (V1 + V2 + V3 + V4 + V5 + V6) / 6			
		19. Opening hours of public space	1= very limited 2=open at least 10 hrs. 3= open most hours
		20. Control of entrance and exit	1= no control 2= moderate control 3= high control
		21. Comfort of space – shade and shelter	1= very limited 2 = low 3= high

		22. Variety of businesses and other uses	1= very limited 2 = moderate 3 = high variety
		23. Presence of street vendors	1= very limited 2 = low 3 = high
Functional Subindex (Fd) = (F1 + F2 + F3 + F4 + F5) / 5			
Total WSI Score = (4vSd x 4vPd x 4vVd x 4vFd)			

5. Case Study Area

Vijayawada is a city in the Krishna district of the Indian state of Andhra Pradesh. Vijayawada is an important city situated in South India and is considered to be the cultural capital of the state of Andhra Pradesh. The biggest railway junction in the South Central Railway leading to major cities like Chennai, Kolkata, Delhi, and Hyderabad, Vijayawada is full of tourists coming from all over. Being a busy and major junction on the Kolkata-Chennai railway line, this city has emerged as an important industrial center. This is the heart of Andhra Pradesh, historically a cultural, political, and educational center. The area chosen as case study in Acharya Ranga Nagar, Vijayawada (Refer Figure 2) The Area of the delineated case study is 2.43 km. enclosed by 4 major roads – National Highway 16, Vijayawada-Machilipatnam Road, and Polyclinic Road & Sri Natarajan Road. The area has 5 major streets, a network of residential streets, parks and other scattered open spaces that are public spaces used by residents that can be evaluated for women's safety in public spaces.



Figure 2: Location of Case study Area

Public space takes many spatial forms, including parks, the streets, sidewalks and footpaths that connect, playgrounds of recreation, marketplaces, but also edge space between buildings or roadsides are also public spaces (Carr, 1993; Madanipour, 1999). A figure-ground illustrates the relationship between built and unbuilt space in cities. Land coverage of buildings is visualized as solid mass (figure), while public spaces formed by streets, parks and plazas are represented as voids (ground). In urban planning, this simple yet powerful graphic tool is used to explore built form patterns and the continuity of open space. Three site locations were selected from the area shown in Figure 4, and analysed for women safety based on the above developed WSI index.



Figure 3: Three Sites in Case study area – Acharya Nagar, Vijayawada

Site 1: Site 1 (Refer Figure 4) is situated on the main Acharya Ranga Nagar road which is busy with vehicular traffic for most hours of the day. There is no sidewalk present on this road so heavy traffic poses a high danger to the pedestrians. There are no shops, vendors, or even residential buildings. In the after-hours, there are no visitors to this site apart from the vehicular traffic. There are the dilapidated structures and vacant plots present on either side of the roads. These lands are heavily vandalised, and used for public urination by men. This severely impacts the perception of safety and familiarity in this space.

Table 3 : WSI score of Site 1

Type of Score	Score
Social Sub Index Score	1.2 out of 3
Physical Sub Index Score	1.4 out of 3
Functional Sub Index Score	1.2 out of 3
Visual Sub Index Score	1.1 out of 3
Total WSI Score	1.2 out of 3

As this place has dilapidated structures, the lighting conditions are very poor leading to creating of multiple blind spots. The dilapidated buildings are inhabited by beggars and homeless. Despite that traffic and its placement near main road, site 1 has scored **very low** on the WSI (refer table 3). Remarks based on observation and Public Perception survey are:

- No. of visitors – less than 20 per day
- High danger from vehicles to pedestrians
- Dilapidated structure on one side and vacant plot on other side
- No shops, residential buildings or vendors.
- Public urination by men

Site 2 : Site 2 (Refer Figure 4) includes a park, temple, playground, children's play area and basketball courts. This site is visited by more than 100 people daily. There is adequate space for all age groups to conduct their individual or group activities. These spaces are segregated by landscaping such as bushes and trees. Women and senior citizens visit the temple and then engage in their individual or group activities in the park which has plenty of seating space and a walking track. Young children play in the play area which has equipment such as seesaws, slides and swings. High ratio of women to men is observed in this space because of structured sub-zones.

Table 4 Site 2 WSI Scores

Type of Score	Score
Social Sub Index Score	2.8 out of 3
Physical Sub Index Score	2.6 out of 3
Functional Sub Index Score	2.4 out of 3
Visual Sub Index Score	2.3 out of 3
Total WSI Score	2.5 out of 3

The site is not enclosed by buildings hence ensuring visibility from a distance and a perception of openness. High scores of WSI is perceived on Site 2

- No. of visitors – More than 50 per day
- Separate play area for kids, basketball court and ground to play other sports.
- Occupied by kids, men and women of all ages
- Well maintained and Presence of vendors.

Site 3 : Site 3 is a narrow park with the shorter side along the main road and other sides along sub arterial roads. This site in a residential area therefore there are no shops or vendors present in this space. Since it is a narrow piece of land this site cannot facilitate many activities. There is a designated open gym area and a walking track. There is no play equipment hence children do not regularly visit this space. It is visited by men who walk on the walking, exercise in the gym area.

Table 1: Site 3 WSI Scores

Type of Score	Score
Social Sub Index Score	1.8 out of 3
Physical Sub Index Score	2.3 out of 3
Functional Sub Index Score	2.2 out of 3
Visual Sub Index Score	2.2 out of 3
Total WSI Score	2 out of 3

Additionally, it has only one entrance, so the ease of movement is low in this space. It is a well-maintained park, where the grass is cut regularly and the equipment is in good condition. Children are often accompanied by their mothers.

6. Results and Discussions

The range of women's scores from perception survey lies between 70 to 86, i.e. the minimum score a woman respondent gave was 70 and the maximum was 86. However, the range of men's scores lies between 53 – 81. The lowest score attained by a man respondent is 53 which is significantly lower than the 70 of a woman respondent. The average score of a man respondent is 65.8 while that of a woman is respondent is 78.7 which is almost 20% higher than the average score of men. Both these observations collectively establish that dimensions and factors of a public space impact a woman's perception of safety more than that of men's perception.

The responses under each dimension were analysed separately for a deeper understanding of the differences in perception of safety in public spaces between men and women. By analysing the factors that were rated as most important by women, the final list of factors was developed as the Women's Safety Index. WSI results reveal that Men do not necessarily think about factors such as visibility from a distance, lighting conditions, ratio of women to men etc. while using a public space which explains the less scores attained by men in the perception survey. However, these factors are very important to a woman to make her feel safe and included while using a public space. The presence or absence of these factors determines the usage of a public space by women. Therefore, by making this space children friendly women are encouraged to use these spaces. Space that are not well lit and becomes a blind spot in the late hours, discourage women from using this space after the sun sets.

Gender-sensitive planning ensures that gender issues and considerations are identified and taken into account in the planning, design and implementation phase. Gender sensitive planning considers the needs of systematically excluded persons. The objective is to meet the demands for a space by creating adaptable and flexible spaces to satisfy the different needs of its users. Gender sensitive planning ensures equitable resource distribution through awareness of different needs. It also allows for correction because it is a continuous process. Since historically public spaces have been dominated by men's presence, women were excluded from these spaces. Gender-sensitive planning ensures representation based on equitable participation and involvement of all groups and focuses on promoting change in gender relations. Some of the Gender sensitive strategies for increased objective and subjectively perceived safety are as follows:

1. Effective and clear spatial orientation and social control in the neighborhood. Adequate spacing and smart zoning to prevent conflicts between users.
2. Entrances and communal areas should be visible from the street to enhance the perceived sense of safety
3. Regularly collect data on women's safety. Conduct safety audits to identify the critical issues.
4. Infrastructure such as clean and well-maintained public toilets for both men and women.
5. Proper lighting in public spaces to avoid the formation of any blind spots.
6. Provide clear street and building signage, listing street names for way finding purposes, to increase access and perceptions of safety.
7. Avoid constructing pedestrian tunnels or underground walkways.
8. Regular maintenance and trimming of trees and other landscaping so that they do not block the lighting.

9. Allowing street vendors and 24hr services which will increase the use of space and create human presence and “eyes on the street”.

6. Conclusions

This study identified and evaluated the factors that impact women’s safety by developing a Women’s Safety Index (WSI) which can be used to evaluate safety levels of public spaces. The first phase of research developed a framework of factors that impacted safety of women in public spaces by studying literature on public spaces, gender equality, urban design and women’s safety and four dimensions were identified—Physical, Social, Functional and Visual. The results from the perception survey established the differences in perception of safety between men and women and truly look at a public space from the lens of women. In phase three, the Women’s Safety Index was applied to three public spaces to evaluate the levels of women’s safety. The results of WSI helped to frame strategies to improve safety levels in the identified unsafe areas for women. Common causes for low safety scores were, lack of adequate lighting, obstruction of visibility from a distance and lack of human presence in the spaces. The major contribution of the paper is results from perception survey that bring out factors such as lighting conditions, visibility from a distance that significantly impacted women’s safety did not have the same impact on men’s perception of safety. Multi-functional spaces should be designed for different social groups to encourage women’s presence in public spaces which has a positive impact on women’s safety. The results from this research pave way for planning women inclusive safe public spaces in cities.

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