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Accessibility to Urban Green Spaces for Women Users: A Comprehensive Approach to Urban Planning

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Abstract—Urban Green Spaces (UGSs) play a vital role in promoting physical and mental well-being and enhancing the quality of life for urban residents. Women represent almost half the population; however, female stakeholders use the parks less than their male counterparts. Therefore, it is essential to understand how women experience and engage with these spaces. The paper comprehensively reviews issues faced by women in utilization of USGs using literature survey. It is found that safety and security, maintenance, availability of women centric amenities, overcrowding, time availability, household engagement, cultural barriers, distance from home, and unavailability of facilities remain focus of concern by women users. Multiple hypotheses investigating influence of demographic factors like age, educational qualification, monthly income, and family size on the identified issues are formulated. For investigating the influence of demographic factors on identified challenges a questionnaire survey, containing 13 items including 4 demographic items, was conducted. A total of 248 responses from January to May 2023 were analyzed using qualitative analysis and ANOVA. The ANOVA results show that variance in among the above-mentioned demographic variables except monthly income has no significant influence on the concern of women to access Urban Green Spaces. The variation in monthly income impact overcrowding and availability of time. The inferences from literature and statistical analysis recommends need for inclusive design for encouraging women in Urban Green Spaces.

Keywords: Accessibility, Urban Green Spaces, Inclusive Planning, Women, Barriers, ANOVA

INTRODUCTION

Urban green spaces are essential for improving people's health and social well-being because they provide place for leisure, recreation, and natural connection (Hartig *et al.*, 2014) (Gascon *et al.*, 2015). Spending time outside in green spaces fosters a stronger sense of local community in people (Kweon *et al.*, 1998). Exposure to green spaces not only enhance people's quality of life (Wolch *et al.*, 2014) accessibility to these spaces also lowers death rates (Wan *et al.*, 2022).

Urban green spaces protect the area's natural and cultural heritage by functioning as places for regional festivals, community events, and theatre performances (Town and Country Planning Organisation, 2014). These areas decrease the energy costs associated with cooling the buildings in cities with temperate climates (Karade *et al.*, 2017). Urban areas struggle to provide their citizens with high-quality living environments due to rapid and immense migration towards cities. Despite the manifold benefits,

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women encounter barriers in accessing and utilizing urban green spaces, stemming from safety concerns, inadequate amenities, limited transportation options, and societal norms. It is imperative to design UGSs to accommodate the specific requirements and preferences of women users, considering factors like safety, security, and diverse recreational preferences (Chong *et al.*, 2013).

Gender influences perceptions and utilization of UGSs (Cohen *et al.*, 2007) (Kaczynski *et al.*, 2010). Women are more engaged and enjoy greater aesthetic significance to UGSs than men (Veitch *et al.*, 2007). Women place more significance on the health and recreational advantages compared to males (Tyrv¨ainen *et al.*, 2007). Women are less represented and less inclined toward vigorous physical activity within urban green spaces than men (Cohen *et al.*, 2007). Males and Females have different preferences in park features based on the activities they usually perform (McKenzie *et al.*, 2016). Women are highly inclined towards the presence of walking pathways for social interaction, whereas for males, properly maintained grass and water features are of more importance from the perspective of performing physical activity (Veitch *et al.*, 2007).

The primary motivation for visiting parks, especially among female participants, was to take their children to these spaces (Kaymaz *et al.*, 2017). Women's recreational activities are highly influenced by various factors such as cultural norms, family responsibilities, age, and societal expectations (Huda & Akhtar, 2006). Safety within urban green spaces remains a focus in the concern by women (Mowen *et al.*, 2005). The preferences concerning the safety in UGSs is highly influenced by the gender (Jorgensen & Anthopoulou, 2007). The accessibility issues, demand for amenities and facilities, perception of safety and security, engagement of women in activities are influenced by age of women (Maas *et al.*, 2008) (Cohen *et al.*, 2010) (Jennings *et al.*, 2016) (Dadvand , 2016) (Sun *et al.*, 2022). Different age group requires different type of facilities (Krenichyn, 2004) (Moran *et al.*, 2020). Family size is associated with multiple responsibilities and engagement in household activities, caregiving responsibility to family members in Urban Green Spaces (Bixler & Floyd, 1997) (Floyd *et al.,* 2011). Women supervising the family members in Urban Green Spaces require open spaces with multiple activities engaging all members in nearby activities. Increase in family size increase women's responsibility specifically in Indian conditions. The access to urban green spaces, preferences of activities, desire for facilities and amenities vary with the variation in family income of women (Gordon-larsen *et al.,* 2013) (Bratman *et al.*, 2015) (Sang *et al.,* 2016). Income and accessibility need exploration in integration of UGSs and women. Self-engagement of women in earning reduces time for indulging in UGSs spaces. Education brings more awareness and thus influence the visits to Urban Green Spaces by motivation (Maas *et al.*, 2008) (Bertram & Rehdanz, 2015). Educational level influence incorporating of activities in daily schedule and type of activities, selection of UGSs for visiting and demand for amenities and availability of facilities (Krenichyn, 2004) (Mitchell & Popham, 2008) (Lee & Maheswaran, 2010) (Bertram & Rehdanz, 2015).

The planning and management of UGSs require consideration of all stakeholders. Women represents almost half of all stakeholders and have different needs in terms of safety and security, recreational preferences, lighting, quality of green spaces, overcrowding and have issues related to culture, time availability and consider intolerance as important factor. Available literature in literary form mentions all these factors being impacted by the variation in age, educational level, income and family size however statistical analysis efforts are vary scanty.

Authors explore the issue of accessibility and the factors impacting the accessibility in relation to the demographic parameters of the women user of UGSs. The investigation is helpful for urban planners, Urban Green Space planning and management authorities for decision making in considering the variations of requirements from the perspective of all women user as per their age, educational qualification, family income and family size.

Following null hypotheses were formulated to review the impact of age, educational qualification, family size and monthly income among the women respondents:

- **H1:** There is no variation in the responses related to factor impacting accessibility for women among women respondents based on their monthly family income.
- **H2:** There is no variation in the responses related to factor impacting accessibility for women among women respondents based on their age.
- **H3:** There is no variation in the responses related to factor impacting accessibility for women among women respondents based on their family size.
- **H4:** There is no variation in the responses related to factor impacting accessibility for women among women respondents based on their education qualifications.

An instrument containing 4 demography questions (Age, Educational Qualifications, Family Size, Monthly Income)

and 9 close-ended constructs using the reference of (Maas *et al.,* 2006) (Kothencz *et al.*, 2017) (Braçe *et al.*, 2021) is constructed after a systematic literature review on the topic. The respondents were asked about their age (classified in grouping of 0–20, 21–30, 31–40, 41–50, 51–60, and 60+), highest educational qualification (classified in grouping of secondary school, senior secondary school, postgraduation, and PhD), family size (in classes 1, 2, 3, 5, 6, or more), and total family income in categories of <10000, 10000-20000, 20000-50000, 50000-1Lakh, 1 Lakh to 10 Lakh, and 10 Lakh plus. The Likert scale is frequently used to assess the respondents' attitudes by inquiring about their agreement or disagreement with an asked statement or question in various studies (Kothencz *et al.*, 2017). Five-point Likert scale (1-5; 1- highly disagree; 5 highly agree) is used for collecting the responses from women users of the urban green spaces. Literature review pointed out that safety and security, quality of green spaces, lighting facility, facilities for all stakeholders, overcrowding, poor maintenance, cultural issues, unavailability of time, and history of intolerant event (case of eve teasing, harassment, and molestation in the green spaces) remain major concern among female for accessing the urban green spaces. These constructs specifically targeted the factors influencing the Urban Green Spaces usage by women users. The questionnaire includes a general introduction question, demographic questions and women's perspective on urban green spaces accessibility. The investigators collected 260 responses by randomly surveying women in Sonipat, Delhi, Chandigarh, Jaipur, Palwal, Faridabad, and Rohtak. The survey was conducted from January to May 2023. A total 248 responses were finally filtered for analyzing the issues of women related to urban green space usage. Demographic analysis of the 248 responses followed by One-way ANOVA is used to test the relationship between the demographical characteristics of women's and their responses of green space accessibility.

Demography of the Respondents

The results of demographic criteria related to age, highest educational qualification, family size and total family income) in the classification mentioned is presented in Figure 1(a, b, c, d).

The age of the 248 female respondents is classified in the grouping of 0–20, 21–30, 31–40, 41–50, 51–60, and 60+. Among the respondents of the questionnaire 34 (14%) were between the ages of 0 and 20, 98 (39%) were between the ages of 21 and 30, 34 (14%) were between the ages of 31 and 40, 42 (17%) were between the ages of 41 and 50, 30 (12%) were between the ages of 51 and 60, and the remaining 10 (4%) were over 60. This implied that the responders are representative of a broad spectrum across various age groups and have almost uniform distribution.

The results of the responses on highest educational qualification show that 56 (23%) respondents had completed their graduation, 78 (31%) respondents had a post-graduate degree, 21 (9%) were enrolled in or had finished their doctoral programme, 50 (20%) had completed senior secondary school, and 43 (17%) had only completed secondary school. The findings demonstrate that the female respondents indicate a more educated population and have a greater range of educational backgrounds.

The results of survey regarding family size of respondents show that 89 (36%) of the respondents belonged to a family with four people, 76 (36%) to a family with five members, 43 (17%) to a family of six plus, 24 (10%) to a family of three members, 9 (3%) to a family of two members, and 3% of the female respondents are single and do not have a family. The results indicate that a wide range of family sizes were represented in the poll.

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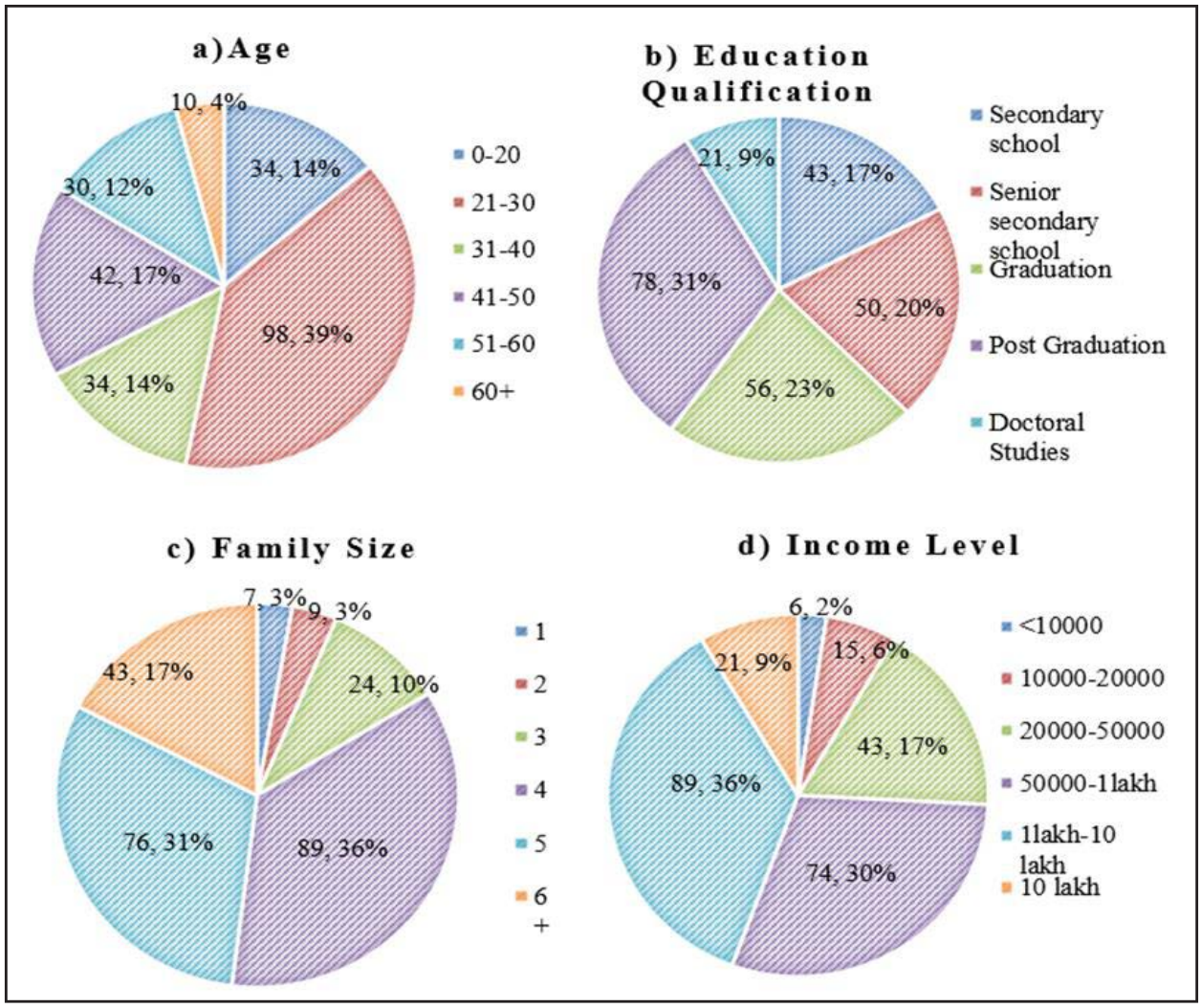

Fig. 1: Demographic Profile categorization of the Women Respondents based on the a) Age, b) Educational Qualification, c) Family Size, d) Income Level

represented in the poll. The responses about their total family income in categories of <10000, 10000-20000, 20000-50000, 50000-1Lakh, 1 Lakh to 10 Lakh, and 10 Lakh plus indicate the approximate monthly income of all the family members of respondents (Figure 4). 89 (36%) people lay in the group of 1 to 10 lakh income, 74 (30%) had 50,000 to 1 lakh income, 43(17%) had 20,000 to 50,000 thousand, 21 (9%) belonged to the group of 10 lakhs income, whereas 15 (6%) had 10,000 to 20,000, and the remaining 6 (2%) came from the group of less than 10,000. The distribution of respondents among the different economic classes shows that women respondents are representatives of all economic classes.

DESCRIPTIVE ANALYSIS OF THE RESPONSES

The results of the survey on the factors influencing the decision of women users on usage of Urban Green Spaces show that range of mean of responses ranges from 3.28 to 4.06, standard deviation ranges from 0.982 to 1.114, the data is negatively skewed with low kurtosis values. This shows that the responses are much aligned towards the issues raised and respondents agree or highly agree to the issues being faced in using the Urban Green Spaces.

The responses regarding questions on five-point Likert scale regarding quality of UGSs, safety and security, lighting

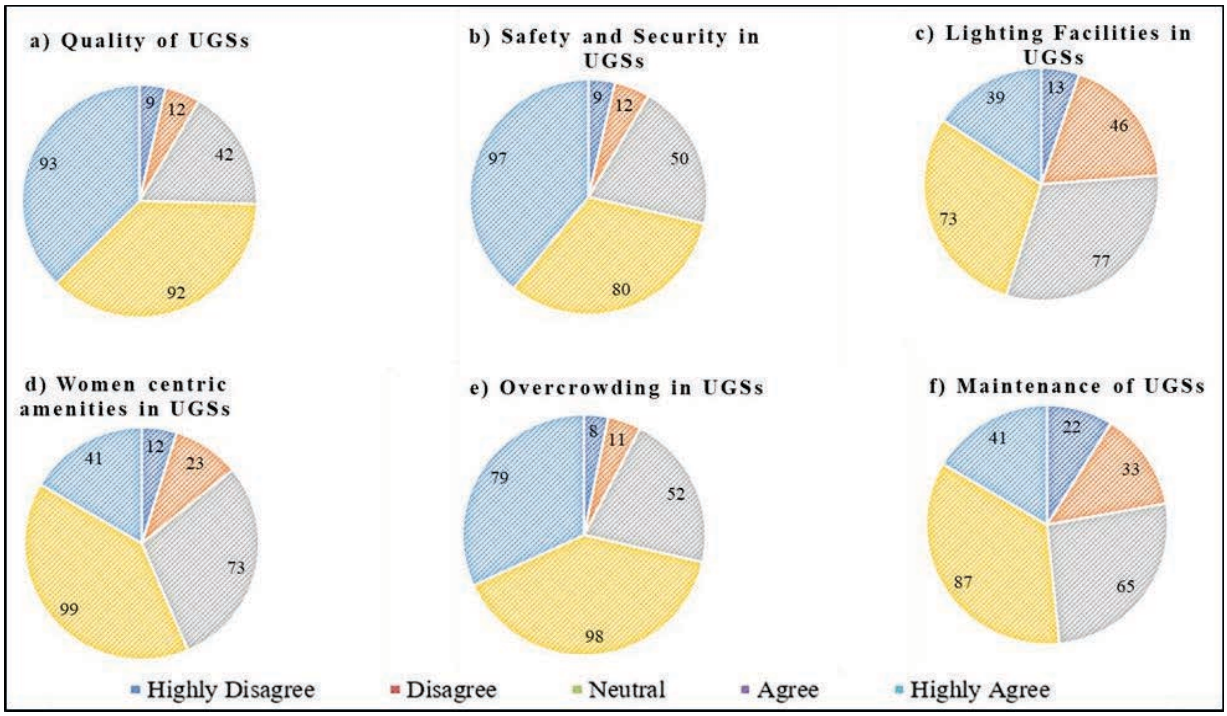

Fig. 2: Women respondent's opinion regarding a) quality of UGSs, b) safety and security, c) lighting facility in USGs, d) women centric amenities, e) overcrowding, and f) maintenance through pie charts on five-point Likert Scale

facility in USGs, women centric amenities, overcrowding and maintenance are presented through pie charts in Figure 2 a, b, c, d, e, and f respectively. Quality of Urban Green Spaces is an important factor influencing women's decision in using the green space. More than 75% of the women respondents agreed to the quality of spaces being important factor influencing the usage. More than 70% of the women respondents have agreed / strongly agreed that security and safety influence their decision on usage of Urban Green Spaces. The response of female respondents regarding lighting influencing their decision on usage of Urban Green Spaces show centrality in their responses which may be due to the usage being limited to daytime hours. However, the limited frequency of women users in non-natural light hours strongly show that women highly regard availability of lighting facilities in Urban Green Spaces. Out of the 248 women respondents 173 respondents feel that non availability of women centric amenities discourages the women users from using the Urban Green Spaces which means that inclusive planning of Urban Green Spaces should strongly include women users in planning, management and maintenance issues. Under crowding and overcrowding both are regarded as negative aspects for women users using UGSs. More than 75% of the women respondents prefer not to use the overcrowded Urban Green Spaces. Maintenance of Urban Green Spaces is considered highly important factor with more than 80% of the respondents of the present survey validating the same.

The responses regarding questions on five-point Likert scale regarding cultural issues of the respondents, history of intolerant events in Urban green Spaces and Unavailability of time with respondents are presented through pie charts in Figure 3 a, b, and c respectively. The responses regarding cultural issues of respondents show that cultural issues bind the women showing using Urban Green Spaces however the increase in education level has lesser influence in urban areas. More than 80% of the women respondents prefer to avoid using the Urban green Spaces with history of intolerant events. All users in general also try to avoid such spaces. Unavailability of time with the respondents due to their engagement in other activities. The responses of the survey validate this item with approximate 200 respondents out of 248 respondents.

Attention to the above-identified issues, which affect the accessibility and use of green space, will lead to improved

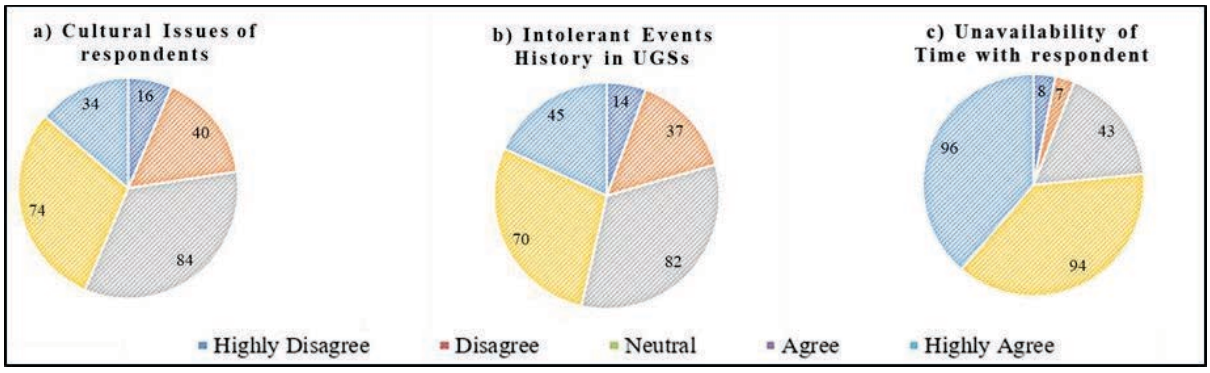

Fig. 3: Distribution of responses regarding a) cultural issues of the respondents, b) history of intolerant events in Urban green Spaces and c) Unavailability of time with respondents through pie charts

women's participation and visitation in urban green spaces. The results of the survey show that there might be strong variation in factors influencing the usage with the variation in age, family size, family income and educational level of the female respondents, hence a relationship analysis should be conducted for establishing the causality in the responses.

Relationship Analysis Based on ANOVA

The proposed hypotheses for age, educational qualification, family size, and monthly income are tested using an ANOVA connection analysis. The

following heads display the results according to these variables.

Monthly Income

The quality of green spaces was assessed between groups. The results showed that there was no statistically significant difference in the

group means (Sum of Squares = 2.096, df = 5, Mean Square = 0.419, F = 0.387, p = 0.857). Additionally, there was no statistically significant difference in the group means for Lighting Facilities, Facilities for All Stakeholders, Poor Maintenance, Cultural Issues, and History of Intolerant Events, indicating that these characteristics had no effect on the accessibility to green spaces in relation to monthly income.

Whereas security and safety between groups with Mean Square = 2.738, F = 2.526, p = 0.030, Sum of Squares = 13.689, df = 5, Sum of Squares = 13.732, df = 5, Mean Square = 2.746, F = 2.867, p = 0.016 for overcrowding and Sum of Squares = 16.572, df = 5

Mean Square = 3.314, F = 3.621, p = 0.004 for time

unavailability with across groups proved to have an impact on how often women use green spaces because
the groups' means differ significantly. Table 3 displays the ANOVA results for the association between monthly income and all responses on the instrument's theoretical constructs.

Family Size

Significant correlations between family size and factors such as the quality of green areas, safety and security, facilities for women stakeholders, overcrowding, poor maintenance, lack of time, and history of intolerant events were found. The non-significant ($p > 0.05$) F-statistics show that there are no statistically significant differences in the group means for any of the assessed variables. Hence, the null hypothesis cannot be rejected.

Age

The quality of green spaces, safety and security, lighting facilities, facilities for all stakeholders, overcrowding, poor maintenance, cultural issues, time issues, and past incidents of intolerant events are among the examined variables for which the F-statistics are not significant ($p >0.05$). This indicates no statistically significant differences in the group means for any variables. These results do not support the rejection of the null hypothesis.

Table 1: The results of ANOVA for Relationship among Monthly Income and all Responses on Theoretical Constructs of the Instrument

		Sum of Squares	df	Mean Square	F	Sig.
Quality Green Spaces	Between Groups	2.096	5	.419	.387	.857
	Within Groups	261.904	242	1.082		
	Total	264.000	247			
Safety and Security	Between Groups	13.689	5	2.738	2.526	.030
	Within Groups	262.247	242	1.084		
	Total	275.935	247			
Lighting Facilities	Between Groups	4.545	5	.909	.740	.594
	Within Groups	297.290	242	1.228		
	Total	301.835	247			
Facilities for all Stakehoders	Between Groups	2.057	5	.411	.384	.860
	Within Groups	259.540	242	1.072		
	Total	261.597	247			
Overcrowding	Between Groups	13.732	5	2.746	2.867	.016
	Within Groups	231.812	242	.958		
	Total	245.544	247			
Poor Maintenance	Between Groups	6.619	5	1.324	.967	.439
	Within Groups	331.252	242	1.369		
	Total	337.871	247			
Cultural Issues	Between Groups	2.555	5	.511	.424	.832
	Within Groups	191.687	242	1.205		
	Total	294.242	247			
Houschold engagement	Between Groups	16.572	5	3.314	3.621	.004
	Within Groups	221.521	242	.915		
	Total	238.093	247			
History intolerant enents	Between Groups	3.368	5	.674	.538	.748
	Within Groups	303.241	242	1.253		

Educational Qualifications

There is no statistically significant difference in the group means for all the variables, as indicated by the F-statistics ($p > 0.05$). In contrast, the only variable that significantly varies between the groups is Overcrowding (Mean Square = 3.115, F = 3.248, p = 0.013; Sum of Squares = 12.460, df = 4).

RECOMMENDATIONS

Based on the inferences following are recommended considering the significance of the conclusions drawn from the literature and the mixed method approach used to analyze the survey instrument results:

- Women will use urban green areas more if planned for and maintained inclusively.
- Maintaining the quality of green spaces is necessary to increase their use by all urban residents.
- Women's participation in urban green areas will rise with the implementation of safety and security measures.
- Adding lighting to urban green spaces will encourage female users to use them at times other than during the day.

- Women's participation in urban green spaces will increase with the proper installation of amenities, regular maintenance, and additional facilities for them.
- Adding urban green spaces can prevent crowding and attract more female users.
- Increased levels of education will reduce cultural constraints on women's use of urban green spaces.
- Fixed working hours and engagement of all users may lead to a rise in the number of women in urban green areas.

CONCLUSION

UGSs are essential to living beings as they have many pragmatic impacts and serve many functions in today's rapidly changing urban world. Despite having many benefits, women are observed to use green spaces less due to different barriers. Hence, studying and gaining insights into women's opinions and experiences with UGSs is necessary. So, an extensive study has been carried out on the barriers women experience while using UGSs. A mixed-methods approach, including a questionnaire survey containing 13 items, including 4 demographic items, was conducted to examine the barriers faced by women in accessing UGSs. Results showed that women's access to urban green areas could be increased by improving and implementing necessary safety and security measures, raising with the implementation of safety and security measures, providing basic amenities and facilities for women stakeholders, managing overcrowding, and considering cultural and personal issues. Depending on the monthly earnings of women, perceptions of the factors affecting their accessibility differ substantially.

CONFLICTS OF INTEREST

No conflict of interest was declared by the authors.

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