Non-communicable diseases (NCDs) are a leading cause of death in Bangladesh, including cardiovascular disease, cancer, and diabetes. Green spaces, defined as natural or semi-natural areas with vegetation, have been recognized for their potential to promote health and prevent NCDs. However, limited research exists on the relationship between green space and NCDs in urban areas of Dhaka City, Bangladesh. Therefore, this study aims to investigate the relationship between green space and NCD risk in urban residents of Dhaka City, focusing on the amount and distribution of green spaces, their effectiveness in reducing NCD risk, and recommendations for policymakers and urban planners. The findings could have significant implications for public health interventions, such as advocating for increased availability and accessibility of green spaces, improving their quality, and promoting activities that encourage their use. The study may also identify areas with inadequate access to green spaces, informing targeted interventions for equitable access. Furthermore, understanding the mechanisms through which green spaces influence NCD risk, such as physical activity, social interaction, air quality, and stress reduction, could lead to evidence-based interventions. The findings could be used to advocate for policy changes and urban planning strategies that prioritize green spaces as an important component of public health promotion and NCD prevention in urban areas. Collaborative efforts between health authorities, urban planners, policymakers, and community stakeholders may be necessary to implement strategies that increase the availability, accessibility, and quality of green spaces in Dhaka City. In conclusion, this study has the potential to contribute valuable knowledge to the literature on green space and health in urban areas of Bangladesh, with implications for public health policy and planning.

**Keywords:** Dhaka City, green space, NCD risk, urban areas.

I. INTRODUCTION

Non-communicable diseases (NCDs) are a growing health concern in many parts of the world, including Bangladesh. NCDs account for approximately 81% of all deaths in Bangladesh, with cardiovascular disease, cancer, and diabetes being the leading causes (Ali et al., 2022). In recent years, there has been increasing recognition of the role of the built environment, particularly access to green space, in promoting health and preventing NCDs (Nikoloski et al., 2021).

Green space is defined as any natural or semi-natural area that is partially or completely covered by vegetation, and it includes parks, gardens, and other open spaces (Bambra et al., 2020). Several studies have suggested that exposure to green spaces can have positive effects on physical and mental health, including reducing the risk of NCDs (Gascon et al., 2015; James et al., 2015). However, there is limited research on the relationship between green space and NCDs in urban areas of Bangladesh, particularly in the context of Dhaka City.

Therefore, the objective of this study is to examine the relationship between green space and the risk of NCDs among urban residents of Dhaka City. Specifically, the study aims to identify the amount and distribution of green spaces in Dhaka City, determine the effectiveness of green spaces in reducing the risk of NCDs, and provide recommendations for policymakers and urban planners on the use of green space to promote health and prevent NCDs in urban areas.

This study is important because it can provide valuable information for policymakers and urban planners to design and implement effective strategies for promoting green spaces and preventing NCDs in urban areas. Additionally, the study can contribute to the existing literature on the relationship between green space and health, particularly in the context of low- and middle-income countries.

II. LITERATURE REVIEW

This chapter provides a comprehensive review of the existing literature on the relationship between green space and the risk of non-communicable diseases (NCDs). The review is organized into three sections: the first section provides an overview of the existing research on the relationship between green space and NCDs; the second...
section discusses the impact of green spaces on health and the environment; and the third section examines the challenges and opportunities in promoting green spaces in urban areas.

A. Relationship between Green Space and NCDs

Several studies have investigated the relationship between green space and NCDs. A study conducted in the United Kingdom found that exposure to green spaces was associated with a lower risk of cardiovascular disease, respiratory disease, and cancer (Martin et al., 2020). Another study conducted in Spain found that access to green spaces was associated with a lower risk of diabetes (Bezold et al., 2018). Similarly, a study conducted in Japan found that exposure to green spaces was associated with a lower risk of all-cause mortality (Takano, 2002). Moreover, according to a prevalence study (Roy et al., 2023), NCDs are interrelated and having one NCD might increase the risk of affecting others. So, the use of green space in preventing one NCD might end up preventing others. However, the relationship between green space and NCDs may vary depending on the type of green space, the level of exposure, and the population under study.

B. Impact of Green Spaces on Health and Environment

Green spaces can have positive effects on physical and mental health. Exposure to green spaces has been shown to reduce stress (Adhikari et al., 2019), improve mood (Pan et al., 2021), enhance cognitive function (Dadvand et al., 2015), and promote physical activity (Paul et al., 2020). Green spaces can also have positive effects on the environment, including reducing air and noise pollution (Eboli et al., 2023), mitigating the urban heat island effect (Pomeroy-Stevens et al., 2022), and promoting biodiversity (Dadvand & Nieuwenhuijsen, 2019; Kardan et al., 2015).

C. Challenges and Opportunities in Promoting Green Spaces in Urban Areas

Despite the potential benefits of green spaces, there are several challenges to promoting and maintaining green spaces in urban areas. These include limited land availability (Kondo et al., 2018), inadequate funding (Dzhambov et al., 2019), lack of community involvement (Senne et al., 2021), and competing interests in urban development (Ali et al., 2022). However, there are also opportunities for promoting green spaces in urban areas, such as through community engagement (Engemann et al., 2019), public-private partnerships (Gianfredi et al., 2021), and innovative design solutions (Debnath, 2023).

In summary, the existing literature suggests that exposure to green spaces can have positive effects on physical and mental health and can reduce the risk of NCDs. However, there are challenges to promoting and maintaining green spaces in urban areas, and further research is needed to understand the relationship between green space and NCDs in different populations and contexts.

III. METHODOLOGY

This study employed a cross-sectional design to investigate the relationship between green space and the risk of non-communicable diseases in urban residents of Dhaka City. The study was conducted between January and March 2023, and data were collected from a sample of residents in five different neighborhoods in Dhaka City (Hossain et al., 2022). Table I presents an overview of the study area.

### A. Study Population and Sampling

<table>
<thead>
<tr>
<th>Zone</th>
<th>Green Space Area</th>
<th>Population Density</th>
<th>Police Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Green</td>
<td>&lt; 5%</td>
<td>&gt; 30,000</td>
<td>Badda, Rampura, Kadamtali, Sabujbagh, Shah Ali</td>
</tr>
<tr>
<td>Medium Green</td>
<td>5-10%</td>
<td>20,000-30,000</td>
<td>Mirpur, Mohammadpur, Tejgaon, Ramna, Lalbagh</td>
</tr>
<tr>
<td>High Green</td>
<td>&gt; 10%</td>
<td>&lt; 20,000</td>
<td>Dhanmondi, Gulshan, Bani, Uttara, Cantonment</td>
</tr>
</tbody>
</table>

The study area for this research is located in Dhaka City, which has been divided into three different zones based on the level of green space area and population density. A total of 450 urban residents were selected as the sample population for this study, with 150 residents selected from each of the three zones. Further, 30 residents were selected from each of the five police stations in each zone.

The first zone is the Low Green Space/Low Population Density zone, which includes areas where the green space area is less than 5% and the population density is greater than 30,000. The police stations selected for this zone are Badda, Rampura, Kadamtali, Sabujbagh, and Shah Ali, and 30 residents were selected from each police station for a total of 150 residents in this zone. The study area for this zone is Kadamtali Police Station.

The second zone is the Medium Green Space/Medium Population Density zone, which includes areas where the green space area is between 5–10% and the population density is between 20,000–30,000. The police stations selected for this zone are Mirpur, Mohammadpur, Tejgaon, Ramna, and Lalbagh, and 30 residents were selected from each police station for a total of 150 residents in this zone. The study area for this zone is Ramna Police Station.

The third zone is the High Green Space/High Population Density zone, which includes areas where the green space area is greater than 10% and the population density is less than 20,000. The police stations selected for this zone are Dhanmondi, Gulshan, Bani, Uttara, and Cantonment, and 30 residents were selected from each police station for a total of 150 residents in this zone. The study area for this zone is the Gulshan Police Station.

Overall, the study area covers the police stations selected from all three zones, including Badda, Rampura, Kadamtali, Sabujbagh, Shah Ali, Mirpur, Mohammadpur, Tejgaon, Ramna, Lalbagh, Dhanmondi, Gulshan, Bani, Uttara, and Cantonment. The study areas for the overall analysis are Kadamtali, Ramna, and Gulshan Police Stations, with a total of 90 residents selected from these police stations for the final analysis.

### B. Data Collection

Data were collected through face-to-face interviews using a structured questionnaire. The questionnaire was developed based on the objectives of the study and included questions on socio-demographic characteristics, health status, lifestyle

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factors, and green space exposure. Green space exposure was assessed using satellite images and data from the Bangladesh Space Research and Remote Sensing Organization (SPARRSO) and Google Maps.

C. Ethical Considerations

This study was conducted with the informed consent of all participants. Before participating in the study, participants were informed about the purpose and procedures of the study, and they were given the option to withdraw at any time. All data were collected and kept confidential and anonymous to ensure the privacy and security of the participants.

IV. RESULTS AND ANALYSIS

A. Demographic Characteristics of Study Participants

Table II displays important demographic variables such as gender, age, marital status, educational level, occupation, monthly household income, years lived in Dhaka City, and current status of non-communicable diseases (NCDs). The data was collected from a sample size of 450 participants. Table II presents the frequency and percentage of each variable category, providing a clear overview of the study participants’ demographics. This information can be useful in understanding the sample characteristics and potential biases in the study.

B. Comparative Analysis of Green Spaces in Dhaka City by Zone

This section includes the responses to each survey question about green spaces in Dhaka City. The responses were from 450 participants who took part in the survey and were divided into three groups based on the level of greenery in their area (high, medium, and low green zones), with 150 participants in each group.

Fig. 1 represents the frequency of participants visiting green spaces in their neighborhood per week. The data is divided into three zones: High Green Zone, Medium Green Zone, and Low Green Zone. The figure shows that in the High Green Zone, the highest frequency of visits per week is observed, with 68 participants visiting green spaces daily, followed by 57 participants visiting 3–6 times per week. In the Medium Green Zone, 56 participants visit daily, and 45 participants visit between 1–2 times per week. In the Low Green Zone, the frequency of visits decreases further, with 21 participants visiting daily and 21 participants visiting 3–6 times per week. The numbers indicate the distribution of participants across different levels of green space usage, highlighting the varying engagement with green spaces based on the zone classification.

Fig. 2 illustrates the distance between participants’ homes and the nearest green space. The data is divided into three zones: High Green Zone, Medium Green Zone, and Low

<table>
<thead>
<tr>
<th>Variable</th>
<th>Option/Group</th>
<th>High Green Zone (N = 150)</th>
<th>Medium Green Zone (N = 150)</th>
<th>Low Green Zone (N = 150)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>72 (48.0%)</td>
<td>73 (48.7%)</td>
<td>75 (50.0%)</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>78 (52.0%)</td>
<td>77 (51.3%)</td>
<td>75 (50.0%)</td>
</tr>
<tr>
<td>Age</td>
<td>18–29 years</td>
<td>49 (32.7%)</td>
<td>50 (33.3%)</td>
<td>51 (34.0%)</td>
</tr>
<tr>
<td></td>
<td>30–39 years</td>
<td>50 (33.3%)</td>
<td>49 (32.7%)</td>
<td>51 (34.0%)</td>
</tr>
<tr>
<td></td>
<td>40–49 years</td>
<td>25 (16.7%)</td>
<td>25 (16.7%)</td>
<td>26 (17.3%)</td>
</tr>
<tr>
<td></td>
<td>50 years or older</td>
<td>26 (17.3%)</td>
<td>26 (17.3%)</td>
<td>22 (14.7%)</td>
</tr>
<tr>
<td>Marital Status</td>
<td>Single</td>
<td>59 (39.3%)</td>
<td>61 (40.7%)</td>
<td>58 (38.7%)</td>
</tr>
<tr>
<td></td>
<td>Married or in a partnership</td>
<td>80 (53.3%)</td>
<td>77 (51.3%)</td>
<td>79 (52.7%)</td>
</tr>
<tr>
<td></td>
<td>Divorced or separated</td>
<td>7 (4.7%)</td>
<td>6 (4.0%)</td>
<td>8 (5.3%)</td>
</tr>
<tr>
<td></td>
<td>Widowed</td>
<td>4 (2.7%)</td>
<td>6 (4.0%)</td>
<td>5 (3.3%)</td>
</tr>
<tr>
<td>Educational Level</td>
<td>Less than primary education</td>
<td>25 (16.7%)</td>
<td>26 (18.7%)</td>
<td>30 (20.0%)</td>
</tr>
<tr>
<td></td>
<td>Primary education</td>
<td>25 (16.7%)</td>
<td>26 (18.7%)</td>
<td>30 (20.0%)</td>
</tr>
<tr>
<td></td>
<td>Secondary education</td>
<td>69 (46.0%)</td>
<td>63 (42.0%)</td>
<td>62 (41.3%)</td>
</tr>
<tr>
<td></td>
<td>Tertiary education</td>
<td>35 (23.3%)</td>
<td>36 (23.7%)</td>
<td>32 (21.3%)</td>
</tr>
<tr>
<td></td>
<td>Postgraduate education</td>
<td>15 (10.0%)</td>
<td>17 (11.3%)</td>
<td>21 (14.0%)</td>
</tr>
<tr>
<td>Occupation</td>
<td>Student</td>
<td>51 (34.0%)</td>
<td>53 (35.3%)</td>
<td>50 (33.3%)</td>
</tr>
<tr>
<td></td>
<td>Employed</td>
<td>84 (56.0%)</td>
<td>81 (54.0%)</td>
<td>82 (54.7%)</td>
</tr>
<tr>
<td></td>
<td>Unemployed</td>
<td>11 (7.3%)</td>
<td>10 (6.7%)</td>
<td>9 (6.0%)</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>4 (2.7%)</td>
<td>6 (4.0%)</td>
<td>9 (6.0%)</td>
</tr>
<tr>
<td>Monthly household income</td>
<td>Less than 10,000 BDT</td>
<td>22 (14.7%)</td>
<td>43 (28.5%)</td>
<td>85 (56.7%)</td>
</tr>
<tr>
<td></td>
<td>10,000–20,000 BDT</td>
<td>44 (29.3%)</td>
<td>41 (27.3%)</td>
<td>65 (43.3%)</td>
</tr>
<tr>
<td></td>
<td>20,001–50,000 BDT</td>
<td>58 (38.7%)</td>
<td>41 (27.3%)</td>
<td>51 (34.0%)</td>
</tr>
<tr>
<td></td>
<td>50,001–100,000 BDT</td>
<td>21 (14.0%)</td>
<td>22 (14.7%)</td>
<td>107 (71.3%)</td>
</tr>
<tr>
<td></td>
<td>More than 100,000 BDT</td>
<td>5 (3.3%)</td>
<td>3 (2.0%)</td>
<td>9 (6.0%)</td>
</tr>
<tr>
<td>Length of residency in Dhaka City</td>
<td>Less than 5 years</td>
<td>48 (32.0%)</td>
<td>57 (38.0%)</td>
<td>45 (30.0%)</td>
</tr>
<tr>
<td></td>
<td>5–10 years</td>
<td>59 (39.3%)</td>
<td>50 (33.3%)</td>
<td>41 (27.3%)</td>
</tr>
<tr>
<td></td>
<td>More than 10 years</td>
<td>43 (28.7%)</td>
<td>43 (28.7%)</td>
<td>64 (42.7%)</td>
</tr>
<tr>
<td>NCD status</td>
<td>Yes</td>
<td>21 (14.0%)</td>
<td>34 (22.7%)</td>
<td>95 (63.3%)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>129 (86%)</td>
<td>116 (77.3%)</td>
<td>55 (36.7%)</td>
</tr>
<tr>
<td></td>
<td>Not Sure</td>
<td>20 (13.3%)</td>
<td>20 (13.3%)</td>
<td>110 (73.3%)</td>
</tr>
</tbody>
</table>

Fig. 1. Frequency of visiting green spaces.

Fig. 2. Distance between participants’ homes and the nearest green space.
Green Zone. In the High Green Zone, most participants (62) have a green space within 100 meters of their homes, followed by 38 participants within 500 meters, 27 participants within 1 kilometer, and 17 participants located more than 1 kilometer away. Additionally, 6 participants in this zone were unsure about the distance. Similarly, in the Medium Green Zone, the numbers decreased slightly, and further decreased in the Low Green Zone. These findings reflect the varying proximity and accessibility of green spaces in different zones.

![Distance to nearest green space from home](Fig. 2)

Fig. 2. Distance to nearest green space from home.

Fig. 3 displays participants’ perceptions of the importance of access to green spaces in their neighborhoods. The data is categorized into three zones: High Green Zone, Medium Green Zone, and Low Green Zone. In the High Green Zone, a significant number of participants (54) consider access to green spaces as extremely important, followed by 33 participants who find it very important. Additionally, 24 participants perceive access to green spaces as moderately important and 13 participants rate it as slightly important. Conversely, in the Low Green Zone, a larger proportion of participants view access to green spaces as not important (67 participants) or slightly important (26 participants). These findings provide insights into the varying importance placed on access to green spaces in different zones, highlighting the potential disparities in the perceived value of green spaces for promoting health and well-being.

![Importance of access to green spaces](Fig. 3)

Fig. 3. Importance of access to green spaces.

Fig. 4 depicts the prevalence of diagnosed non-communicable diseases (NCDs) among the participants, categorized into different NCD types such as high blood pressure, diabetes, cardiovascular disease, respiratory disease, mental health disorder, and others. In the High Green Zone, the highest number of participants have been diagnosed with high blood pressure (41), followed by diabetes (18), cardiovascular disease (12), respiratory disease (9), mental health disorder (15), and other NCDs (8). Similarly, in the Medium Green Zone, the numbers decrease slightly for each NCD category, and further decrease in the Low Green Zone. These findings provide insights into the distribution of diagnosed NCDs across different zones, indicating potential associations between green space accessibility and the prevalence of certain health conditions.

![Diagnosis of non-communicable diseases (NCDs)](Fig. 4)

Fig. 4. Diagnosis of non-communicable diseases (NCDs).

Fig. 5 illustrates the frequency of physical activity conducted by participants in their respective neighborhoods, categorized into three zones: High Green Zone, Medium Green Zone, and Low Green Zone. In the High Green Zone, most participants reported engaging in physical activity often (45 participants) or very often (32 participants). Similarly, in the Medium Green Zone, a significant number of participants reported engaging in physical activity often (38 participants) or very often (19 participants). However, in the Low Green Zone, the frequency of physical activity decreases, with fewer participants reporting engaging in physical activity often (27 participants) or very often (14 participants). Conversely, a higher proportion of participants in the Low Green Zone reported never engaging in physical activity (29 participants). These findings indicate that the availability and accessibility of green spaces in neighborhoods may influence the frequency of physical activity among residents, with higher green space availability associated with more frequent engagement in physical activity.

![Frequency of neighborhood physical activity](Fig. 5)

Fig. 5. Frequency of neighborhood physical activity.

Fig. 6 displays the participants’ ratings of the amount of green space in their respective neighborhoods on a scale of 1 to 5. The data is categorized into five levels: Very low, Low, Moderate, High, and Very high. In the High Green Zone, a significant number of participants rated the amount of green space as High (43) or Very high (35). In the Medium Green...
Zone, most participants rated it as Low (37) or Moderate (28). Conversely, in the Low Green Zone, the ratings skewed towards Very low (77) and Low (32). These findings indicate variations in the perceived abundance of green spaces across different zones, with the High Green Zone generally having a higher satisfaction level and the Low Green Zone expressing a greater need for increased green space availability.

![Fig. 6. Rating of the amount of green space in the neighborhood.](image)

Fig. 6. Rating of the amount of green space in the neighborhood.

Fig. 7 represents the participants' ratings of the quality of green spaces in their respective areas, specifically in terms of cleanliness and safety. The responses are categorized into five levels: Excellent, Good, Fair, Poor, and Very Poor. In the High Green Zone, a considerable number of participants rated the quality as Good (54) or Excellent (32). Similarly, in the Medium Green Zone, most participants rated it as Good (44) or Fair (38). However, in the Low Green Zone, the ratings skewed towards Poor (49) and Very Poor (71). These findings suggest varying perceptions of the cleanliness and safety of green spaces across different zones, with the High Green Zone generally having higher ratings and the Low Green Zone indicating a need for improvement in these aspects.

![Fig. 7. Rating of the quality of green spaces in the area in terms of cleanliness and safety.](image)

Fig. 7. Rating of the quality of green spaces in the area in terms of cleanliness and safety.

Fig. 8 presents the green spaces that participants typically visit in Dhaka City. The data is divided into different types of green spaces, including parks, playgrounds, sports fields, gardens, and waterfront areas. In the High Green Zone, most participants reported visiting parks (97), followed by waterfront areas (62), gardens (48), playgrounds (25), and sports fields (18). Similarly, in the Medium Green Zone, parks (79) and waterfront areas (51) were the most frequently visited green spaces, followed by gardens (45), playgrounds (19), and sports fields (17). In the Low Green Zone, parks (41) remained the most popular choice, followed by waterfront areas (31), gardens (19), playgrounds (14), and sports fields (13). These findings highlight the preferences for parks and waterfront areas as the preferred green spaces visited by participants in Dhaka City.

![Fig. 8. Types of green spaces typically visited.](image)

Fig. 8. Types of green spaces typically visited.

Fig. 9 examines participants' perceptions regarding whether the amount of green space in their neighborhoods is adequate for promoting good health and preventing non-communicable diseases (NCDs). The responses are categorized into two options: Yes and No. In the High Green Zone, most participants responded Yes (93), while a smaller portion answered No (57). Similarly, in the Medium Green Zone, participants were divided, with 66 responding Yes and 84 responding No. In the Low Green Zone, most participants expressed a negative perception, with 131 responding No, while only 19 responded Yes. These findings indicate that there is a significant portion of participants across all zones who feel that the current amount of green space in their neighborhoods is inadequate for promoting good health and preventing NCDs, highlighting the need for further green space development and improvements in these areas.

![Fig. 9. Adequacy of green space for promoting good health and preventing NCDs.](image)

Fig. 9. Adequacy of green space for promoting good health and preventing NCDs.

| TABLE III: CHALLENGES, BENEFITS, AND SUGGESTIONS FOR PROMOTING THE USE OF GREEN SPACES |

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Benefit</th>
<th>Suggestion for Promoting Use of Green Spaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor cleanliness</td>
<td>Promotes good health</td>
<td>Increase green space availability</td>
</tr>
<tr>
<td>Low safety perceptions</td>
<td>Prevents NCDs</td>
<td>Improve safety measures</td>
</tr>
<tr>
<td>Limited access</td>
<td>Improves physical health</td>
<td>Expand green space development</td>
</tr>
</tbody>
</table>

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Second, the study suggests that increasing access to quality green spaces by improving infrastructure, safety, awareness, and community involvement. Public-private partnerships could aid long-term management of multifunctional green spaces across Dhaka.

V. DISCUSSION

A. Interpretation of Results and Implications for Policy

The results of this study show that green spaces are significantly associated with a reduced risk of NCDs in urban residents of Dhaka City. This finding supports the growing body of literature on the health benefits of green spaces in urban areas. The study also found that parks and open spaces were the most commonly used types of green spaces by urban residents. This suggests that the provision of parks and open spaces should be a priority for policymakers and urban planners when designing green spaces in urban areas (Nawamawat et al., 2020).

The results of this study have important implications for policymakers and urban planners when designing green spaces in Dhaka City. This finding supports the growing body of literature on the health benefits of green spaces in urban areas. The study highlights the importance of designing green spaces in a way that is accessible and user-friendly for urban residents, particularly those with limited mobility (Kardan et al., 2015). Third, the study underscores the need for policymakers to consider the social and cultural context of urban areas when designing green spaces (Comber et al., 2008).

B. Strengths and Limitations of the Study

The main strength of this study is its focus on a specific urban area, Dhaka City, which allowed for a detailed analysis of the relationship between green space and NCDs in a specific context. However, the study also had some limitations. First, the study was cross-sectional, which means that causality cannot be inferred. Second, the study relied on self-reported data on NCDs and green space use, which may be subject to recall bias (Francis et al., 2012). Finally, the study did not consider other potential confounding variables, such as air pollution and noise, which may have influenced the relationship between green space and NCDs (Lee & Maheswaran, 2011).

C. Challenges, Benefits, and Suggestions for Promoting the Use of Green Spaces in Dhaka City

Table III highlights challenges and benefits of green spaces in Dhaka City. Key challenges include limited availability near dense, high-demand areas and a lack of proper infrastructure and safety measures at existing spaces. However, visiting green spaces provides physical, mental, social, environmental, and economic benefits. To help promote use and prevent disease, policymakers could increase access to quality green spaces by improving infrastructure, safety, awareness, and community involvement. Public-private partnerships could aid long-term management of multifunctional green spaces across Dhaka.

<table>
<thead>
<tr>
<th>Question</th>
<th>Outcomes</th>
</tr>
</thead>
</table>
| 1. What are some of the challenges you face in accessing and using green spaces in Dhaka City? | - Limited availability and accessibility of green spaces, especially in densely populated areas with high demand for recreational areas.  
- Lack of proper infrastructure and amenities in green spaces, such as walking paths, seating areas, lighting, and restroom facilities.  
- Pollution and environmental degradation in and around green spaces, affecting the quality of air, water, and soil, and reducing the appeal and usability of green spaces.  
- Safety concerns, including inadequate security measures, crime, and encroachment in green spaces, which may discourage people from visiting and utilizing these areas.  
- Lack of awareness and education about the importance of green spaces, leading to underutilization and neglect, and limited knowledge about the location and accessibility of green spaces. |
| 2. What are some of the benefits you have experienced from visiting green spaces in Dhaka City? | - Physical health benefits, such as improved air quality, increased opportunities for physical activity, and stress reduction through relaxation and recreation  
- Mental health benefits, including reduced stress, anxiety, and depression, and improved overall well-being through contact with nature and green environments.  
- Social benefits, such as opportunities for community engagement, social interaction, and cultural activities, which can foster a sense of belonging and social cohesion.  
- Environmental benefits, such as biodiversity conservation, climate regulation, and ecosystem services, which contribute to a healthier and more sustainable urban environment.  
- Economic benefits, including potential for tourism, increased property values, and job creation, which can boost the local economy and improve the livelihoods of communities surrounding green spaces. |
| 3. Do you have any suggestions for how policymakers and urban planners can promote the use of green spaces in Dhaka City to prevent NCD? | - Increase the availability and accessibility of green spaces in all areas of Dhaka City, with a focus on densely populated areas and underserved communities.  
- Improve the quality of green spaces by providing necessary infrastructure and amenities, such as walking paths, seating areas, lighting, and restrooms, to enhance the usability and safety of green spaces.  
- Enhance safety measures in green spaces, including adequate security, lighting, and regular monitoring to ensure a safe environment for users, particularly during evenings and nights.  
- Conduct awareness campaigns and education programs to raise public awareness about the importance of green spaces for preventing NCDs and promoting health and well-being.  
- Involve local communities, policymakers, and urban planners in the planning, design, and management of green spaces to ensure their needs and preferences are taken into consideration, and to promote community ownership and stewardship of green spaces.  
- Promote multi-functional green spaces that cater to diverse needs, such as recreational activities, cultural events, and biodiversity conservation, to maximize the benefits and engagement of different user groups.  
- Foster partnerships between government, non-governmental organizations (NGOs), private sectors, and local communities for funding, maintenance, and promotion of green spaces, and explore innovative financing mechanisms to ensure sustainable management and operation of green spaces in Dhaka City. |

C. Challenges, Benefits, and Suggestions for Promoting the Use of Green Spaces in Dhaka City

Table III highlights challenges and benefits of green spaces in Dhaka City. Key challenges include limited availability near dense, high-demand areas and a lack of proper infrastructure and safety measures at existing spaces. However, visiting green spaces provides physical, mental, social, environmental, and economic benefits. To help promote use and prevent disease, policymakers could increase access to quality green spaces by improving infrastructure, safety, awareness, and community involvement. Public-private partnerships could aid long-term management of multifunctional green spaces across Dhaka.

V. DISCUSSION

A. Interpretation of Results and Implications for Policy

The results of this study show that green spaces are significantly associated with a reduced risk of NCDs in urban residents of Dhaka City. This finding supports the growing body of literature on the health benefits of green spaces in urban areas. The study also found that parks and open spaces were the most commonly used types of green spaces by urban residents. This suggests that the provision of parks and open spaces should be a priority for policymakers and urban planners when designing green spaces in urban areas (Nawamawat et al., 2020).

The results of this study have important implications for policy. First, the findings suggest that increasing access to green spaces in urban areas can play a critical role in reducing the risk of NCDs (Gascon et al., 2015). Second, the study highlights the importance of designing green spaces in a way that is accessible and user-friendly for urban residents, particularly those with limited mobility (Kardan et al., 2015). Third, the study underscores the need for policymakers to consider the social and cultural context of urban areas when designing green spaces (Comber et al., 2008).

B. Strengths and Limitations of the Study

The main strength of this study is its focus on a specific urban area, Dhaka City, which allowed for a detailed analysis of the relationship between green space and NCDs in a specific context. However, the study also had some limitations. First, the study was cross-sectional, which means that causality cannot be inferred. Second, the study relied on self-reported data on NCDs and green space use, which may be subject to recall bias (Francis et al., 2012). Finally, the study did not consider other potential confounding variables, such as air pollution and noise, which may have influenced the relationship between green space and NCDs (Lee & Maheswaran, 2011).

C. Suggestions for Future Research

Future research could build on the findings of this study by exploring the mechanisms through which green spaces influence NCD risk. For example, research could investigate the role of physical activity, social interaction, and stress reduction in the relationship between green space and NCDs (Gascon et al., 2016). Additionally, future research could consider the impact of other environmental factors, such as air pollution and noise, on the relationship between green spaces...
space and NCDs (Adlakha & Sallis, 2021).

D. Suggestions for Reducing NCDs

In addition to the implications for policy and future research, the results of this study suggest several strategies for reducing the risk of NCDs in urban areas. One approach is to increase access to green spaces, particularly parks and open spaces, in urban areas. This could be achieved through the creation of new green spaces, as well as the improvement and maintenance of existing ones. Another approach is to design green spaces in a way that is accessible and user-friendly for urban residents, particularly those with limited mobility. This could include features such as well-lit paths, seating areas, and accessible entrances. Finally, policymakers and urban planners should consider the social and cultural context of urban areas when designing green spaces, and involve local residents in the planning and design process. By taking these steps, it may be possible to reduce the risk of NCDs and improve the overall health and wellbeing of urban residents.

VI. CONCLUSION

The study findings highlight the need for policymakers and urban planners to prioritize the development and maintenance of green spaces in urban areas as a means of promoting health and preventing NCDs (van den Berg et al., 2015). This can be achieved through:

1) Allocating more land for parks and green areas, particularly in densely populated areas (Labib et al., 2020).
2) Encouraging the development of community gardens and green roofs as additional green spaces (James et al., 2015).
3) Improving the maintenance and management of existing green spaces (Nguyen et al., 2021), by implementing appropriate measures to prevent degradation and pollution of green spaces and ensuring their proper care and maintenance.
4) Raising awareness among policymakers, urban planners, and the general public about the importance of green spaces for promoting health and reducing the risk of NCDs.

In conclusion, this study highlights the need for greater attention to the role of green spaces in promoting health and preventing NCDs in urban areas. The study findings provide important evidence to inform policy and decision-making related to urban planning and public health. By promoting the development and maintenance of green spaces in urban areas, policymakers and urban planners can create healthier and more sustainable environments.

REFERENCES


Conflict of interest

The authors declare that they have no conflict of interest.

Appendix A

Table IV: Responses of the Participants (N = 150)

<table>
<thead>
<tr>
<th>Questions</th>
<th>Response Choices</th>
<th>High Green Zone</th>
<th>Medium Green Zone</th>
<th>Low Green Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>68</td>
<td>56</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>1. Frequency of visiting green spaces per week</td>
<td>3–6 times/week</td>
<td>57</td>
<td>45</td>
<td>21</td>
</tr>
<tr>
<td>i–2 times/week</td>
<td>17</td>
<td>29</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>Less than once/week</td>
<td>5</td>
<td>12</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>3</td>
<td>8</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>2. Distance to nearest green space from home</td>
<td>Within 100m</td>
<td>62</td>
<td>53</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>Within 500m</td>
<td>38</td>
<td>32</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Within 1km</td>
<td>27</td>
<td>25</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>More than 1km</td>
<td>17</td>
<td>26</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>I don’t know</td>
<td>6</td>
<td>14</td>
<td>24</td>
</tr>
</tbody>
</table>

1. Importance of access to green spaces                                    | 1 (Not important) | 36               | 23                | 16             |
| 2.                                                                        | 2                | 13               | 17                | 18             |
| 3.                                                                        | 3                | 24               | 24                | 23             |
| 4.                                                                        | 4                | 33               | 37                | 26             |
| 5. (Extremely important)                                                  | 5                | 54               | 49                | 67             |

1. On a scale of 1–5, how would you rate the amount of green space in your neighborhood? | 1 (Very low) | 18 | 52 | 77 |
| 2 (Low)                                                                   | 23               | 37              | 32                |
| 3 (Moderate)                                                              | 31               | 28              | 23                |
| 4 (High)                                                                  | 43               | 21              | 14                |
| 5 (Very high)                                                             | 35               | 12              | 4                 |

5. Frequency of neighborhood physical activity                             | Never            | 17               | 28                | 47             |
| Frequently                                                                | 13               | 25               | 43                |
| Sometimes                                                                 | 46               | 38               | 28                |
| Often                                                                     | 74               | 59               | 22                |

6. How would you rate the quality of green spaces in your area in terms of cleanliness and safety? | Excellent | 32 | 23 | 6 |
| Good                                                                      | 54               | 44               | 15                |
| Fair                                                                      | 27               | 38               | 19                |
| Poor                                                                      | 23               | 24               | 49                |
| Very Poor                                                                 | 14               | 21               | 7                 |

8. Which green spaces do you typically visit?                              | Parks            | 97               | 79                | 41             |
| Playgrounds                                                               | 25               | 19               | 14                |
| Sports fields                                                             | 18               | 17               | 13                |
| Gardens                                                                   | 48               | 45               | 19                |
| Waterfront areas                                                          | 62               | 51               | 31                |
| Other                                                                     | 17               | 24               | 5                 |

9. Do you feel that the amount of green space in your neighborhood is adequate for promoting good health and preventing NCDs? | Yes | 93 | 66 | 19 |
| No                                                                        | 57               | 84               | 131               |

Appendix B

A. Part A: Demographic Information

1. What is your gender?
   - Male
   - Female
   - Other

2. What is your age range?
   - 18–29 years
   - 30–39 years
   - 40–49 years
   - 50 years or older

3. What is your marital status?
   - Single
   - Married or in a partnership
   - Divorced or separated
   - Widowed

4. What is the highest level of education you have completed?
   - Less than primary education
   - Primary education
   - Secondary education
5. What is your current occupation?
   o Student
   o Employed
   o Unemployed
   o Others (please specify) __________

6. What is your approximate monthly household income?
   o Less than 10,000 BDT
   o 10,000–20,000 BDT
   o 20,001–50,000 BDT
   o 50,001–100,000 BDT
   o More than 100,000 BDT

7. How long have you lived in Dhaka City?
   o Less than 5 years
   o 5–10 years
   o More than 10 years

8. Have you been diagnosed with any non-communicable diseases?
   o Yes (please specify)
   o No
   o Not sure

B. Part B: Green Space and Health

9. How often do you visit green spaces (parks, gardens, playgrounds, etc.) per week?
   o Daily
   o 3–6 times/week
   o 1–2 times/week
   o Less than once/week
   o Never

10. What is the distance of the nearest green space from your home?
    o Within 100m
    o Within 500m
    o Within 1km
    o More than 1km
    o I don’t know

11. How important is access to green spaces for you?
    o 1 (Not important)
    o 2 (slightly important)
    o 3 (Important)
    o 4 (very Important)
    o 5 (Extremely important)

12. Have you been diagnosed with any non-communicable diseases (like high blood pressure, diabetes, etc.)? If yes, please select all that apply:
    - High blood pressure
    - Diabetes
    - Cardiovascular disease (heart disease)
    - Respiratory disease (lung disease, asthma)
    - Mental health disorder (depression, anxiety)
    - Other (please specify): __________
    - None of the above

13. How often do you do physical activity in your neighborhood?
    o Never
    o Rarely
    o Sometimes
    o Often

14. On a scale of 1–5, how would you rate the amount of
    green space in your neighborhood?
    o 1 (Very low)
    o 2 (Low)
    o 3 (Moderate)
    o 4 (High)
    o 5 (Very high)

15. How would you rate the quality of green spaces in your area in terms of cleanliness and safety?
    o Excellent
    o Good
    o Fair
    o Poor
    o Very Poo

16. Which green spaces do you typically visit in Dhaka City? (Select all that apply)
    o Parks
    o Playgrounds
    o Sports fields
    o Gardens
    o Waterfront areas
    o Other (please specify): __________

C. Part C: Challenges, Benefits, and Suggestions for Promoting the Use of Green Spaces in Dhaka City

18. What challenges have you faced in accessing or using green spaces in Dhaka City?
    __________________________________________
    __________________________________________

19. What benefits have green spaces provided for you?
    __________________________________________
    __________________________________________

20. What suggestions do you have for how policymakers and urban planners can promote the use of green spaces in Dhaka City to prevent non-communicable diseases?
    __________________________________________
    __________________________________________