Impact of green campus on the mental health of the students in Dhaka

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Abstract: This study investigates the impact of green campuses on Dhaka students' mental health. Green campuses are academic buildings that have a lot of greenery. Surveys and interviews will be used to learn more about the stress, feelings, and academic performance of the pupils. We will test whether green spaces have an impact on student performance by contrasting pupils on green and non-green campuses. Our understanding of how green campuses might enhance mental health in Dhaka will be aided by the findings. Policymakers and educators may find this information useful in developing healthier learning environments for their pupils. In the end, the goal is to demonstrate how green areas may improve the wellbeing of students in crowded places like Dhaka.

Survey and Questionnaire: The students of Dhaka were involved as stakeholders for understanding the impact of green campus on the mental health of the students of Dhaka. Eighteen questions made up the survey, which helped us to find the impact of green campus or other things like their houses' environment with green spaces on the mental health of the students of Dhaka.

Keywords— Traffic congestion, Urban Mobility, Bicycle, Sustainable Traffic Solution, Environment Problem, Data Analysis, Non-motorized, Infrastructure development, online survey, Literature Review.

I. INTRODUCTION

Green campuses are areas where a lot of vegetation, such as trees and plants, is interspersed with the structures. These areas are meant to make students feel happier and more at ease—they are not merely beautiful to look at. However, despite its apparent benefits, there is a lack of evidence to support its effectiveness, particularly in a city the size of Dhaka. This is the relevance of our research. If attending a green campus actually improves students' moods, that is what we aim to investigate. We will have conversations with pupils and inquire about their feelings and academic performance. Next, in order to determine whether there is a difference, we will compare pupils from green campuses with those from normal ones. If it turns out that green campuses do matter, it might have significant implications for educators and decision-makers in the education system. With this knowledge, they could improve education for students, particularly in crowded areas like Dhaka. Our study thus seeks to determine whether or not green campuses can improve students' academic performance and sense of well-being. We want to demonstrate the value of having nature around, even in the center of a large city, by taking this action.

II. OBJECTIVE

Our research is to determine whether or not attending a green campus improves the academic performance and well-being of Dhaka students. We will interview students about their experiences and academic performance, contrasting pupils on green campuses with those on ordinary ones. If it turns out that green campuses actually do have an impact, it may make educators and those in charge of school policy realize how crucial it is to have nature around, particularly in densely populated areas like Dhaka. Our ultimate goal is to demonstrate how a lot of greenery, mixed in with school structures, may enhance children' academic performance and mood, therefore improving education for all in densely populated areas like Dhaka.

III. Literature Review:

The literature review focuses on the impact of green spaces on mental health, specifically in the context of School, universities and college students. The studies provide evidence for the positive effects of green spaces on mental health, but also highlight the need for further research to establish causality and generalizability.

I. **Visiting Urban Green Space and Orientation to Nature Is Associated with Better Wellbeing during COVID-19** by Yijun Zhang et al. (2020) is an observational study that examined the impact of green spaces on adolescents' mental well-being. The study found that visiting urban green spaces and having an orientation towards nature was associated with better mental well-being during COVID-19. However, the study had limitations such as a lack of uniformity in how green space and mental well-being were measured, making it difficult to do a meta-analysis. The study also focused only on adolescents, not including other age groups.

II. **Investigating the Mental Health Impacts of University Campus Green Space** by Fahimeh

Malekinezhad et al. (2020) is a quantitative study that examined the relationship between perceived sensory dimensions of campus green spaces, perceived restorativeness, and restorative experiences in university students. The study found a positive correlation between perceived sensory dimensions of campus green spaces and perceived restorativeness, which significantly impacts restoration experiences in university students. However, the study was limited to university students in Malaysia, which may limit the generalizability of the findings.

III. **Perceived Greenness at Home and at University Are Independently Associated with Mental Health** by Alexander K. F. Loder (2020) is a cross-sectional study that assessed the independent associations between perceived greenness at home and university environments and mental health in college students. The study found that perceived greenness at home and university environments were independently associated with mental health in college students. However, the study did not account for other factors affecting mental health, such as personality traits and mood states.

IV. **The Role of the Campus Outdoor Environment on University Student** by Mallory Koning et al. (2022) is an observational study that investigated the correlation between campus outdoor environments and mental health in university students. The study found that campus outdoor environments impact a range of student behaviors, with some characteristics encouraging physically demanding activities and others promoting passive behaviors. However, the study employed a cross-sectional design, which limits the understanding of changes over time, and used nonrandom convenience sampling, which may limit the generalizability of the findings.

V. **The Impact of Green Space on University Students' Mental Health: The Mediating Roles of Solitude Competence and Perceptual Restoration** by Zhang, J. (2024) aimed to determine which dimensions of green space are preferred by students for reducing stress, evaluate the restorative experience of different environments, and investigate whether solitude competence and perceptual restoration mediate the relationship between green space and mental health. The study used a quantitative approach involving a cross-sectional survey with 550 students from Northeast Forestry University, China. The results showed that green space significantly improves university students' mental health, especially through the mediating roles of solitude competence and perceptual restoration. Higher solitude skills led to enhanced perceptual recovery and restorative experiences, while perceptual recovery played a partial mediator role in the relationship between green space and restorative experiences. The study supported the idea that green spaces offer opportunities for solitude, contributing to mental health benefits.

VI. **Effects of diversity within urban green spaces on students' mental health and general wellbeing benefits** by Shi, J. (2023) aimed to understand how exposure to different characteristics of urban green spaces influences mental health and general wellbeing benefits to students. The study involved 2,012 undergraduate students at two Canadian universities. The results showed that certain characteristics of urban green spaces, like their spaciousness and ease of access, positively impact the mental health and overall well-being of students. The study used a mixed-methods approach combining qualitative and quantitative data analysis, including descriptive statistics and Spearman rank correlation coefficients.

VII. **Mental Health Among University Students During COVID-19 Lockdown in Bangladesh:** A Cross-Sectional Study by Romana, U., Rahmanb, R., & Talukdera, A. (2022) aimed to investigate the mental health of university students during the COVID-19 lockdown in Bangladesh. The study used a cross-sectional design with a sample size of 2,220 students from 13 universities. The results showed that the prevalence of anxiety and depression was high among university students during the lockdown, with significant gender differences.

VIII. **Academic Greenspace and Well-being—Can Campus Landscape be Therapeutic? Evidence from a German University** by Foellmer, J., Kistemann, T., & Anthonj, C. (2021) aimed to investigate the relationship between academic greenspace and well-being in a German university. The study used a cross-sectional design with a convenience sampling method, gathering data from 100 students. The results showed that the use of academic greenspace positively influences students' physical, mental, and social well-being.

IX. **The Psychological Restorative Effects of Campus Environments on College Students in the Context of the COVID-19 Pandemic: A Case Study at Northwest A&F University, Shaanxi, China** by Sun, S., Chen, Y., Mu, S., Jiang, B., Lin, Y., Gao, T., & Qiu, L. (2021) aimed to determine the psychological restorative effects of different campus environments on college students in the context of the COVID-19 pandemic. The study used a cross-sectional design with a convenience sampling method, gathering data from 819 students at Northwest A&F University, Shaanxi, China. The results showed that blue space was perceived as the most psychologically restorative campus environment, while grey space was the least restorative, with sports ground and green space falling in between. The study also investigated the relationship between the four dimensions of perceived restorativeness (being away, extent, fascination, and compatibility) and psychological restoration based on the Perceived Restorativeness Scale (PRS).

X. **Does greenery experience indoors and outdoors provide an escape and support mental health during the COVID - 19 quarantine?** by

Dzhambov et al. (2021), investigates the relationship between indoor and outdoor greenery and mental health during the COVID-19 quarantine in Bulgaria. The study found that exposure to indoor greenery, like houseplants and green views, had protective effects against depression and anxiety during the quarantine. However, the study has limitations such as a cross-sectional design, which makes it difficult to establish causality, and a sample size that may not be fully generalizable to other populations or contexts.

XI. **Visiting Urban Green Space and Orientation to Nature Is Associated with Better Wellbeing during COVID-19** by Brenda et al. (2023) aimed to associate visiting urban green spaces and having an orientation to nature with better wellbeing during the COVID-19 pandemic. The study included 3085 participants across various Australian cities and used a convenient sampling technique. The research focused on the positive association between visiting urban green spaces, nature orientation, and wellbeing during the pandemic, partially mediated by physical activity and social interaction.

XII. **Higher Education Students' Behavior and Mental Health during Covid-19 Lockdown: A Pilot Study** by Mishra, L. and Pramoda Kumar, N. (2021) aimed to assess the mental health and behavior of Mizoram University students during the Covid-19 lockdown period. The study gathered information from 894 university students using a snowball sampling technique. The research focused on the changes in daily habits, such as sleeping patterns, exercise frequency, and relaxation time, as well as engagement in activities like reading books, writing assignments, and viewing news related to the pandemic. The study found that more than half of the participants reported paying more attention to their emotional well-being during the pandemic, with nearly 70% spending more time exercising. Additionally, the majority of participants reported positive mental health and psychological well-being. The study suggests that spending more time resting and exercising may have helped participants adapt to other negative impacts on mental health, including increased pressure and stress.

XIII. **Association between the Physical Activity Behavioral Profile and Sedentary Time with Subjective Well-Being and Mental Health in Chilean University Students during the COVID-19 Pandemic** by Reyes-Molina et al. (2022) aimed to investigate the relationship between physical activity, sedentary behavior, and mental health in Chilean university students during the pandemic. The study used a convenient sampling method to gather data from 469 students. The results showed that physically inactive and sedentary students had worse well-being and mental health compared to active and non-sedentary students. Sedentary behavior was found to be one of the variables that most affected the mental health of these students. The study used a cross-sectional design, which limits the ability to establish causality between physical activity, sedentary behavior, and mental health outcomes. Self-report measures for physical activity and sedentary time may introduce recall bias and overestimation or underestimation of these behaviors. The study adjusted for several confounding variables, but there may be other unmeasured factors that could influence the relationship between physical activity, sedentary behavior, and mental health. The findings may not be directly applicable to other populations or different contexts as the study was conducted in Chile during the COVID-19 pandemic.

XIV. **University Students' Wellbeing and Mental Health during COVID-19: An Online Photovoice Approach** by Ünsal Seydooğulları et al. (2023) used a qualitative research design with an online photovoice approach to investigate the supportive and non-supportive factors for the mental health of college students studying Islamic sciences in Turkey during the COVID-19 pandemic. The study used snowball sampling and recruited 108 participants from different universities in Turkey. The study identified 27 supportive and 27 non-supportive themes affecting the mental health of the participants. The study's findings suggest that the online photovoice approach can be an effective method for understanding the mental health experiences of college students during the pandemic. However, the study's limitations include a small sample size, a geographical focus on Turkey, and the use of a single method for data collection. The study did not use any inferential statistics, and there were no independent or dependent variables specified. The study's results add to the existing literature that supports the importance of understanding the mental health experiences of college students during the pandemic and the potential benefits of using innovative methods like online photovoice to gather data.

XV. **Greenery experienced indoors and outdoors associated with less emotional distress among college students in the United States during the COVID-19 pandemic** by Lanion et al. (2022) aimed to investigate the relationship between exposure to indoor and outdoor greenery and mental health during the COVID-19 quarantine. The study used a cross-sectional design and surveyed a sample of students aged between 18 to 35 years from two universities in Bulgaria. The results showed that exposure to indoor greenery, like houseplants and green views, had protective effects against depression and anxiety during the COVID-19 quarantine. However, the study lacked longitudinal data, making it difficult to establish causality between greenery and mental health during the COVID-19 quarantine. The study did not control all potential confounding variables, including age, gender, education level, employment status, and pre-existing mental health conditions. The sample size was limited to 1280 students, and the study was conducted during the COVID-19 pandemic, which may limit its generalizability to other contexts or time periods.

These studies investigating the relationship between green spaces and mental health among university students reveal consistent evidence of the positive impact of green environments on well-being, particularly during the COVID-19 pandemic. While varying in methodologies and sample sizes, these studies collectively underscore the significance of access to green spaces, both indoors and outdoors, in promoting better mental health outcomes among college populations worldwide. However, further research addressing methodological limitations and exploring diverse contexts is warranted to enhance our understanding of the mechanisms underlying this relationship and to inform targeted interventions for improving student well-being.

IV. METHODOLOGIES

A. Survey Design

A mixed-method approach was employed to collect data on the impact of green campus on the mental health of the students of Dhaka. The research utilized an online Google Form survey conducted with the general students of Dhaka.

A.1 Online Survey

A structured questionnaire, denoted as Qonline, was designed and implemented using Google forms, containing questions related to green campus, its impact, requirement for green spaces in the educational institutions and the effect of it on students' well-being.

B. Data Collection

B.1 Online Survey Responses

- *The online survey collected responses from N number of participants who provided valuable insights into their experiences and perspectives on the impact of green campus on their mental health.*

C. Data Analysis

C.1 Inferential Statistics

C.2 Inferential Statistics were calculated to summarize and analyze the central tendency and variability of responses. Mainly, we worked with the Nominal values, as most of the question answer were opinion based.

• Mean ($\bar{X}$): $\bar{X}$ =

• Mode = most frequently occurring value • Standard Deviation (SD):

$$\sqrt{\frac{\sum_{i=1}^{N}(Xi-\bar{X})^2}{N}}$$

SD =

• Variance (Var):

$$\frac{\sum_{i=1}^{N}(Xi-\bar{X})^2}{N}$$

Var =

C.3 The Chi-Square Test

The chi-square test will be employed to investigate associations between different categorical variables, such as the relationship between opinions on bicycle effectiveness and demographic factors.

B. Ethical Considerations

Ethical guidelines were strictly maintained throughout the research process. Informed consent was obtained from all participants, ensuring confidentiality and anonymity.

C. Limitations

Sampling Bias: There are inherent biases in the selection of respondents from schools, colleges, and universities. For example, certain institutions had better or worse green campus facilities, which skewed the results.

V. DATA ANALYSIS

Finally, we work on Impact of green campus on the mental health of the students in Dhaka through the conducting of a survey to among the students. We had exactly 108 respondents who answered to our survey with 62.96% of them being the male while 37.04% of them were female.

Male	Female
62.96%	37.04%

Tab. 1. Our Respondents Variance

Majority of the age group of my respondents (20-24 years) are. In this survey, we had about 18 inquiries to the respondents and all the questions enabled us to evaluate the Impact of green campus on the mental health of the students in Dhaka. Firstly, we shared our encouragement for green spaces as one of the modes of impact in favor of the mental health and then we asked for their thoughts on it. We will now explore the impacts of green campus spaces on mental health. We thus computed standard deviation, variance, mean and mode values for the dataset which is related to some particular questions on our respondents.

Mean Age	1.815
Mode Age	20-24
Standard Deviation	0.390
Variance	0.152

E. Inferential Statistics:

In our survey, we collected the samples from the students of Dhaka city from online. Most of the samples have nominal data. And these categorical data is analyzed in different ways. There were opinion based answers, age groups, time limits, rankings, etc. Firstly, we tried to figure out the experience of students in Dhaka regarding the impact of green campus. We got the below data:

Therefore, a chi-square test was done to check that if the wellbeing enhanced by the availability of green spaces is relevant to green spaces. The results are shown below.

The Chi-Square Test: 18.126
Degree of Freedom: 12

P- value: 0.1119

Tab. 2. The Chi-Square Test

Here, the p-value is more than 0.05 which means wellbeing enhanced by the availability of green spaces is not relevant to green spaces. There is enough evidence to support the null hypothesis.

Again, we did a chi-square test was done to check that if the relaxation and stress relief by the green campus areas is relevant to green campus spaces. The results are shown below.

The Chi-Square Test: 23.149
Degree of Freedom: 12
P- value: 0.02648

Tab. 3. The Chi-Square Test

Here, the p-value is less than 0.05 which means relaxation and stress relief by the green campus areas is relevant to green campus spaces. There is enough evidence to support the claim.

G. Data Visualization:

In our survey, there were different ages of people. There were both male and female in our respondents. The data of male and female, and the age variance is shown below.

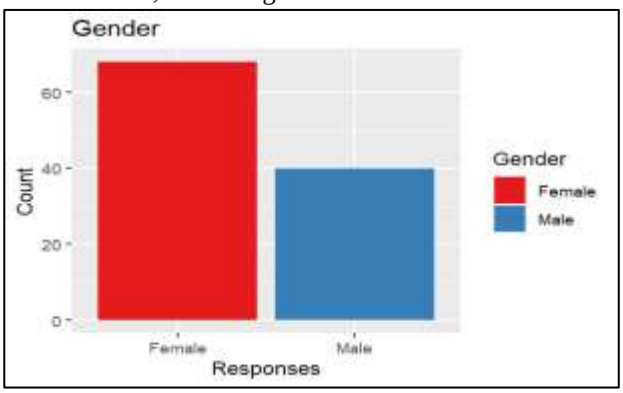

Figure 1: Gender of Respondents

Here most of the respondents were female and less of them were male.

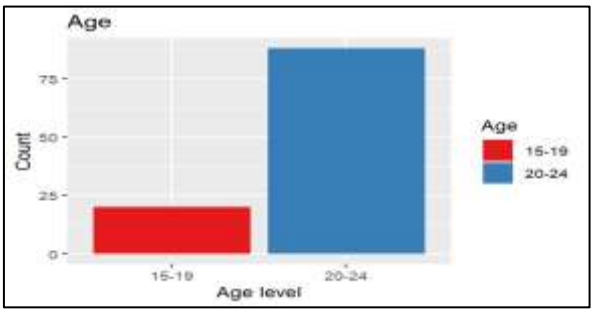

Figure 2: Age Variance

Most of the respondents' were from the age range of 20-24 and there were less amount of respondents' from the age range of 15-19.

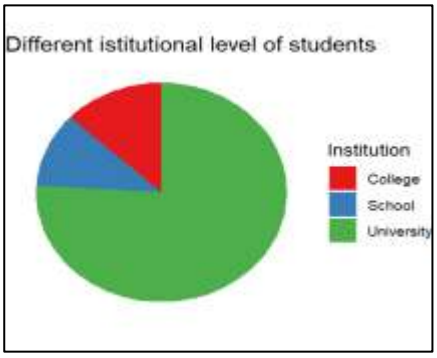

Figure 3: Institutional of student

The respondents were mostly from the university students, then were from the college students and then were from the school students

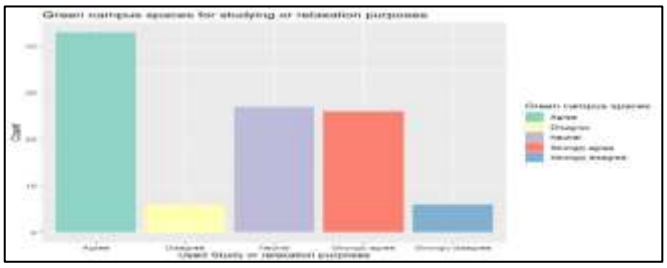

Figure 4: Use of green campus for studying and relaxati on

With the above statement most of the respondents agreed, th en were the amount who were neutral, then the students who were strongly agreed, then the students who were strongly di sagreed and after all who were disagreed.

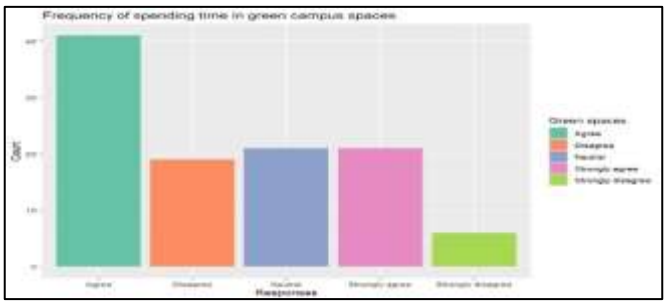

Figure 5: Time spend in green campus spaces

For this statement most of the students were who selected ag ree, then were the students who selected neutral and strongly agree, then were the students who selected disagree, and the n the students who selected strongly disagree.

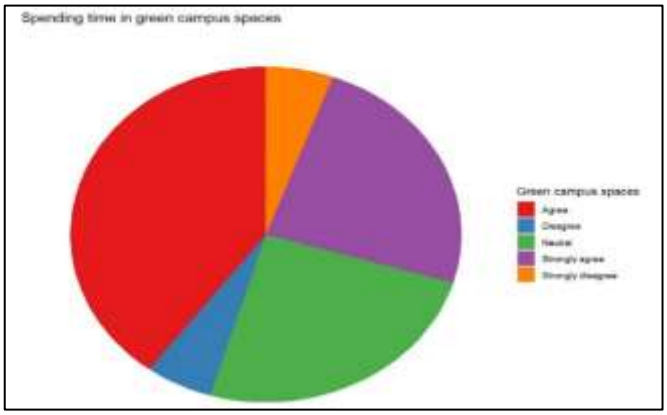

Figure 6: Time spend in outdoor seating areas in green campus spaces

For this statement, most of the students selected agree, then t he amount was for neutral and strongly agree, then the stude nts selected disagree, and then were the students who selecte d strongly disagree.

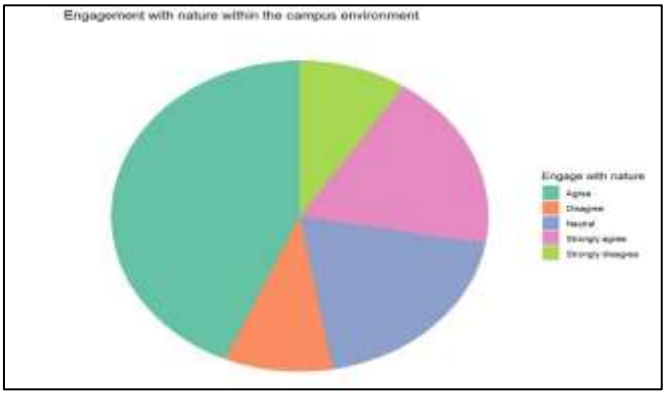

Figure 7: Engagement with nature in campus

For this statement most of the students selected sometimes, t hen were the students who selected yes, always, then were th e students who selected rarely and never.

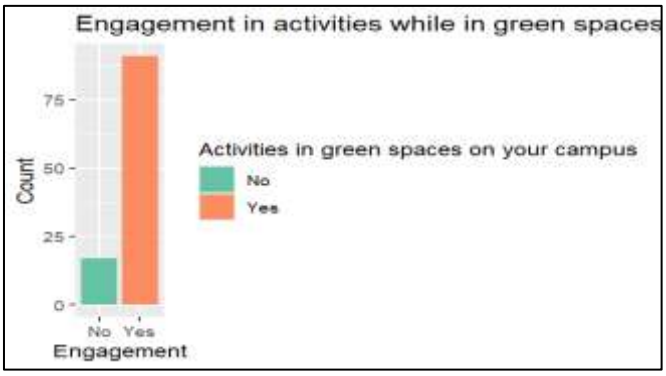

Figure 8: Engagement in activities while in green spaces

In this statement most of the students said yes and less of th em said no.

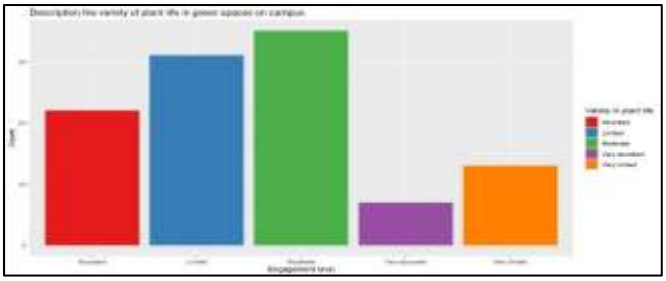

Figure 9: Variety of plant life on green campus spaces

In this statement, it can be seen that most of the students sele cted moderate, then were the students who selected limited, t he were the students who selected abundant, then were the st udents who selected very limited and lastly, there were some students who selected very limited.

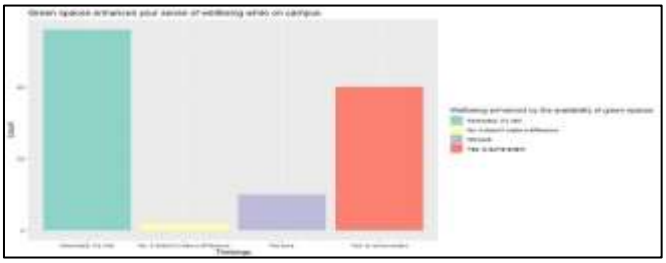

Figure 10: Green campus enhances the sense of wellbein g

With this statement, most of the students selected absolutely , it's vital, then were the students who selected yes, to some extent, then were the students who selected not sure, and the n there were some students who selected no, it doesn't make a difference.

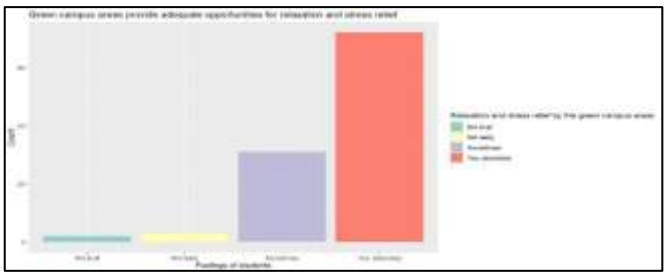

Figure 11: Green campus areas for relaxation and stress relief

In this statement, most of the students selected yes, absolutel y. Then were the students who selected sometimes, then wer e the students who selected not really, and then there were s ome students who selected not at all.

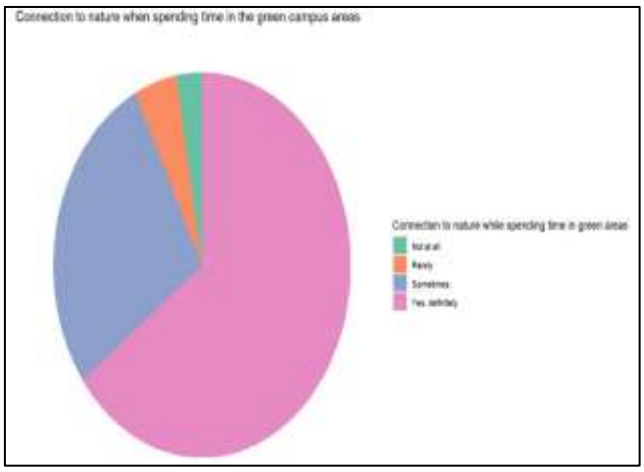

Figure 12: Connection to nature in green campus areas

In this statement, most of the students selected yes, absolutel y, then were the students who selected sometimes, then were the students who selected rarely, and then there were some s tudents who selected not at all.

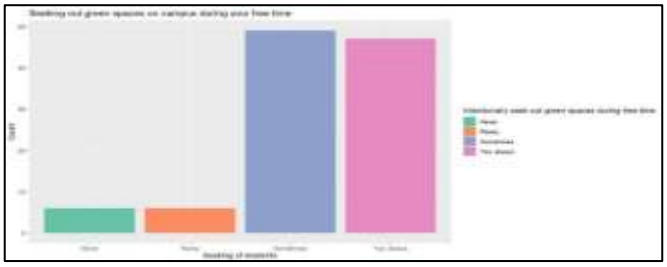

Figure 13: Seeking out green spaces during free time in campus

In this statement, most of the students selected sometimes, th en were the students who selected yes, always, then were the students who selected rarely and never.

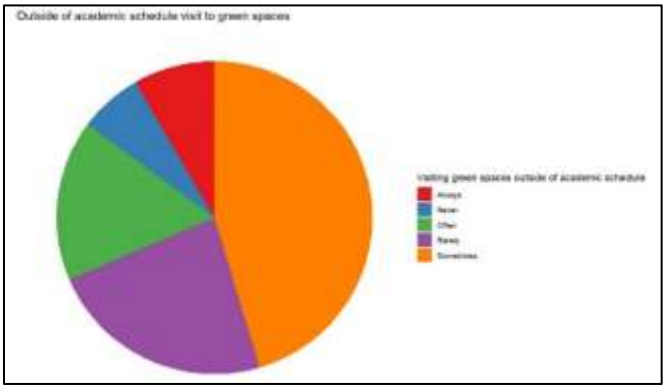

Figure 14: Visit to greeneries out of academic schedule.

In this statement, most of the students selected sometimes, th en were the students who selected rarely, then were the stud ents who selected often, and then there were some students who selected always and lastly there were some students wh o selected never.

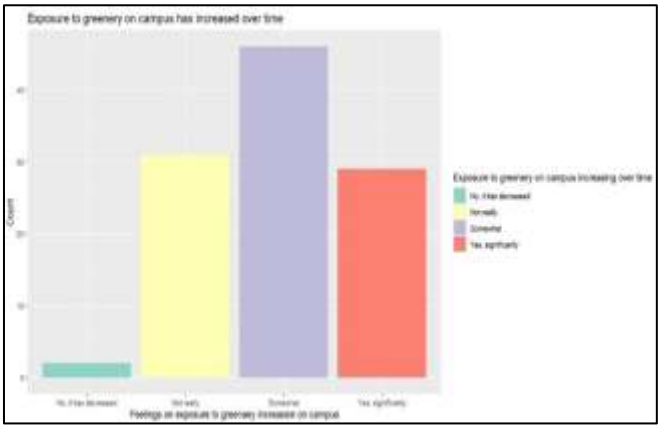

Figure 15: Increase of greenery on campus

In this statement, most of the students selected sometimes, th en were the students who selected not really, then were the s tudents who selected yes, significantly, and then there were some students who selected no, it has decreased.

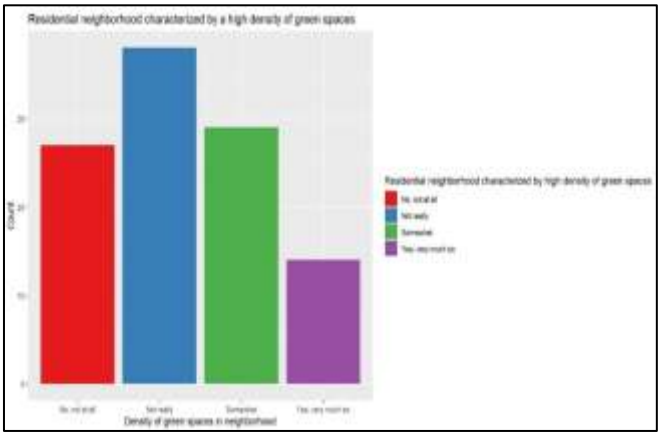

Figure 16: Greeneries in residential neighborhood

In this statement, most of the students selected not really, the n were the students who selected somewhat, then were the st udents who selected no, not at all, and then there were some students who selected yes, very much so.

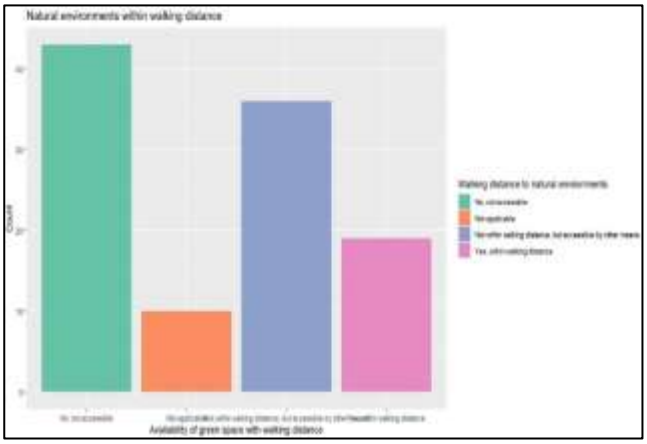

Figure 17: Natural environments within walking distan ce

In this statement, most of the students selected no, not acces sible, then were the students who selected not within

VI. Result

H. Positive Perception of Bicycles as a Sustainable Solution:

Our survey results indicate a positive perception among respondents regarding the effectiveness of bicycles as a sustainable solution to the ongoing traffic congestion problem. The majority of participants expressed a belief in the potential of bicycles to alleviate traffic-related issues in Dhaka. This positive sentiment may attributed to the environmental friendliness, health benefits, and cost effectiveness associated with bicycle usage.

I. Infrastructure Gaps and Government Initiatives:

Despite the favorable view of bicycles as a solution, a significant concern arises from the apparent lack of sufficient bicycle infrastructure and government initiatives.

J. Public Demand for Government Action: The survey results underscore a clear demand from the public for proactive steps from the government to promote and facilitate bicycle usage. Initiatives such as the development of dedicated cycling lanes, integration of bicycle-friendly features in urban planning, and awareness campaigns are essential to bridge the existing gaps and encourage sustainable transportation practices.

K. Health and Environmental Considerations: Beyond the immediate transportation benefits, the positive correlation between concerns about health problems due to traffic jams and the perception of bicycles as an effective alternative highlights the interconnections of health and environmental considerations. Promoting bicycle usage aligns with broader goals of enhancing public health and mitigating environmental pollution associated with motorized vehicles.

VII. Conclusions

In conclusion, our survey illuminates a promising potential for bicycle to serve as a sustainable solution to the ongoing traffic congestion in Dhaka. However, the realization of this potential is contingent upon addressing

the existing gaps in infrastructure and governmental support. It is imperative for the government to take decisive actions, including the development of bicycle-friendly infrastructure and the implementation of supportive policies, to meet the growing demand for sustainable transportation. Our project contributes valuable insights into the public perspective on this matter, emphasizing the need for collaborative efforts between the government and the community. As we move forward, advocating for the integration of bicycles into the urban transportation landscape becomes paramount for a more sustainable and efficient future for Dhaka.

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