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Perceived environmental barriers to physical activity in young adults in Dhaka City, Bangladesh – does gender matter?

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Perceived environmental barriers to physical activity in young adults in Dhaka City, Bangladesh – does gender matter?

Abstract

Background: Physical activity (PA) has demonstrated health benefits, but participation is low in many countries. Little is known about environmental barriers to PA among Asian young adults. The purpose of this study was to identify common perceived environmental barriers to PA in young adults in Dhaka, Bangladesh and to examine if these barriers differed by gender.

Methods: This was cross-sectional study with a self-administered survey and data collected from a convenience sample of 573 students aged 20.71±1.35 years (female: 45%) in Dhaka. Binary logistic regression analysis was used to examine the association between environmental barriers and gender, adjusting for potential confounders.

Results: Poor street lighting at night (62%) and lack of convenient places to do PA (56%) were the most frequently reported environmental barriers to PA. Females were more likely than males to identify lack of neighbourhood safety (OR: 4.65; 95% CI: 3.09-7.00), poor street lighting [2.82 (1.95-4.11)], lack of convenient places [2.04 (1.39-3.00)], unclean and untidy neighbourhood [1.84 (1.25-2.72)] and poor weather [1.61 (1.11-2.33)] as barriers to PA, after adjusting for a set of confounders.

Conclusions: Findings suggest that environmental barriers to PA are particularly salient to young females in urban Bangladesh. This study underscores the need for safe and convenient options for PA that are also female friendly.

Introduction

Physical activity (PA) is well-documented to promote health in all age groups (1). However, approximately 23% of the global population aged ≥18 years is insufficiently active (2). This has significant public health implications especially for major non-communicable diseases (NCD) such as cardiovascular disease and type 2 diabetes (1). An estimated 66%-80% of deaths caused by NCDs occur in low- and middle-income countries (LMIC) (3). As in many other LMICs, NCDs are a major public health issue in South Asia – which has one-fifth of the world's population (4). In 2015, there were 78 million adults aged 20-79 years with diabetes in South Asia, and this is expected to double by 2040 with an estimated 140 million cases (5). The health expenditure due to diabetes in this region is expected to increase from 7.3 million US dollars in 2015 to 12.9 billion US dollars by 2040 (5). One of the major contributory factors for the increased prevalence of diabetes and other cardiometabolic syndromes in South Asia is the increasing prevalence of physical inactivity, which has been attributed in part to rapid urbanisation, increased industrialisation, mechanisation in domestic and workplace activities, and increased use of motorised vehicles (4).

Insufficient PA during young adulthood can increase the risk for NCDs in later life (6). During the transition from adolescence to early adulthood, young adults may have more freedom to make lifestyle choices, which can often result in unhealthy practices such as insufficient PA (7). In addition to increased risk of future NCD, insufficiently active young adults are significantly less healthy than their active counterparts (8). Regular PA in young adulthood has a range of physical and psychosocial health benefits such as healthy weight, reduced depression and anxiety, and overall physical and psychological wellbeing (8, 9).

The environmental influences on PA are of particular interest as area-level intervention strategies could be more effective in promoting PA at the population level and more sustainable than interventions targeting individual or social factors (10). Research from different countries suggests that PA in young adults is associated with various environmental influences.

Perceived personal safety; low crime rate; traffic safety; aesthetics; and availability of sidewalks, recreational facilities, convenient places for PA and green space can positively influence PA participation (3, 11, 12). Some research in LMICs has shown differences by gender (3, 13); suggesting that females might experience or perceive environmental barriers to PA differently from males (13). An unsafe neighbourhood, perceived poor street lighting, lack of convenient places such as a large park within close proximity of residence is likely to affect females' PA more than males' (3, 13-15).

Most of the evidence related to the environment and PA are, however, from developed countries such as the USA, Canada and Australia, with only a few studies from LMICs (16). There is little information about young adults' perceptions of the environment for PA in LMIC Asian countries (16). This is important as the environment in LMICs is likely to differ from high-income countries. LMICs are often characterised by higher population density; more traffic congestion, road traffic accidents, and crime; and less green space and infrastructure than high-income countries (17, 18).

The aim of this study was, therefore, to understand the perceived environmental barriers to PA in young adults in an LMIC in Asia. This study was conducted with university students in Dhaka City, Bangladesh and aimed to (a) identify the commonly reported environmental barriers to PA, and (b) examine whether perceived environmental barriers to PA differed by gender.

Methods

Study design

We conducted a cross-sectional survey with a sample of 573 undergraduate students aged 18-24 years from six purposively selected universities (three public, three private) in

Dhaka City, Bangladesh. We used a self-administered survey to collect data during September-November 2015.

Participants

From a list of 49 public/private universities which offer undergraduate programs in Dhaka (19), we identified a convenience sample of eight to be invited to participate in this study. These universities were selected to include a mix of public and private institutions (for socioeconomic diversity); and based on their large size, diversity of study areas; geographical convenience, and connection with the authors. Six universities agreed to participate. After obtaining approvals from the university authority, the principal investigator [RU] consulted with the institution nominated representatives (class lecturer) for a suitable time to access the students during classes. The principal investigator attended classes and explained the study emphasising the voluntary nature of participation, and verbally invited the students to participate. Study participants were required to be: (i) an undergraduate student, (ii) aged 18 to 24 years, and (iii) a permanent resident of Bangladesh. We obtained written informed consent from all participants. As this study was with university students and English is the medium of instruction at university level in Bangladesh, we administered the survey in English. A small pilot study with the survey indicated that English language was not a barrier to understanding the survey. Participants completed the survey in approximately 40-45 minutes. We asked questions about lifestyle and wellbeing, perceived environmental barriers to PA and sociodemographics.

Measurements

Perceived environmental barriers to PA

The participant information sheet and front page of the survey described PA as body movement causing an increase in breathing and/or heart rate, and including activities such as

exercise, sports, competitive or friendly games swimming, walking and cycling. This is consistent with the working definition of PA used by the World Health Organisation (WHO) (20).

Considering the socio-demographics and cultural aspects of Bangladesh, we selected seven environmental barrier items from previous PA research with young adults in LMICs (3, 11) and Asia (12), and in the general population in LMICs (13, 21, 22). Items included: "*The weather is often too bad to do physical activity*"; "*There are no convenient places (e.g., parks or open fields) nearby for physical activity*"; "*It is not safe to walk in my neighbourhood*"; "*My neighbourhood is not clean and tidy*"; "*The footpaths are not in good condition in my neighbourhood*"; "*There is heavy traffic in my neighbourhood*"; and "*Streets are not well lit during night in my neighbourhood*". Respondents indicated to what extent they agreed or disagreed with each statement using response options of 1='strongly disagree', 2='disagree', 3='unsure', 4='agree' and 5='strongly agree'.

Other measures

Participants also completed survey items to assess: age, gender, height and weight, marital status, university type, enrolled program, year of study, parents' educational qualification, parents' current occupation/employment status, monthly gross household income, household composition, and housing type. We grouped age into two categories: 18-20 and 21-24 years due to a relatively narrow range. We computed body mass index (BMI) from self-reported height and weight and then grouped into three categories based on major cut-off points suggested by the WHO: normal range (18.50-24.99 kg/m^2); underweight (<18.50 kg/m^2) and overweight (≥25.00 kg/m^2) (23). We used monthly gross household income as a proxy socio-economic status indicator and categorised it into four groups (≤20,000 Bangladeshi currency-BDT; 20,001-40,000 BDT; 40,001-70,000 BDT and >70,000 BDT).

We piloted a draft version of the questionnaire in a small sample of undergraduate students (n=30, male=15, female=15) from a university based in Dhaka City, Bangladesh to evaluate feasibility and acceptability. Participants in the pilot study provided qualitative feedback on the written instructions; and instances where the items were unclear, difficult to understand, irrelevant, socio-culturally inappropriate or misleading. Based on this qualitative feedback the questionnaire was revised and finalised.

Statistical analyses

We report participants' responses to each of the environmental barrier items as percentages by gender. To identify the most commonly reported environmental barriers to PA, we dichotomised responses into categories of agreement [4 or 5] and non-agreement [1, 2 or 3], and reported the proportion of participants' in agreement as a percentage. Using binary logistic regression analyses we examined whether perceived barriers varied by gender, adjusted for potential confounders. We considered the following potential sociodemographics as potential confounders: age, gender, BMI, marital status, parental education and employment/occupation status, monthly gross household income, household composition, housing type, university type, enrolled program, and year of study. We selected only those confounders which had univariate associations with the corresponding dependent variables (barrier item) at 10% level in the univariate analyses. Before entering the selected variables in the regression model, we examined them for collinearity. The final multivariable models included gender and the other variables which were statistically significant. We present unadjusted and adjusted odd ratios (OR) with 95% CI for each item with statistical significance set at 5%.

Results

Study participants

Of those invited, 575 participants completed the questionnaire (response rate 92%). Due to incomplete data, we excluded two participants from analysis. Thus, the analytical sample for this study consisted of 573 participants; 45% were female and the average age was 20.7±1.35 years. About 60% of the participants reported that their father had tertiary education, while 16% of participants' fathers were farmers/ day labourers. The gross monthly family income of the study participants was comparable across the four income-groups with 20% in the lowest income quartile and 21% in the highest income quartile, which suggests a reasonable representation of different socio-economic classes among the study participants. Table 1 summarises sociodemographic characteristics of the participants.

Table 1. Characteristics of the participating young adults in Dhaka, Bangladesh, 2015 (n=573)

Characteristics	n¥	%
Age (years)		
18-20	262	45.7
21-24	311	54.3
Gender		
Male	313	54.6
Female	260	45.4
Marital status		
Single	538	93.9
Married or others	35	6.1
BMI		
<18.50 kg/m^2	139	24.3
18.50-24.99 kg/m^2	353	61.7
≥25.00 kg/m^2	80	14.0
University type		
Public	277	48.3
Private	296	51.7
Year of study		
First year	184	32.1
Second year	223	38.9
Third year	166	29.0
Mother's educational qualification		
Primary or equivalent	111	19.4
Secondary (or equivalent)	147	25.7
Higher secondary (or equivalent)	125	21.9
Tertiary (or equivalent)	188	32.9
Father's educational qualification		

Primary or equivalent	53	9.3
Secondary (or equivalent)	64	11.2
Higher secondary (or equivalent)	102	17.9
Tertiary (or equivalent)	352	61.7
Mother's employment status		
Working	119	20.8
Not working	452	79.2
Father's occupation		
Government/ public service	152	26.7
Non-government/ private service	96	16.9
Professional	50	8.8
Self-employed/ business	178	31.3
Farmer/ day labourer	93	16.3
Monthly gross family income (in BDT)*		
≤20,000	115	20.3
20,001-40,000	162	28.6
40,001-70,000	172	30.4
>70,000	117	20.7

¥ Total for each variable may not be equal to n=573 due to missing values

* BDT = Bangladeshi Taka (local currency); 10,000 BDT = 121.14 USD as of October 23, 2017

Common environmental barriers

Nearly two-third of the participants (62%) were in agreement (agree + strongly agree) with perceiving poor street lighting at night as an environmental barriers to PA. The next most common barriers were lack of convenient places for PA (56%) and poor condition of the footpaths (54%). Just under half of the participants agreed (agree + strongly agree) that heavy neighbourhood traffic (48%) was a barrier. Approximately one-third of participants agreed that lack of safety (36%) and unclean/untidy neighbourhood (33%) were environmental barriers to PA. Less than one-third (29%) of the participants agreed that poor weather was a barrier to PA. Figure 1 shows that more females than males agreed that poor street lighting (74% vs 51%), lack of convenient places for PA (65% vs 49%) and lack of safety (55% vs 20%) were barriers to PA.

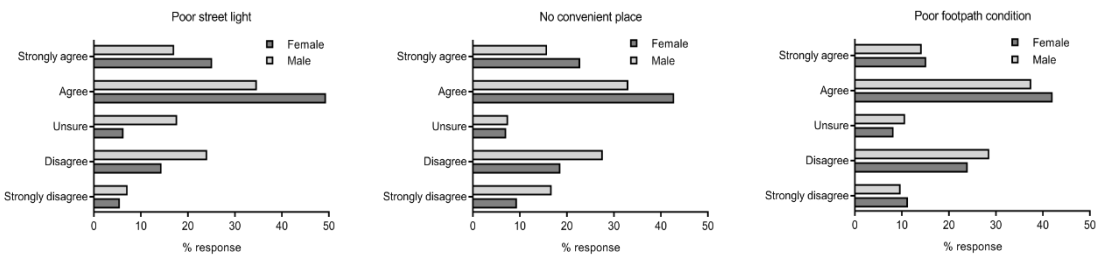

Figure 1. Distribution of responses to barriers to physical activity across five of the response categories as percentage, by gender, Dhaka, Bangladesh, 2015

Gender differences in perception of environmental barriers

Females were over four times more likely than males to perceive lack of neighbourhood safety ($p<.001$) as a barrier to PA after adjusting for BMI, age group, mother's education, father's education, living arrangement, and housing type. As shown in Table 2, females were nearly three times more likely than males to perceive poor street lighting at night ($p<.001$) and two times more likely to perceive lack of convenient places for PA ($p<.001$) as a barrier to PA after adjusting for their corresponding set of confounders. Females were also significantly more likely than males to perceive lack of neighbourhood cleanliness/tidiness ($p=.002$) and poor weather ($p=.012$) as barriers to PA after adjusting for their corresponding set of confounders as listed in Table 2.

Table 2. Logistic regression estimates of associations between perceived environmental barriers to physical activity and gender, adjusted for potential confounders, in young adults, Dhaka, Bangladesh, 2015

Perceived environmental barrier[#†]	**Unadjusted OR for females (Ref: male)**	**95% CIs**	**Adjusted OR for females (Ref: male)**	**95% CIs**	***p-value***
It is not safe to walk in my neighbourhood [a]	4.85	3.35 - 7.01	4.65	3.09 - 7.00	**<.001**
Streets are not well lit during night in my neighbourhood [b]	2.72	1.91 - 3.88	2.82	1.95-4.11	**<.001**
There are no convenient places nearby [c]	2.00	1.43 - 2.81	2.04	1.39-3.00	**<.001**
My neighbourhood is not clean and tidy [d]	1.76	1.24 - 2.50	1.84	1.25-2.72	**.002**
Weather is often too bad to do physical activity [e]	1.54	1.07 - 2.21	1.61	1.11-2.33	**.012**
The footpaths are not in good condition in my neighbourhood [f]	1.25	0.90 - 1.74	1.29	0.90-1.84	.165
There is heavy traffic in my neighbourhood [g]	1.11	0.80 - 1.54	1.09	0.77-1.53	.625

[#]Response to barriers were dichotomised as agreement (agree + strongly agree) and non-agreement (strongly disagree + disagree + unsure)

[†] Each model is adjusted for confounders having a univariate association with the corresponding perceived barrier items at p≤.1.

[a] Adjusted for BMI, age group, mother's education, father's education, living arrangement, and housing type

[b] Adjusted for mother's education and employment status

[c] Adjusted for age group, university type, father's education, monthly family income, living arrangement, and housing type

[d] Adjusted for university type, monthly family income, living arrangement, and housing type

[e] Adjusted for age group, university type, and living arrangement

[f] Adjusted for university type, mother's education, father's education, and living arrangement

[g] Adjusted for and father's education and housing type

CI=Confidence intervals

Discussion

This study identified common perceived environmental barriers to PA in an urban sample of young adults in Bangladesh. The findings are consistent with a growing body of literature exploring environmental barriers to PA in LMICs (3, 11, 13, 21, 22). This study indicates that perceptions of environmental barriers to PA may differ by gender; with females

more likely than males to report environmental barriers. Safety and convenience were particularly salient issues for young adult females.

Poor street lighting was the most commonly reported environmental barrier to PA, with females more likely to report this than males. Asian urban adults have previously reported sufficient street lighting as a positive influence on PA (21). Enough street lighting is very important from a safety perspective, as it is likely to increase visibility, help identification of roadway obstacles, minimise slip and trip hazards, and thus enable safe walking/cycling. Street lighting may also be important for travel to and from PA opportunities (e.g., sports, training, fitness centres) at night. People may perceive it unsafe to be in a street which has poor lighting because of the possibility of being a victim of crime (e.g., mugging).

Consistent with a previous study in a sample of university students in Nigeria (3), we found that perceived neighbourhood safety was more salient to females than males. In Bangladesh, females tend to avoid walking (which could be for exercise or to get to and from PA), even in daylight, because they perceive themselves as vulnerable to crime (15). As walking is the most common form of PA undertaken in neighbourhood streets and public open spaces (24), ensuring females feel secure to walk in their neighbourhood is important. Neighbourhood safety may also impact on outdoor activities (e.g., sports) or use of public PA facilities e.g., parks. Improving neighbourhood safety is a multidisciplinary issue that involves infrastructure, local policing and participation of the local community.

More than half of the participants perceived that they did not have a convenient place nearby for PA. Consistent with a recent study in Bangladeshi adults (14), we found more females than males reported the lack of convenient places as an environmental barrier to PA. This could include places such as parks or other open space suitable for walking or jogging, sports clubs, fitness centres and gyms. In LMICs, lack of access to recreational facilities such as parks is one of the most consistently identified environmental barriers to PA (13, 16). Parks

are an important recreational setting (25), and may offer facilities for PA and foster increased PA participation. Dhaka, as one of the most densely populated cities in the world, however, offers few green or public open spaces. According to the WHO, the city has a 0.052 square metres of green space per capita, well below the recommendation of nine square metres per capita set by the WHO (18). Given the large population and limited space, it would be a major challenge for the policymakers to introduce more green space in the city. However, policymakers could consider other opportunities for convenient places to do PA e.g., improving the university PA infrastructure, offering free PA equipment for home use, and creating indoor PA facilities in local residential areas.

More than half of the participants reported the poor condition of footpaths as a barrier to PA, with no statistically significant gender differences. However, females were more likely than males to report lack of neighbourhood cleanliness or tidiness as barrier to PA. In general, the poor condition of walkways and local areas is likely to offer less aesthetically pleasant neighbourhoods, which can preclude people from walking and using local facilities for activity (3). Many footpaths in the city remain inaccessible mainly due to the dumping of construction materials, illegal motor vehicle parking, temporary shops, and street vendors (26). This may be particularly important for females who are more likely to do walking within the close proximity of their neighbourhood because of safety and convenience issues (24).

Nearly half of the participants reported heavy traffic as an environmental barrier to PA, with no significant gender differences. Heavy traffic is a subjective perception, such as feeling unsafe crossing a road (27). Evidence related to unsafe traffic conditions (e.g., heavy traffic) and its relationship with PA is inconsistent in general population studies in LMICs (3, 22). The roads in Dhaka city are often highly congested. Motorists are unlikely to obey traffic laws; they often do not share the road responsibly or follow lanes, drive on the wrong side of the road, and violate regulatory signs and traffic lights (28). Non-motorised vehicles used for public

transport such as rickshaws share roads with motorised vehicles, even on highways, and are likely to contribute to traffic congestion in the city. The heavy traffic system in urban areas of Bangladesh, especially in Dhaka, may discourage people from walking or bicycling during leisure time or for active commuting. Heavy traffic may also discourage people from travelling to PA opportunities (e.g., fitness centre, sports, training) because of the time, stress and inconvenience involved.

According to the most recent estimates, Dhaka is ranked as the densest city in the world with 44,100 people per square kilometre (29). Given such a high population burden, traffic congestion may be unavoidable in the city. With existing resources, law-enforcement strategies are needed to ensure motorists obey traffic laws; and increase pedestrian/cyclist safety. Awareness campaigns using mass media such as television, social media, and print media can be useful to build awareness about road safety. Urban planners may consider road pricing and road space rationing (vehicle use rotation), introducing fees to enter heavy traffic areas, and car-free weekends to mitigate traffic congestion. Due to insufficient public transport in the city, there is a high demand of rickshaws among urban dwellers which also contributes to traffic congestion. Measures such as increasing the number of buses on the road, and restricting rickshaws to local areas may be useful to address this issue. Separate bicycle lanes can be useful to improve cyclists' safety, but also may not be pragmatic with the existing urban infrastructure of Dhaka city. Most of the existing roads are not wide enough and in most of the places, the buildings are within close proximity of the roads, leaving little or no space for additional lanes for bicycles. However, for the suburbs around the city, which are going through an urban transformation, separate bicycle lanes could be included to promote active transport.

Poor weather had the lowest level of agreement in our study, with only one-third of participants perceiving it as a barrier. This is inconsistent with a study of environmental barriers to PA in university students in Kuwait (12). Bangladesh has a subtropical monsoon climate:

Although there is seasonal rainfall, high temperature and humidity during summer in Bangladesh, the overall climate is significantly different from countries in the Arabian Gulf region, which are often characterised as having a long, hot and humid summer (12). However, consistent with the Kuwait study (14), we found that females were more likely than males to report poor weather as a barrier. Indoor (climate controlled) PA facilities may promote PA in young females in Bangladesh.

This is the first study to assess perceived environmental barriers to PA in a large sample of young adults in Dhaka, Bangladesh. The study had some limitations. The cross-sectional design does not allow determination of causality. We used a convenience sample of university students from a large metropolitan city which may not be generalisable to other young adults of the country. Self-reported questionnaires to measure environmental barriers may have been subject to bias and individual interpretation; e.g., although a student may live in a relatively quiet residential area, s/he may report neighbourhood traffic as very high. However self-report is a common means to understand these perceived barriers (30). This study did not report on PA level, and if perceived environmental barriers were actually (negatively) associated with actual PA participation. It is possible, for example, that those participants who were physically active reported more barriers as they may be more likely to experience them than those who are inactive. Therefore, future studies could use longitudinal assessment, include objective environment measurement, and examine links between reported barriers and PA participation. We assessed a limited number of environmental factors, and so cannot report on other potential environmental barriers such as poor street connectivity, lack of accessible bicycle paths, lack of accessible health clubs and unattended dogs. The potential barriers we assessed may not have been relevant to all types of PA, and may not have addressed all local specificities relevant to PA barriers.

Conclusions

We identified some specific environmental factors commonly perceived as barriers to PA by young adults in urban Bangladesh and found females reported more barriers than males. The main environmental barriers to PA were the lack of neighbourhood safety, poor street lighting at night and lack of convenient places nearby for PA. These issues may be particularly salient to females. This study underscores the need for local, safe and convenient PA opportunities for young adults in this area. Future research could focus on population-based studies including representative samples from regional and metropolitan areas to better understand how the environment may influence PA participation of young adults in Bangladesh.

Authors' statements

Authors' disclaimers

Not applicable

Authors' contributions

All authors collaborated on the study concept, study materials and implementation and interpretation of results. RU collected and analysed data and led the manuscript; NWB contributed to the manuscript; AK analysed data and contributed to the manuscript. All authors have read and approved the final version of the manuscript, and agree with the order of presentation of the authors.

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Competing interests

None declared.

Ethical approval

Ethics approval was obtained from The University of Queensland Behavioural and Social Sciences Ethical Review Committee, Australia (Ref: 2015000860, Amendment-31/07/2015). Written informed consent was obtained from all study participants.

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