HEALTH PROMOTION

Population-based cross-sectional study of the correlation of physical inactivity and sedentary behaviour with sociodemographic factors among Bangladeshi adults

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Keywords

Sedentary behaviour • Physical activity • Bayesian regression model • GPAQ • Bangladesh

Summary

Background. *Physical inactivity and sedentary behaviour are influenced by various interconnected variables. In Bangladesh, studies on physical inactivity and sedentary behaviour are scarce, regardless of age in the adult population. This study aims to determine the correlates of adults' physical inactivity and sedentary behaviour with sociodemographic factors, including gender, age, residential, educational, and occupational status.*
Methods. *This is a secondary analysis of a cross-sectional survey conducted from February to May 2018 across eight divisions of Bangladesh. Global Physical Activity Questionnaire was used to measure physical inactivity and sedentary behaviour. The data consisted of 8,185 adults aged 18 to 69 years. The Bayesian regression model was used to analyse the correlates.*
Results. *Physical inactivity, including work, active transport, and recreation, males and urban residents were more likely to be inactive than their female counterparts and rural residents. Married adults had greater (Odd Ratio [OR]: 6.6, 95% CI: 5.46 to 7.98) recreation-related physical inactivity. Unemployed adults were more likely to engage in sedentary behaviour (OR: 4, 95% CI: 2.48 to 6.12) and less likely to engage in moderate physical activity (OR: 2.2, 95% CI: 1.43 to 3.39).*
Conclusions. *A notable pattern of insufficient recreational physical activity among adults in Bangladesh was noted. Establishing nationwide surveillance systems to detect physical activity and sedentary behaviour trends to evaluate potential interventions for improving physical activity and reducing sedentary behaviour. Expanding school-based physical activity programs help children and adolescents learn lifelong healthy behaviours. Community sports programs for all ages promote active living.*

Introduction

Physical inactivity and sedentary behaviour are adversely associated with health and quality of life [1, 2]. Inadequate physical activity and sedentary behaviour are major risk factors for non-communicable diseases [3]. Physical inactivity is the fourth leading risk factor for mortality [4]. Globally, physical inactivity is attributed to 3.2 million deaths and 32.1 million disability-adjusted life years annually [4]. Worldwide, the healthcare costs of physical inactivity are estimated at $538 billion, burdening healthcare systems and societies [5]. Similarly, sedentary behaviour accounts for 3.8-5.9% of all deaths due to prolonged sitting time [6-7]. Diseases that correlate with sedentary behaviour cost to the British healthcare system GBP 761.80 million [8] and the Australian $170 million [9]. Several socio-demographic factors have been associated with physical inactivity and sedentary behaviour. Physical inactivity and sedentary behaviour are distinct but interconnected components in developing non-communicable diseases. Most studies attempt to quantify the prevalence of physical activity [10, 11]. Although several studies investigated the relationship between physical activity and socio-demographic factors [12-4], most studies focused on specific population groups, including adolescents and older people, and have a small sample size, which limits the generalizability of the findings [13, 14]. Additionally, previous studies have limited focus on the correlates between different types of physical activity intensity, sedentary behaviour, and sociodemographic factors in adults in Bangladesh using a nationally representative adult population [12, 13]. Forms of physical activity include work, active transportation, recreation, and types of intensity refer to moderate and vigorous physical activity. Besides, a recently published review reported Bangladeshi physical activity and sedentary behaviour, with insufficient evidence of sedentary behaviour [15]. In a recent study, recreation-related activities had the highest frequency of physical inactivity, followed by lack of vigorous

activity, active transport, and work [16]. This study lacks the identification of socio-demographic correlates with physical inactivity and sedentary behaviours among adults in Bangladesh [16]. In addition, the study did not examine whether the results differed by gender, between rural and urban residents, or by level of socio-economic status [16]. Thus, our study aims to: 1) provide the correlates of different types of physical inactivity and sedentary behaviour and 2) how study findings differed by gender, location (rural or urban), or socio-economic status in adults in Bangladesh using nationally representative data from the STEPS Survey 2018. Study findings enable policymakers to design an effective public health policy intervention to improve physical activity levels and reduce sedentary behaviour, reducing the prevalence of non-communicable diseases and alleviating their individual, familial, and socio-economic impacts.

Methods

This study followed the STROBE checklist provided in the supplementary file, Table I.

Participants and public involvement

The study did not involve human subjects. The current investigation comprehensively examined a secondary dataset from the STEPS Survey 2018 [17].

Study design, setting and population

Data collection for the STEPS Survey 2018 was completed from February to May 2018 across eight divisions of Bangladesh. This was a nationwide cross-sectional survey. The primary sampling units (PSUs) of the Bangladesh Bureau of Statistics census used a multistage sampling method. This is a regionally stratified probability-based sampling process. The study population consisted of adults, including older adults aged 18 to 69, who had lived at home for at least six months and were present during the night before the survey. The adults were eliminated from the study if they lived in military bases or group quarters, jails, healthcare facilities, nursing homes, or other similar institutions; if they were deemed fragile, unstable, or physically unfit; or if they were reluctant to engage in the study.

Sample size

The sample size was calculated to ensure the generalizability and reliability of the study findings for the total number of targeted adults in the country. The calculated sample size was adequate to give valid estimates for all variables for males, females, and four age groups (18 to 24, 25 to 39, 40 to 54, and 55 to 69). The sample size was determined by the prevalence of non-communicable disease's risk factors, the relative accuracy rate (20%), and survey practicality.

Based on obesity prevalence, each group needed 472 adults for a successful analysis. The Bangladesh Demographic Health Survey had a 10% non-response rate for individuals, 10% non-coverage rate for households and design effect of 2 were considered. Therefore, the final sample size was calculated with a 20% non-response rate. Initially, 496 PSUs updated in 2017 were examined. One PSU from fieldwork had to be dropped due to inaccessibility. Therefore, 9,900 adults from 495 PSUs comprised the modified sample size.

Sampling frame and Sampling strategy

The Bangladesh Bureau of Statistics' completed list of PSUs – including type of home, location, and anticipated number of households – was included in the sample frame. The study identified 293,533 PSUs: 65,193 urban and 228,340 rural. Bangladesh Bureau of Statistics household lists were used for sampling. Twenty houses from every PSU were randomly assigned either "male" or "female" in an equal ratio. One adult was randomly selected among a household's eligible adults. To avoid bias, preselected families were not replaced during implementation. PSUs were distributed evenly across divisions (62 each), including rural and urban strata (248 each). Household numbers served as the organising PSUs in both urban and rural strata. By using probability proportional to size sampling, each stratum identified 31 PSUs.

Data collection and quality control

A pretested, standard WHO STEPS questionnaire (version 3.2) with all core questions, including several extended and country-specific items, was used to collect data. The Bengali questionnaire was verified by translation and reverse translation. The data was collected in three steps: STEP 1 was face-to-face interviews, STEP 2 was physical measurements, and STEP 3 was blood and urine samples. Android devices obtained data on-site and uploaded it to the cloud using ODK software. Quality control includes daily data review and field monitoring.

Data management and processing

The ODK software was used to input data on personal digital assistants. The ONA database server received the information electronically. The field data collector uploaded daily data to the server. The central office downloaded the data into Microsoft Excel for consistency and validity checks. They combined each adult's personal identification number, and the QR code allowed for integrating data from STEP-1, STEP-2, and STEP-3. The data cleaning process adhered to the WHO STEPS guidelines.

Variables of physical inactivity and sedentary behaviour

The WHO defines physical inactivity as failure to meet the minimum weekly moderate (150 minutes), vigorous (75 minutes), or both exercise requirements [18]. The GPAQ examined three physical activity domains: recreational, work-related, and active transportation-related inactivity. The physical activities were measured

Tab. I. Association of physical inactivity sedentary behaviour with sociodemographic factors for adults in Bangladesh, 2018 (n = 8185).

Characteristics			WHO recommended PA OR (95% CI)	Work-related PA OR (95% CI)	Active transport-related PA OR (95% CI)	Recreation-related PA OR (95% CI)	Moderate PA OR (95% CI)	Vigorous PA OR (95% CI)	Sitting > 8 hours per day OR (95% CI)
Gender	Women	Yes	Ref						
		No	0.86 0.76, 0.98	0.73 0.65, 0.82	0.83 0.76, 0.91	0.78 0.64, 0.85	0.71 0.64, 0.79	0.83 0.76, 0.92	1 0.82, 1.37
	Men	Yes	Ref						
		No	1.1 1.02, 1.30	1.3 1.21, 1.53	1.2 1.08, 1.30	1.3 1.16, 1.55	1.4 1.25, 1.56	1.1 1.08, 1.31	0.95 0.74, 1.19
Age	18-29	Yes	Ref						
		No	0.93 0.81, 1.06	1 0.92, 1.22	1.1 1.01, 1.25	0.95 0.80, 1.11	1 0.93, 1.19	1 0.92, 1.15	0.950 0.69, 1.25
	30-44	Yes	Ref						
		No	0.6 0.86, 1.09	0.97 0.87, 1	0.88 0.80, 0.96	0.99 0.84, 1.14	0.97 0.87, 1.07	0.98 0.89, 1.076	0.85 0.65, 1.08
	45-59	Yes	Ref						
		No	1 0.91, 1.19	0.94 0.83, 1	1 0.94, 1.15	1 0.86, 1.18	0.94 0.84, 1.06	1 0.91, 1.12	1 0.72, 1.32
	60-69	Yes	Ref						
		No	1.2 0.95, 1.54	1.1 0.88, 1.38	0.99 0.82, 1.16	1.1 0.88, 1.45	1.1 0.91, 1.39	0.93 0.77, 1.1	1.8 1.22, 2.63
Residence	Rural	Yes	Ref						
		No	0.99 0.88, 1.12	0.92 0.82, 1.04	0.91 0.83, 0.99	0.98 0.84, 1.12	0.91 0.82, 1.01	0.90 0.81, 0.98	1 0.81, 1.33
	Urban	Yes	Ref						
		No	1 0.89, 1.12	1 0.96, 1.2	1 1, 1.19	1 0.89, 1.18	1 0.97, 1.20	1.1 1.00, 1.21	0.96 0.74, 1.24
Educational status	High School	Yes	Ref						
		No formal education	0.61 0.53, 0.70	0.59 0.50, 0.67	0.90 0.81, 0.99	1.8 1.50, 2.16	0.93 0.83, 1.04	0.48 0.43, 0.53	0.98 0.75, 1.28
	College/ university	Yes	Ref						
		No formal education	0.78 0.64, 0.95	0.93 0.75, 1.14	0.75 0.64, 0.87	1.1 0.84, 1.46	1.1 0.97, 1.36	0.66 0.57, 0.77	0.990 0.63, 1.44
Occupation	Student	Yes	Ref						
		No	0.63 0.47, 0.83	2 1.34, 3.02	1.6 1.24, 2.13	0.86 0.54, 1.27	2.1 1.51, 3.17	1.3 1.04, 1.76	1.4 0.76, 2.39
	Unemployed	Yes	Ref						
		No	1 0.70, 1.4	2 1.29, 3.28	0.89 0.68, 1.17	0.53 0.29, 0.88	2.2 1.43, 3.39	0.71 0.50, 0.97	4 2.48, 6.12
	Employed	Yes	Ref						
		No	1.2 0.99, 1.51	0.52 0.38, 0.68	0.90 0.73, 1.08	1.4 1.04, 2.0	0.52 0.40, 0.67	0.96 0.78, 1.15	0.43 0.30, 0.63
Marital status	Never married	Yes	Ref						
		No	0.91 0.72, 1.14	0.57 0.47, 0.70	2.6 2.08 3.23	0.15 0.12, 0.18	0.78 0.64, 0.96	2.1 1.80, 2.51	1.3 0.84, 2.02
	Married	Yes	Ref						
		No	1.1 0.88, 1.3	1.7 1.41, 2.1	0.39 0.30, 0.48	6.6 5.46, 7.98	1.2 1.04, 1.55	0.46 0.39, 0.55	0.77 0.49, 1.20

PA: Physical Activity; OR: Odds Ratio; CI: Credible Interval, Ref: Reference value.

at a moderate and vigorous level. However, a study reported that sitting for more than 8 hours significantly increased the risk of non-communicable diseases and all-cause mortality [19]. So, in this study, "sedentary behaviour" refers to sitting for more than eight hours per day. Further details of the formulation of physical inactivity variables are provided in the supplementary file, Table II.

Data Analysis

The weighted data accounts for PSU, household, sex, and individuals, as if household member selection probability reflects individual Bangladesh. Missing data was included in the analysis. Therefore, among the target adults of 9,900, 8,185 (82.7%) completed STEP-1 and were included in the study.

Descriptive statistics were utilised to provide an overview of the sample's characteristics. This study used a widely accepted Bayesian regression model. This model offers viable results and yields significant improvements in parameter estimation compared to other statistical models [20]. Therefore, Bayesian linear regression analysis examined the associations between physical activities and sedentary behaviour with sociodemographic characteristics, including gender, age, education level, residence, occupation, and marital status. The degree of correlation was determined using the odd ratio (OR). Outcome measures and group differences were calculated at a 95% credible interval (CI). If the 95% credible interval did not contain 0, then the findings were considered significant. Statistical analysis was conducted in STATA version 17 (StataCorp LLC, College Station, TX, USA).

Results

Physical inactivity and sedentary behaviour

The total number of participants in the study was 8,185. The highest number of participants were assessed as physically inactive considering the recreational (n = 7,331), vigorous (n = 5,708), and active transport-related (n = 3,078) physical activities, as shown in Figure 1. Recreation-related physical inactivity was seen among women in the rural area of Mymensingh district, Bangladesh, as shown in Figure 2.

Physical inactivity and sociodemographic factors

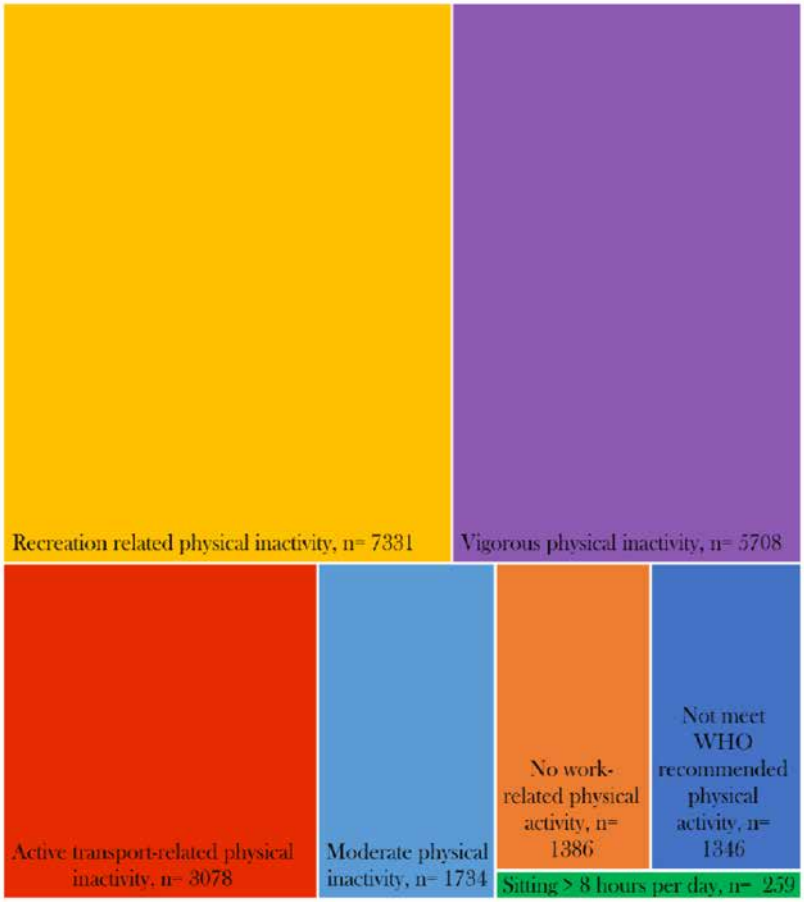
Bayesian linear regression found that inadequate physical activity levels were linked to sociodemographic factors (Tab. I). Across all forms of physical inactivity, including work, active transport, and recreation-related inactivity, males and urban residents were more likely to be inactive than their female counterparts and rural residents. Adults aged 60-69 years were less likely to engage in any physical activity except active transportation-related and vigorous activities such as carrying or lifting heavy objects, engaging in construction work, washing clothes, reaping

Tab. II. Correlates of physical inactivity sedentary behaviour with sociodemographic factors for adults in Bangladesh, 2018 (n = 8.185).

Characteristics			Sitting > 8 hours per day OR (95% CI)
Gender	Women	No	
		Yes	1 0.82, 1.37
	Man	No	
		Yes	0.95 0.74, 1.19
Age	18-29	No	
		Yes	.095 0.69, 1.25
	30-44	No	
		Yes	0.85 0.65, 1.08
	45-59	No	
		Yes	1 0.72, 1.32
	60-69	No	
		Yes	1.8 1.22, 2.63
Residence	Rural	No	
		Yes	1 0.81, 1.33
	Urban	No	
		Yes	0.96 0.74, 1.24
Educational status	High School	No formal education	
		Yes	0.98 0.75, 1.28
	College/ university	No formal education	
		Yes	0.99 0.63, 1.44
Occupation	Student	No	
		Yes	1.4 0.76, 2.39
	Unemployed	No	
		Yes	4 2.48, 6.12
	Employed	No	
		Yes	0.43 0.30, 0.63
Marital status	Never married	No	
		Yes	1.3 0.84, 2.02
	Married	No	
		Yes	0.77 0.49, 1.20

PA: Physical Activity; OR: Odds Ratio; CI: Credible Interval; Ref: Reference value.

Fig. 1. Treemap of physical inactivity and sedentary behaviour of Bangladeshi Adults, 2018.



paddy, and fishing with nets. Active transportation was associated with greater inactivity in the younger (18-29 years) group (Odd ratio [OR]: 1.1; 95% CI: 1.01, 1.25). Insufficient vigorous physical activity was seen among never-married adults (OR: 2.1; 95% CI: 1.80, 2.51). Inadequate participation in recreation-related physical activity was more likely (OR: 1.8; 95% CI: 1.50, 2.16) in those who had completed high school or less than in those with no formal education. Diverse positive relationships were observed among the different occupational groups. Among all other occupations, unemployed adults had a greater odd ratio of moderate physical inactivity (OR: 2.2; 95% CI: 1.43, 3.39). Students were inactive in moderate (OR: 2.1; 95% CI: 1.51, 3.17), work-related (OR: 2, 95% CI: 1.34; 3.02) and vigorous physical activities (OR: 1.3, 95% CI: 1.04; 1.76). Although the positive odd ratio for having all forms of insufficient physical activity increased across marital status, married adults were 6.6 times less likely (95% CI: 5.46, 7.98) to engage in recreation-related physical activity compared to respondents who had never married.

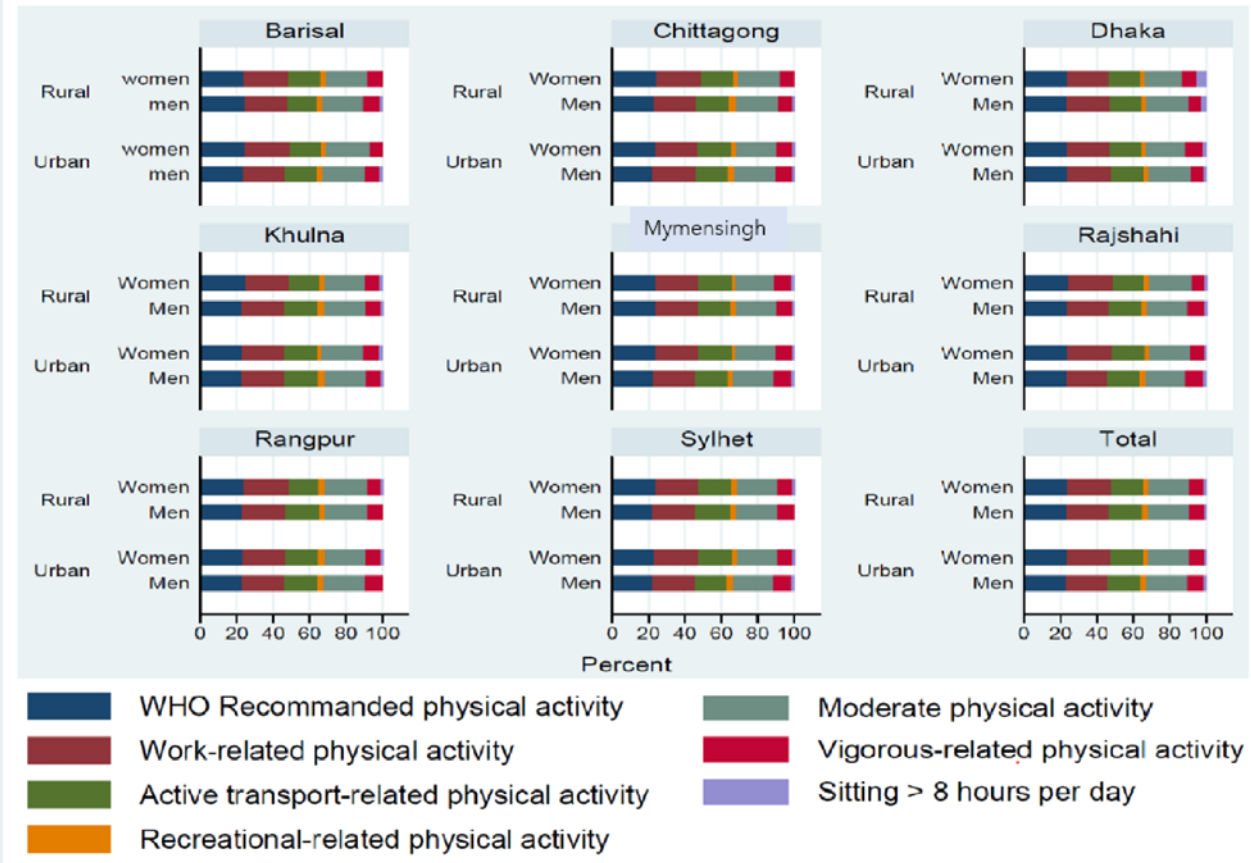
Sedentary behaviour and sociodemographic factors

The findings of a Bayesian linear regression study demonstrated an association between sedentary behaviour (characterised as sitting for more than eight hours a day) and the sociodemographic factors presented in Table II. Overall, adults who self-identified as unemployed were four times (95% CI: 2.48, 6.12) more likely to report higher levels of sedentary behaviour than those who self-identified as employed or students. Aged adults (60–69 years) were found to have 1.8 times (95% CI: 1.22, 2.63) higher sedentary behaviour compared with adults aged 18–59. Never-married adults have higher odds (OR: 1.3, 95% CI: 0.84, 2.02) of spending more than 8 hours sitting per day compared to married ones.

Discussion

This study reports the correlates of different forms of physical activity for different intensity and sedentary behaviour with sociodemographic factors for nationally representative adults in Bangladesh. Overall, insufficient physical activities were found to have positive associations with all sociodemographic factors. Importantly, higher associations were observed in recreation-related physical inactivity among married adults. Subsequently, this study confirmed that unemployed adults were less likely to engage in moderate physical activity. The current study also found that unemployed adults were more likely to be sedentary.

Fig. 1. Treemap of physical inactivity and sedentary behaviour of Bangladeshi Adults, 2018.



Recreational physical activities are less common and familiar in Bangladesh than developed countries. Our study found that married adults were remarkably less active in recreational physical activity. Similar trends were observed among Brazilian married adults [21]. A recent review revealed that the contribution of Bangladeshi adults participating in recreational physical activity was minimal [15]. Previous studies reported that participating in moderate or vigorous recreational physical activity significantly lowered the risk of metabolic syndrome and cardiovascular mortality [22, 23]. In Bangladesh, the prevalence of metabolic syndrome was 30.0%, and the risk of low-level cardiovascular disease was 37.8% [24, 25]. For this reason, efforts are focused on national and regional campaigns to promote the benefits of physical activity and encourage movement in daily life. Investing in infrastructure like bike lanes, walking trails, and parks will make staying active easier and safer [26]. Additionally, partnerships with sports organisations will enhance community engagement in sports [26].

In developing countries such as Bangladesh, unemployment predisposes adults to poor lifestyles and limits physical activity. Concurrent with this, our study found a lack of moderate physical activity among unemployed adults. This finding corresponded to an Irish survey, which found that unemployed adults had a higher association with physical inactivity [27]. The unemployment rate in Bangladesh was 5.3% [28]. Unemployment is also inseparable from demotivation, isolation, and lack of interest and their mental health consequences [29], which could hamper engagement in physical activity. Targeted interventions should promote physical activity among unemployed adults by addressing challenges like demotivation and isolation. Providing social support and accessible exercise opportunities can help reduce the adverse effects of unemployment [30]. Additionally, combining mental health support with these programs may enhance participation and well-being [30].

This study provides evidence that physical inactivity tends to increase with age. Specifically, adults aged 60 and older exhibit lower levels of recreational, work-related, and moderate physical activity than those aged 18 to 59. This trend aligns with findings from low- and middle-income countries, such as Bangladesh [12] and is further supported by cross-sectional and prospective studies conducted in developed nations [31, 32]. Community-based sports initiatives should be launched to improve physical activity across all age groups [30]. These initiatives could include organized events, local sports leagues, and free or low-cost classes held in public spaces, all aimed at encouraging participation from individuals of all ages [30].

Adults with high school education were less likely to be classified as inactive in following to perform recreation-related activities than those with no formal education.

Similarly, a study conducted among university students in the capital of Bangladesh reported a relatively moderate level of recreational physical activity [32]. Furthermore, older adults with secondary education were more likely to meet physical activity recommendations than those with elementary or incomplete education [33]. While higher education increases the likelihood of participating in sports or exercise, it does not significantly impact involvement in recreation-related activities [34]. In addition, studies [34-37] indicated that education level influences the age-physical activity relationship, with educational discrepancies in physical activity widening with age. These findings suggested that effective intervention strategies are needed to promote physical activity from the school-age years [30]. Fostering more physical activity among children and adolescents helps prevent non-communicable diseases and reduces the economic burden on society and individuals [30]. Therefore, expanding school physical activity programs is crucial to provide children and adolescents with regular opportunities for sports and physical activities [30].

Sedentary behaviour, in general, was more likely to be reported among unemployed adults, older adults, and adults who had never married, as confirmed in this study. This study also confirmed that adults with more than a high school education were less likely to adopt sedentary behaviour. Comparable to our study, the unmarried, unemployed, and older Japanese adults were more sedentary behaviour [30]. A meta-analysis reported that being sedentary for more than 6-8 hours per day increases the risk of death from all causes and cardiovascular disease [35]. The findings of this study indicated a relatively significant correlation between employment, age, marital status and sedentary behaviour. Given this finding, if appropriate measures were not taken, there is going to be a potential rise of non-communicable diseases and an increased economic burden among the Bangladeshi population. Therefore, promoting community-based sports programs for all ages, including unemployed adults and adults who have never married, is essential in reducing the time individuals spend sitting and increasing physical activity.

This is the first study to compare a broad form of physical inactivity and its intensity type with sedentary behaviour among Bangladeshi adults. The other strength is the inclusion of a large sample size. The limitations of this study are: 1) it restricted causal inferences concerning the postulated determinants and concomitant physical inactivity behaviour, and 2) the likelihood of inaccurate physical activity information causing recall bias may exist using IPAQ.

Based on the study findings, we have proposed several recommendations. 1) Bangladesh faces a significant gap in its public health infrastructure due to the lack of a comprehensive surveillance policy for tracking physical activity and sedentary behaviour. This absence makes it challenging to accurately assess the physical activity levels and implement effective interventions for healthier lifestyles. The Ministry of Social Welfare should prioritise developing a robust surveillance system to periodically collect data on physical activity across different demographics. This would help policymakers understand the extent of physical inactivity and associated health risks, such as cardiovascular diseases. A surveillance framework would enable the government to track changes, evaluate public health initiatives, and tailor interventions for at-risk groups. In addition, it could facilitate collaboration with international health organisations, aligning Bangladesh's strategies with global best practices. Investing in this system is crucial for promoting a healthier, more active population and improving overall well-being. 2) Developing community-tailored physical activity lifestyle studies involving moderate and vigorous activity. 3) A longitudinal study to further investigate the impacts of physical inactivity and sedentary behaviour on different socio-demographic categories among adults in Bangladesh.

Conclusions

Insufficient recreational physical activity is positively associated with all sociodemographic factors, particularly among married and employed adults. Bangladeshi adults should be more habitual with recreational and vigorous physical activity and lower their sedentary behaviour. A comprehensive approach to this challenge includes key strategies such as establishing national surveillance systems to monitor physical activity and sedentary behaviour, which will help track trends and evaluate interventions. Expanding school-based physical activity programs is crucial for building lifelong healthy habits in children and adolescents. Promoting community sports programs for all ages also fosters a culture of active living.

Acknowledgements

The authors express gratitude to the WHO for granting access to their survey data and to the STEPS country team (National Institute of Preventive and Social Medicine) in Bangladesh for organising and executing the survey.

Ethics approval

Since this study utilized a secondary dataset from the WHO, it was exempt from the need for any kind of ethical review.

Consent to participate

Not applicable.

Consent for publication

Not applicable.

Availability of data and material

Data is available at: https://apps.who.int/iris/handle/10665/332886.

Code availability

Not applicable.

Conflicts of interest statement

The authors have explicitly stated that they have no known financial interests or personal affiliations with third parties that could potentially impact the outcome of this study.

Authors' contributions

MJK: Conceptualization; Data curation; Formal analysis; Investigation; Resources; Software; Validation; Visualisation; Roles/Writing-original draft; and Writing-editing. SJW: Validation, and Writing-review & editing. PK: Validation, and Writing-review & editing. SK: Data curation; Formal analysis; Resources; Software; Visualisation; and Writing-review & editing. BG, MUA and SMMH**:** Validation, Writing-review & editing.

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Received on May 9, 2024. Accepted on February 5, 2025.

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How to cite this article: Khan MJ, Kannan P, Ganesan B, Khatun S, Ali MU, Hasan SMM, Winser SJ. Population-based cross-sectional study of the correlation of physical inactivity and sedentary behaviour with sociodemographic factors among Bangladeshi adults. J Prev Med Hyg 2025;66:E45-E55. https://doi.org/10.15167/2421-4248/jpmh2025.66.1.3275

Supplementary material

Tab. S1. STROBE Statement – checklist of items that should be included in reports of observational studies.

	Item No.	Recommendation	Page No.
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2
Objectives	3	State specific objectives, including any prespecified hypotheses	3
Methods			
Study design	4	Present key elements of study design early in the paper	3
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	3
Participants	6	(a) Cohort study—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up Case-control study—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls Cross-sectional study—Give the eligibility criteria, and the sources and methods of selection of participants	3
		(b) Cohort study—For matched studies, give matching criteria and number of exposed and unexposed Case-control study—For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	4
Bias	9	Describe any efforts to address potential sources of bias	
Study size	10	Explain how the study size was arrived at	4
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	6
		(b) Describe any methods used to examine subgroups and interactions	
		(c) Explain how missing data were addressed	6
		(d) Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy	4
		(e) Describe any sensitivity analyses	
Participants	13*	(a) Report numbers of individuals at each stage of study-eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	5
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	
		(b) Indicate number of participants with missing data for each variable of interest	6
		(c) Cohort study-Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	Cohort study-Report numbers of outcome events or summary measures over time	
		Case-control study-Report numbers in each exposure category, or summary measures of exposure	
		Cross-sectional study-Report numbers of outcome events or summary measures	16

▶

Tab. S1 (follows). STROBE Statement – checklist of items that should be included in reports of observational studies.

	Item No.	Recommendation	Page No.
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	
		(b) Report category boundaries when continuous variables were categorized	
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done-eg analyses of subgroups and interactions, and sensitivity analyses	
Key results	18	Summarise key results with reference to study objectives	8
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	11
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	11
Generalisability	21	Discuss the generalisability (external validity) of the study results	8
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	11

Tab. S2. Questions account for variable formation from Global physical activity questionnaire.

Code	Questions
P1	Does your work involve vigorous-intensity activity that causes large increases in breathing or heart rate like carrying or lifting heavy loads, digging or construction work, reaping paddy, washing clothes, fishing by nets etc, for at least 10 minutes continuously?
P2	In a typical week, on how many days do you do vigorous-intensity activities as part of your work?
P4	Does your work involve moderate-intensity activity that causes small increases in breathing or heart rate such as brisk walking, carrying light loads, washing clothes for at least 10 minutes continuously?
P5	In a typical week, on how many days do you do moderate-intensity activities as part of your work?
P8	In a typical week, on how many days do you walk or bicycle for at least 10 minutes continuously to get to and from places?