Research paper

Short-term insomnia symptoms are associated with level and not type of physical activity in a sample of Indian college students

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Keywords

Exercise • Insomnia • Behaviour • Sleep • Physical activity

Summary

Objective. *There is diverse results on the association between physical activity and sleep. So this study investigated association of level and type of physical activity with short term insomnia among college students.*

Methods. *A cross sectional study was conducted among college students in India. The sample was 662 students with 359 males and 303 females. The predictor variables were type and level of physical activity and predicted variables were sleep complaints. Physical activity components were aseesesed through international physical activity questionnaire and sleep complaints using Pitsburg sleep questionnaire. The binary logistic regression models were used for data analysis. Level of significance was set at $p \leq 0.05$ for all the analysis.*

Results. *The age (mean ± SD) of the participants were 23.2 ± 3.5 years. The self reported symptoms of short trem insomnia such as global sleep quality (adjusted odds ratio(AOR) = 15.58), subjective sleep quality (AOR = 6.01), sleep latency (AOR = 5.09), sleep duration (AOR = 0.13), sleep disturbances (AOR = 4.88), day time sleep dysfunction (AOR = 5.59) had shown association with level of physical activity. There was no association of type of physical activity with any other predicted variables.*

Conclusions. *The findings of the present study supports that level of physical activity is a key predictor of short term insomnia symptoms among college students. There should be Interventions to maintain and improve the level of physical activity among students.*

Introduction

Sleep problems are a significant public health burden, with an impact both at individual as well as on the community level [1, 2]. The international classification of sleep disorders (ICSD3) identified short-term insomnia disorder as short-term trouble in initiating or maintaining sleep resulting in overall sleep dissatisfaction. The accompanying daytime symptoms with sleep disturbances happen in people with a conducive situation and opportunity at night for getting normal sleep. The reported one-year prevalence of short-term insomnia disorder is around 15 to 20% in the adult population [3]. There is scarcity of data available for prevelance of short term insomnia in university students. However a systematic review has shown insomnia prevelance of 18.5% in the university students, and its 7.4% higher than in the general population. Its being reported that 60% of college students have issues with sleep quality [4]. Sleep problems are the second leading cause affecting academic performance among this group [5]. Physical activity is vital for the maintenance of health. It confers numerous physical and psychological health advantages. It was observed that majority of the students at the university level are not sufficiently active [6]. Quality of life, work habits, and different facets of academic activities are associated with physical activity among college-going individuals [7-9].

Short-term insomnia is generally identified based on self-reported subjective symptoms [3]. Different questionnaires are available to quantify the magnitude of subjective sleep problems. The level of physical activity can also be quantified with the help of self-assessment questionnaires. The Pittsburg sleep quality index (PSQI) is one of the widely used questionnaires to evaluate sleep quality and insomnia. The scale assesses and measures symptoms, which are part of short-term insomnia disorder [10, 11]. The international physical activity questionnaire (IPAQ) is a reliable and valid tool to calculate the level of physical activity [12].

The relationship between physical activity and sleep can be bidirectional. Interventions to improve physical activity have resulted in improved sleep, but not the other way around [13]. The levels of physical activity

have shown mixed effects on various sleep parameters among collegiate students.A systematic review with meta analysis have found that modereate physical activity have shown better sleep quality in college students but its suggested that more studies are required in this area [14]. Differences in the methodology used in various studies made it difficult to compare the results.
It was reported by Štefan et al., that poor sleep quality and its domains leads to reduced levels of physical activity levels in young adults [15]. There are limited studies reporting the sleep problems among college students, in south Asian countries [16, 17]. The symptoms related to short-term insomnia can affect both mental and physical function capacity. There is lacunae in information regarding the association of physical activity level with subjective symptoms of short-term insomnia in collegiate students.Hence the study was done to find whether there is any association between short term insomnia symtoms and physical activity in collegiate students. We hypothesized that there is a significant association between different physical activity levels and self-reported symptoms of short term insomnia symptoms in college students.

Methods

Study design, setting and sample selection

The study was a cross sectional observation study. The participants were recruited from Jamia Millia Islamia (JMI), New Delhi, India. It is a federal government-funded university. The participants age ranged from 18-30 years, with a mean age of 23.2 ± 3.5 years, including both males (359; 54.2%) and females (303; 45.8%) (Tab. I). The inclusion criteria were those students who can follow and understand the English language. Students with any physical or mental disorder that may affect sensory, motor, or cognitive functions and those with history or presently having a primary sleep disorder, such as sleep apnea, primary insomnia, were excluded. The inclusion and exclusion criteria were ascertained from the health records and by self-reporting of the participants.
The prospective participants of the study were contacted through emails with details of the study. They were informed about the aims, objectives, and significance of this study. Those who were willing to participate were personally met by the investigators for further part of the study. Data collection was done by the first author himself; he was available throughout the data collection procedure, in case the respondents needed any assistance. Seven hundred university students were screened for the study. The participants were provided with a list of health conditions that they had to self-report for screening. Twenty- two students were excluded as they did not meet the inclusion criteria. The PSQI and IPAQ-SF were distributed among 678 participants, and they were informed to answer the questionnaire. The demographic details of the participants collected were age, gender, height, weight, academic level, years at university, type of residence, and smoking habit. Six hundred sixty-

Tab. I. Participants characteristics & descriptive statistics of the variables.

Participants characteristics/variables	Mean ± S.D/ frequency (%)
Age (years)	23.2 ± 3.5
Gender	
Male	359 (54.2%)
Female	303 (45.8%)
Body Mass Index (kg/m²)	22.3 ± 3.6
Underweight	90 (14%)
Healthy weight	424 (64%)
Overweight	124 (19%)
Obese	24 (4%)
Level of study	
Under-graduation	363 (54.8%)
Post-graduation	171 (25.8%)
Research scholar	128 (19.3%)
Years at university	
Junior level (< 1 year)	227 (34%)
Senior level (> 1 year)	435 (66%)
Residence	
Hostel in university	285 (43%)
Rented accommodation outside university	224 (34%)
Home (with family)	153 (23%)
Tobacco smokers	198 (30%)
PSQI global (total) score: global sleep quality	5.2 ± 2.4
Healthy sleep quality - total score < 6	321 (48.5%)
Poor sleep quality - total score ≥ 6	341 (51.5%)
PSQI: subjective sleep quality	
Code 0 (0 - very good & 1 - fairly good)	566 (85%)
Code 1 (2 - fairly bad & 3 -very bad)	96 (15%)
PSQI: sleep latency+	
Code 0 (0 - < 15 minutes & 1- 16-30 minutes,)	413 (62%)
Code 1 (2 - 31-60 minutes & 3 - > 60 minutes)	249 (18%)
PSQI: sleep duration	
Code 0 (0 - > 7 hours & 1 - 6-7 hours)	627 (95%)
Code 1 (2 - 5-6 hours & 3 - < 5 hours)	35 (5%)
PSQI: sleep efficiency	
Code 0 (0 - > 85% & 1 - 75-84%)	611 (92%)
Code 1 (2 - 65-74% & 3 - < 65%)	51 (8%)
PSQI: sleep disturbance++	
Code 0 (0 - not during past month &1- less than once a week)	506 (76%)
Code 1 (2 - once or twice a week & 3- three or more times a week 3)	156 (42%)
PSQI: daytime dysfunction	
Code 0 (0 - no problem at all & 1- only a very slight problem)	484 (73%)
Code 1 (2 - somewhat of a problem & 3 - a very big problem)	178 (27%)
IPAQ: level of activity	
Vigorous	73 (11.0%)
Moderate	252 (38.1%)
Low	337 (50.9%)
IPAQ: type of activity	
Vigorous	95 (14%)
Moderate	125 (19%)
Walking	442 (67%)

PSQI: Pittsburgh sleep quality index; IPAQ: International physical activity of questionnaire.

two participants were included in the study; data of 16 participants were excluded due to improper filling up of the questionnaires. The complete procedure for filling the consent form and the questionnaires took approximately 15-20 minutes.

The participants were required to fill up a consent form attesting to their status as volunteers and understanding their rights. The details of the participants were kept confidential by assigning a number. The study was approved by the institutional ethics committee of the Jamia Millia Islamia, New Delhi, India.

Variables

Predictor variables

The predictor variable level and type of physical activity were measured with the international physical activity questionnaire, short-form (IPAQ-SF). It is a self-report questionnaire primarily designed for assessing physical activity among adults (age range of 15-69 years) [11]. The IPAQ-SF consists of 7 items and classifies physical activity at four intensity levels. The IPAQ-SF asks participants to report activities performed for at least 10 minutes during the last seven days. Respondents were asked to report time spent in a physical activity performed across leisure time, work, domestic activities, and transport at each of the three intensities: walking, moderate, and vigorous. Using the instrument's scoring protocol, the level of total weekly physical activity was estimated by weighing time spent in each activity intensity with its estimated metabolic equivalent (MET) energy expenditure. The IPAQ-SF scoring protocol assigns the following MET values to "light intensity" activities, such as walking, and to "moderate", and "vigorous" intensity activities as 3.3 METs, 4.0 METs, and 8.0 METs, respectively [12]. The original authors recommended the "last 7-day recall" version of the IPAQ-SF for physical activity surveillance studies, in part because the accurate recollection beyond seven days is limited [18].

Predicted variable (outcome variable)

The Pittsburgh Sleep Quality Index (PSQI) questionnaire was used to assesses the predicted variable short term insomnia symptoms. The PSQI is a self-reported questionnaire that quantitatively assesses the respondent's quality of sleep for the past month [19]. The PSQI, which was evaluated in different populations, was designed for both clinical and research applications [20]. The PSQI includes 19 questions, which are separated into seven groups that account for the global sleep quality score. The aggregate global score is made up of sleep characteristics, which include subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, and daytime dysfunction. These characteristics are evaluated based on subjective self-reporting or inferred from the basic information such as the respondent's usual wake time, number of actual hours slept, and amount of time to fall asleep" [21, 22].

The questionnaire's self-reported item is scored on a scale ranging from 0 to 3. The scores are then cumulated using sub-totals from each of the seven categories, giving a final score between 0 to 21. The lower scores indicating healthy and higher scores indicating poor global sleep quality [17]. We used the reported cut-off score of > 6 global score in Indian students to classify participants as poor and healthy sleepers [23].

Data analysis

The Statistical Package for the Social Sciences 21.0 (SPSS Inc., Chicago, Illinois) was used for data analysis. Descriptive statistics were used for the presentation of participant characteristics. PSQI individual component scores of 0-1 and 2-3 were coded as 0 and 1, respectively [24, 25]. The logistic regression analysis was done for symptoms of short-term insomnia and with the level and type of physical activity and socio-demographic characteristics. The variable which had shown a association with a $p < 0.25$ were included for the final model of multiple logistic regression. The significance level of $p \leq w\ 0.05$ was set for the final model.

Results

Demographic variables, insomnia symtoms and physical activity: age, body mass index (kg/m^2), the PSQI, the frequency distribution of sex (male/female), level of education, years at university, type of residence, component scores of the PSQI, and the level and type of physical activity are presented in Table I.

Global sleep quality and subjective sleep quality: the level of physical activity had a significant association with global sleep quality (after controlling for age, BMI, type of residence, type of physical activity, education level, and academic year. Those who were doing lower physical activity were 15 more times likely to have poor sleep quality. Similarly, the level of physical activity has a significant association with subjective sleep quality. Those who were doing lower physical activity were six times more likely to report poor sleep quality than a high level of physical activity achievers (Tab. II).

Sleep latency and sleep duration: The level of physical activity had a significant association with sleep latency after controlling for the type of physical activity. Those who were engaged in lower physical activity were five times more likely to have higher sleep latency than a high level of physical activity achievers. The level of physical activity has a significant association with sleep duration after controlling for age, residence, and type of physical activity of the participants. Those who were engaged in lower physical activity were less likely to have a short sleep duration than a high level of physical activity achievers (Tab. III).

Habitual Sleep Efficiency: gender had a significant association with habitual sleep efficiency after controlling for age, academic year, level of education, and type and level of physical activity of the participants. Males were less likely to have lower habitual sleep efficiency (74% or less) than females (Tab. IV).

Sleep disturbances and daytime dysfunction: the level of

Tab. II. Association of level of physical activity with global sleep quality and subjective sleep quality.

Predicted variable	Predictor variable	COR (95% CI)	AOR (95% CI)
Global sleep quality	**PA level**		
	Low	10.896 (5.855-20.280)**	15.585 (6.438-37.733)***
	Moderate	1.625 (0.865-3.054)	1.772 (0.865-3.632)
	High	Reference	-
	PA type		
	Vigorous	0.217 (0.132-0.357)	1.574 (0.861-2.879)
	Moderate	0.286 (0.186-0.439)	1.478 (0.715-3.058)
	Walking	Reference	-
	Age (+ 1 year)+	0.958 (0.917-1.002)	1.038 (0.934-1.155)
	BMI+		
	Underweight	1.166 (0.471-2.891)	1.082 (0.370-3.164)
	Healthy weight	0.892 (0.391-2.038)	0.873 (0.335-2.275)
	Overweight	0.674 (0.279-0.1.631)	0.710 (0.259-1.952)
	Obese	Reference	-
	Level of education+		
	Under-graduate	1.523 (1.008-2.301)	1.266 (0.545-2.943)
	Post-graduate	1.020 (0.635-1.639)	0.680 (0.358-1.291)
	PhD scholar	Reference	-
	Type of residence+		
	Hostel in college	0.744 (0.498-1.112)	0.853 (0.532-1.365)
	Rent outside the college	1.110 (0.728-1.693)	1.116 (0.687-1.814)
	Home (with family)	Reference	-
Subjective sleep quality	**PA level**		
	Low	2.739 (1.137-6.600)*	6.018 (1.555-23.286)*
	Moderate	1.129 (0.441-2.890)	1.504 (0.519-4.357)
	High	Reference	-
	PA type		
	Vigorous	0.528 (0.254-1.098)	1.990 (0.622-6.361)
	Moderate	0.654 (0.354-1.207)	2.090 (0.795-5.494)
	Walking	Reference	-
	Level of education+		
	under-graduate	0.722 (0.412-1.266)	0.602 (0.338-1.074)
	Post-graduate	0.904 (0.479-1.706)	0.765 (0.399-1.467)
	PhD scholar	Reference	-

*: p < 0.05; **: p < 0.01; ***: p < 0.001; +: covariate; COR: crude odds ratio; AOR: adjusted odds ratio; CI: confidence interval; PA: physical activity.

Tab. III. Association of physical activity with sleep latency and sleep duration.

Predicted variable	Predictor variable	COR (95% CI)	AOR (95% CI)
Sleep latency	**PA level**		
	Low	2.838 (1.579,5.101) ***	5.094 (2.184, 11.881) ***
	Moderate	1.438 (0.783, 2.639)	1.920 (0.964, 3.825)
	High	Reference	-
	PA level		
	Low	0.654 (0.407, 1.051)	1.932 (0.959, 3.895)
	Moderate	0.641 (0.417, 0.985)	1.507 (0.833, 2.727)
	High	Reference	-
Sleep duration	**PA level**		
	Low	0.361 (0.153, 0.852) **	0.139 (0.023, 0.843) **
	Moderate	0.538 (0.158, 1.838)	0.104 (0.01, 1.073)
	High	Reference	-
	PA type		
	Vigorous	1.073 (0.428, 2.694)	0.992 (0.393, 2.503)
	Moderate	0.401 (0.119, 1.353)	0.372 (0.11, 1.259)
	Walking	Reference	-
	Age (+ 1 year)+	0.935 (0.842, 1.038)	0.928 (0.831, 1.035)
	Type of residence+		
	Hostel in college	0.942 (0.423, 2.096)	1.155 (0.503, 2.655) **
	Rent outside the college	0.389 (0.138, 1.094)	0. 392 (0. 138, 1.113)
	Home (with family)	Reference	-

*: p < 0.05; **: p < 0.01; ***: p < 0.001, +: covariate; COR: crude odds ratio; AOR: adjusted odds ratio; CI: confidence interval; PA: physical activity.

Tab. IV. Association of physical activity with habitual sleep efficiency.

Predicted variable	Predictor variable	COR (95% CI)	AOR (95% CI)
Habitual sleep efficiency	**PA level**		
	Low	0.645 (0.350, 1.187)	0.692 (0.168, 2.668)
	Moderate	0.123 (0.017, 0.914) *	0.127 (0.012, 1.339)
	High	Reference	-
	PA type		-
	Low	Reference	0.920 (0.239, 3.540)
	Moderate	1.177 (0.322, 4.294)	0.669 (0.168, 2.668)
	High	2.442 (0.853, 6.99)	-
	Age (+ 1 year)+	1.052 (0.971, 1.138)	1.105 (0.927, 1.317)
	Gender		
	Male	0.623 (0.350, 1.107)	0.527 (0.284, 0.978) **
	Female	Reference	-
	Level of education+		
	Under-graduate	0.735 (0.369, 1.463)	1.210 (0.314, 4.659)
	Post-graduate	0.506 (0.209, 1.227)	0. 617 (0. 214, 1.778)
	PhD scholar	Reference	-
	Academic year		0.766 (0.331, 1.769)
	Freshman	0.564 (0.289, 1.100)	-
	Senior	Reference	

*: $p < 0.05$; **: $p < 0.01$; ***: $p < 0.001$; +: covariate; COR: crude odds ratio; AOR: adjusted odds ratio; CI: confidence interval; PA: physical activity.

physical activity had a significant association with sleep latency after controlling for the level of education, age, gender, BMI, type of residence, and type of physical activity. Those who were engaged in lower physical activity were five times more likely to have sleep disturbances than high-level physical activity achievers. The level of physical activity had a significant association with daytime dysfunction after controlling for BMI, type of residence, type of physical activity, and education level. Those who were doing lower physical activity were more than 5.5 times more likely to have moderate to severe levels of daytime dysfunctions than those with a high level of physical activity. (Tab. V).

Discussion

The level of physical activity had shown to influence the components of sleep, such as sleep latency, sleep duration, sleep efficiency, subjective sleep quality, sleep disturbances, and day time dysfunction. This indicates that an increased level of physical activity influences sleep components, which resulted in better-improved sleep quality. It was also observed that type of physical activity did not affect sleep quality or its components.

The results of this study demonstrated that the prevalence of short-term insomnia symptoms (51.5%) was higher among university students who had lower self-reported levels of physical activity. The study also found that males had poorer sleep quality as compared to females. The findings of the present study were also consistent with a previously reported prevalence ranging from 19.2 to 57.5% [26]. The results are also broadly in line with a recent survey showing that a minimum of 18% of adults in the US had inadequate or poor sleep [27]. Many college and university students are poor sleepers, with 70.6% of students having less than 8 hours of sleep. Students who frequently report having sleep disturbances because of academic stress further experience a harmful influence on their academic performance [28]. A key factor or "main problem" in this vicious cycle is daytime sleepiness, which is reported by 50% of university students [5].

Since the objective of the current study was to find out the association of physical activity levels and subjective symptoms of short-term insomnia, the predictor variables, physical activity levels, were categorized into low, moderate, and high. The predicted variables related to subjective symptoms were also categorized as mentioned in the statistical analysis part. This categorization of scores was done according to the scoring criteria recommended for both the scales [12, 19, 20]. The results of the present study showed that physical activity level is a predictor of sleep quality among college students. An inverse association was found between physical activity level and sleep quality score. The findings of the present study in Indian students were similar to those carried out in other countries. A review by Lang et al. found that, despite differences in methodology, it was still possible to conclude that participants who had higher levels of physical activity were more likely to have a better quality of sleep [29]. More specifically, it was found that persons with better self-perceived exertion during exercise had reduced light sleep and increased deep sleep when compared to those who reported less self-perceived exertion. Thus supporting the recommendation that exercise should be included as a part of person's daily routine; the likely benefits of which would be an improved level of sleep quality [30].

The acute exercise was reported to have only limited effects on factors such as total sleep time, slow-wave sleep, sleep onset latency (SOL), and decreased REM sleep. Regular exercise was demonstrated to have moderate to strong positive effects on overall sleep quality while exhibiting moderate-to-largely

Tab. V. Association of physical activity with sleep disturbances and daytime sleep dysfunction.

Predicted variable	Predictor variable	COR (95% CI)	AOR (95% CI)
Sleep disturbances	**PA level**		
	Low	2.929 (1.443, 5.945) *	4.889 (1.666, 14.351)* p = 0.004
	Moderate	1.162 (0.549, 2.462)	1.342 (0.567, 3.179)
	High	Reference	-
	PA type		
	Low	0.584 (0.331, 1.029)	2.105 (0.859, 5.157)
	Moderate	0.525 (0.311, 0.888)*	1.617 (0.743, 3.522)
	High	Reference	-
	Age (+ 1 year)+	0.948 (0.898, 0.999)	0.981 (0.887, 1.086)
	Gender		
	Male	0.730 (0.507, 1.052)	0.780 (0.501, 1.214)
	Female	Reference	-
	BMI+		
	Underweight	0.474 (0.292, 0.772)*	1.337 (0.445, 3.926)
	Healthy weight	0.257 (0.130, 0.507)**	0.665 (0.251, 1.760)
	Overweight	0.654 (0.246, 1.741)	0.378 (0.130, 1.104)
	Obese	Reference	-
	Level of education+		
	Under-graduate	1.371 (0.833, 2.257)	0.805 (0.333, 1.944)
	Post-graduate	1.024 (0.572, 1.836)	0. 672 (0. 325, 1.389)
	PhD scholar	Reference	-
	Type of residence+		
	Hostel in college	0.714 (0.449, 1.135)	0.855 (0.520, 1.408)
	Rent outside the college	0.862 (0.534, 1.389)	1.039 (0.600, 1.799)
	Home (with family)	Reference	-
Day time sleep dysfunction	**PA level**		
	Low	5.237 (2.429 -11.292) **	5.592 (1.817-17.206) *
	Moderate	1.321 (0.583-2.991)	1.204 (0.471-3.081)
	High	Reference	-
	PA type		
	Low	0.265 (0.137-0.512) **	1.044 (0.396-2.755)
	Moderate	0.373 (0.220-0.633) **	1.337 (0.621-2.881)
	High	Reference	-
	BMI+		
	Underweight	2.280 (0.778-6.684)	2.716 (0.844-8.741)
	Healthy weight	1.380 (0.503-3.784)	1.615 (0.548-4.756)
	Overweight	0.899 (0.302 -2.672)	1.073 (0.340-3.382)
	Obese	Reference	-
	Level of education+		
	Under-graduate	1.193 (0.748-1.902)	0.739 (0.433-1.263)
	Post-graduate	0.835 (0.480-1.454)	0.540 (0.293-0.995) *
	PhD scholar	Reference	-
	Type of residence+		
	Hostel in college	0.766 (0.485-1.209)	0.851 (0.518-1.399)
	Rent outside the college	1.102 (0.694-1.752)	1.118 (0.680-1.840)
	Home (with family)	Reference	-

*: $p < 0.05$; **: $p < 0.01$; ***: $p < 0.001$; +: covariate; COR: crude odds ratio; AOR: adjusted odds ratio; CI: confidence interval; PA: physical activity.

strong positive effects on all subscales of the PSQI. Furthermore, regular exercise has been found to increase total sleep time and sleep efficiency to some degree [31,32]. A study, including adults, tested the chronic effects of exercise by combining a twice-weekly aerobic training program for six weeks with everyday physical activity. They found a positive linear association between global PSQI outcome and daily physical activity. The results of the study support the use of long-term exercise programs as an intervention for poor sleep quality in adults [33].

The time frame for assessing sleep quality was the last month, whereas physical activity levels were the past week. This gave rise to a difference in the assessment time frames of the two variables. However, the usually recommended time frame for assessing sleep quality is within the past one month, sleep problems persisting beyond three month is considered to be chronic sleep disorders [34]. The amount of physical activity recommended is based on per week basis [35]. Studies may be done by keeping both the time frames equal.

The sample size of the present study is relatively large, thus helps to increase the potential generalizability of the results. There are some limitations to the present study. First, this type of study design (cross-sectional) limits the strength of relationships since it does not

investigate cause and effect relationships. Second, the self-report questionnaires were used to indentify the partcipants rather than based on clinical diagnosis with more objective methods.This fact may have affected the accuracy of the variables of interest. We recommend future longitudinal studies with a large sample size to further clarify the cause-effect associations between physical activity level and sleep quality.

Conclusions

Level of physical activity can influce sleep and its related doimains.Physical activity is very important component influencing sleep quality both at subjective and global score, it also influes sleep latency, sleep dutation, daytime sleepiness and sleep disturbnaces also. There should be active and continuous effort from the educational institutions and other stakeholders to promote the physical activity among the students.

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Conflict of interest statement

The authors declare no conflict of interest.

Authors' contributions

AKG: conception, design of study, data collection interpretation of results, drafting manuscript and approval of the final version of manuscript; MMN: conception, design of study, data collection, data analysis interpretation of results, drafting manuscript and approval of the final version of manuscript; Md.DM: design of study,data analysis interpretation of results, drafting manuscript and approval of the final version of manuscript; BBB: data analysis interpretation of results, drafting manuscript and approval of the final version of manuscript, SRPP: design of study, interpretation of results, drafting manuscript and approval of the final version of manuscript; ASB: design of study, interpretation of results, drafting manuscript and approval of the final version of manuscript.

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