



RESEARCH PAPER

Physical activity and sedentary behaviors among active college students in Kuwait relative to gender status

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Keywords

College students • Exercise • Kuwait • Physical activity • Sedentary behaviors • Sleep

Summary

Objectives. To determine the prevalence of physical activity (PA), sedentary behaviors (SB) and sleep duration and the associations between those variables among Kuwaiti Physical Education (PE) College students.

Methods. A total of 418 participants (220 females) were randomly selected from the Basic Education College in the Public Authority for Applied Education and Training in Kuwait. Body weight and height were measured, and body mass index (BMI) was calculated. A validated questionnaire was used to assess lifestyle behaviors.

Results. Based on BMI classification, the prevalence of overweight or obesity among males (34.9%) was significantly higher than that of females (16.7%). However, the mean (SD) of body fat percentage using bioelectrical impedance analysis was 21.3 (9.0) for males and 32.3 (7.7) for females. The proportions of

highly active (> 1,200 METs-min/week) males (85.9%) and females (64.3%) were significantly ($p < 0.005$) different. The participants exceeding 3 hours of screen viewing time/day and insufficient sleep duration (< 7 hours/night) were 76.8% and 65.1%, respectively, with no gender differences. Logistic regression, adjusted for confounders, showed that highly active PE students had a higher proportion of SB. However, neither sleep duration nor body fat percentage exhibited any significant difference relative to PA.

Conclusions. Despite having high PA, Kuwaiti PE College students had a high prevalence of SB and insufficient sleep. Gender differences were found in PA but not in screen time or sleep duration. Efforts toward reducing SB and insufficient sleep among Kuwaiti PE College students are needed to reduce unhealthy lifestyle behaviors and promote health and well-being.

Introduction

Chronic diseases, including cardiovascular disease, type 2 diabetes mellitus, obesity, and cancer are spreading rapidly worldwide, including the State of Kuwait [1, 2]. Indeed, Kuwait ranks second in obesity worldwide and first in the Middle East for type 2 diabetes [3, 4]. Since there are many risk factors for chronic diseases, including smoking status, physical inactivity, and dietary habits [5], assessing such risk factors in different segments of Kuwaiti population, such as College students, is critical. The prevalence of overweight and obesity in Kuwaiti young generation, aged 14-19 years, was reported to be 50.5 and 46.5%, respectively [6]. This high prevalence is attributed to both sedentary behaviors and poor eating habits [6]. Therefore, awareness about the health benefits of physical activity should be emphasized among this population. Such information should be shared in schools by physical education (PE) teachers because it is their responsibility to teach students the importance of physical activity for a healthy lifestyle and well-being [7]. Needless to say that being physically active is well recognized as very beneficial for mental, physical and social health along the life span [8].

College age students have an important role in the Kuwaiti society, especially physical education students. However, college and university students may be especially at risk for sedentary behaviors, as much of their campus day involves sitting still in classroom lectures and doing additional homework at home using computers and internet search. Elsewhere, research have shown that College students were highly sedentary [9]. Physical inactivity was also reported to be prevalent among University students. A study assessing non-communicable disease risks among college students in the United States revealed a large percentage of them did not meet the dietary and physical activity international guidelines [10]. Another study found that the majority of university students were not meeting international recommendations on physical activity, and that the percentage of overweight was increasing in both genders and across all age groups [11].

In the State of Kuwait, there is only one large PE department. Graduates of that department are prepared to work mainly in public and private schools. If PE teachers are to educate the next generation of young Kuwait's about the importance of healthy lifestyle behaviors, it is necessary that they serve as role models,

by regularly incorporating physical activity into their daily lives and avoiding as much sedentary behaviors as possible. However, to the best of our knowledge, recent and comprehensive assessment of lifestyle behaviors of Kuwaiti college physical education students is lacking. Therefore, the main objective of the present study was to determine the prevalence of physical activity levels, sedentary behaviors, and sleep duration among Kuwaiti male and female PE Colleges students and examine the associations between physical activities, and sedentary behaviors, sleep duration and body fat content.

Methods

STUDY DESIGN AND PARTICIPANTS

This is a cross-sectional study comprising healthy PE College students randomly chosen from all students enrolled in a randomly selected classes in the department of Physical Education and Sports at the College of Basic Education in Kuwait, which is the only PE department in the country. The sample size calculation was based on the number of participants needed to have sample proportion with 0.05 of population proportion within a 95% confidence level [12]. Ethical approval was attained from the Public Authority for Applied Education and Training (PAAET). Informed written consent was obtained from all participants prior to participation. The research procedures and protocols were conducted in accord with the principles expressed in the Declaration of Helsinki.

Body weight and height were measured in the morning with minimal clothing and without shoes using calibrated medical scales. Weight was measured to the nearest 100 gram, while height was measured to the nearest centimeter. Body mass index (BMI) was calculated by dividing the weight in kilogram over the squared height in meters. Overweight plus obesity level was calculated based on $BMI \geq 25 \text{ kg/m}^2$. In addition, body fat percentage and muscle mass were determined noninvasively using Tanita Body Composition Analyzer (BC-1000 Madison, WI).

ASSESSMENTS OF PHYSICAL ACTIVITY

The Arab Teen Lifestyle Study (ATLS) questionnaire was used to assess physical activity, sedentary behaviors and sleep duration [13, 14]. The questionnaire has been widely used in recent years in youth and young adults and was previously shown to be a reliable and valid instrument for assessing physical activity and other lifestyle habits in youth [14-16]. Briefly, the physical activity section of the questionnaire was intended to collect information on the frequency, duration and intensity of light-, moderate- and vigorous-intensity physical activities during a typical week. The physical activity questionnaire covers all types of physical activity domains including transport, household, and fitness, sporting and recreational activities. A variety of physical activities were included in the questionnaire

such as walking, jogging, running, swimming, cycling, weight training, martial arts, dancing for women, moderate- and vigorous-intensity sports and household physical activities. To determine the participants' levels of physical activity, we used the total physical activity duration in minutes per week. Classification of physical activity (as high or low) were based on two cut-off scores. The first criteria was based on activity energy expenditure above or below 600 METs-min/week, or equivalent of 30 minutes of moderate intensity physical activity for 5 days per week (30 minutes x 4 METs x 5 days). The second criteria was based on activity energy expenditure above or below 1,200 METs-min/week, or equivalent of 60 minutes of moderate intensity physical activity for 5 days per week (60 minutes x 4 METs x 5 days). This cut-off score was based on the recommended amount of health enhancing physical activity for adults [14].

ASSESSMENT OF SEDENTARY BEHAVIORS AND SLEEP DURATION

The ATLS questionnaire includes questions designed to assess typical time in hours spent per day in sedentary activities, including television (TV) viewing, video games, and recreational use of computer, internet, and social media during weekdays and weekends. In addition, participants were asked to state their typical sleep duration in hours spent on weekday and weekend nights. Total screen viewing time cut-off value was 3 hours per day. Sufficient and insufficient sleep duration was calculated as above or below 8 hours per night, respectively [17].

DATA AND STATISTICAL ANALYSIS

Data were entered into a coded SPSS data entry sheet, checked, cleaned and analyzed using IBM SPSS software, version 22. Descriptive statistics were calculated and presented as means and standard deviations (SD) or proportions. Prevalence of low and high levels of physical activity, sedentary behaviors, sleep, and overweight or obesity were calculated using cross tabulation. T-tests for independent samples were used to detect differences in time spent in physical activity between males and females. Finally, we used logistic regression analysis, adjusted for age, weight and BMI, to test the differences in selected variables, including screen time, sleep duration and body fat percentage, relative to activity energy expenditure (METs-min/week) cut-off scores. Adjusted odds ratio and confidence intervals were reported. Alpha level was set at 0.05 and p-value less than alpha level was considered significant.

Results

Table I presents the descriptive characteristics of the participants. A total of 418 participants (198 males and 220 females) were randomly selected from college students in the Department of Physical Education & Sports at the Public Authority for Applied Education and Training during the 2017-2018 academic year.

Tab. I. Descriptive characteristics of the participants (means ± standard deviations or percentage).

Variable	All (n = 422)	Male (n = 198)	Female (n = 224)
Age (year)	20.8 ± 2.3	20.5 ± 2.3 *	21.1 ± 2.3
Weight (kg)	63.4 ± 14.7	71.3 ± 15.8 *	56.5 ± 9.2
Height (cm)	165.6 ± 8.8	172.7 ± 7.1 *	159.3 ± 4.3
BMI (kg/m ²)	23.0 ± 4.0	23.8 ± 4.5 *	22.3 ± 3.4
Fat (%)	27.2 ± 10.0	21.3 ± 9.0 *	32.3 ± 7.7
Muscle mass (kg)	32.1 ± 8.5	39.3 ± 5.5 *	25.5 ± 4.2
Body mass index (BMI) (%)			
Normal weight (< 25 kg/m ²)	74.8	65.1 *	83.3
Overweight or obese (≥ 25 kg/m ²)	25.2	34.9 *	16.7
Physical activity/inactivity (%) **			
High active 1 (> 600 METs-min/week)	87.9	96.0 *	80.8
Low active 1 (< 600 METs-min/week)	12.1	4.0 *	19.2
High active 2 (> 1,200 METs-min/week)	74.4	85.9 *	64.3
Low active 2 (< 1,200 METs-min/week)	25.6	14.1 *	35.7

* p < 0.005 for the difference between the male and female participants (t-test for independent samples or Chi-Square tests); ** Based on total activity energy expenditure above and below 2 specific cut-offs.

Mean (SD) age of the whole group was 20.8 (2.3) years, ranging from 17 to 33 years. Males were significantly heavier, taller and have higher mean BMI score than females. Fat percent was lower while muscle mass was higher among males compared with females. Based on BMI classification, the prevalence of overweight or obesity among male participants (34.9%) was significantly higher than that of females (16.7%). The overall prevalence of highly active students, based on activity energy expenditure above or below 600 METs-min/week, was 87.9%, with males reporting significantly greater levels of physical activity level (96%) than females (80.8%). However, the average level of highly active students dropped slightly when activity energy

expenditure cut-off value was increased to equal or above 1200 METs-min/week, thus reaching 74.4%.

Table II shows the profile of physical activity and sedentary behaviors of the participating College students relative to gender. Compared with females, male participants exhibit significantly greater amounts in all types of physical activities except dance and household activity. Total physical activity (mean and standard errors) in minutes per week were 685.8 (34.3) and 455.2 (25.5) in males and females, respectively. Male participants reported a greater total amount of vigorous-intensity physical activities, whereas females reported a greater total amount of moderate-intensity physical activities. The proportion of all students exceeding

Tab. II. Means and standard errors of the times spent in different types of physical activity, screen activity and sleep by active Kuwaiti college students.

Variable	All (n = 422)	Male (n = 198)	Female (n = 224)	p value *
Walking (min/week)	109.7 (5.6)	129.9 (9.0)	91.9 (6.7)	0.001
Stair Stepping (min/week)	9.5 (0.22)	10.1 (0.29)	8.9 (0.33)	0.011
Jogging (min/week)	72.1 (5.4)	98.9 (9.8)	48.4 (4.9)	< 0.001
Cycling (min/week)	20.5 (3.1)	23.6 (5.7)	17.7 (3.0)	0.349
Swimming (min/week)	41.4 (3.2)	51.7 (5.4)	32.3 (3.5)	0.003
Martial art (min/week)	18.2 (3.5)	31.4 (7.2)	6.5 (1.5)	0.001
Resistance training (min/week)	71.1 (6.2)	119.0 (11.1)	28.6 (4.7)	< 0.001
Household (min/week)	54.5 (4.0)	21.3 (4.2)	66.9 (6.3)	< 0.001
Traditional female dance (min/week)	37.4 (3.7)	0.0	70.5 (6.2)	< 0.001
Moderate-intensity sports (min/week)	61.8 (5.1)	68.3 (6.9)	56.0 (7.4)	0.227
Vigorous-intensity sports (min/week)	76.3 (6.3)	131.6 (11.6)	27.5 (3.9)	< 0.001
Sum of all moderate-intensity physical activity (min/week)	245.4 (10.9)	219.5 (13.1)	285.3 (16.6)	0.002
Sum of all vigorous-intensity physical activity (min/week)	309.0 (15.6)	466.3 (25.8)	169.9 (12.8)	< 0.001
Total physical activity (min/week)	563.4 (21.7)	685.8 (34.2)	455.2 (25.5)	< 0.001
Average screen time (hours/day)	5.55 (0.15)	5.62 (0.22)	5.49 (0.20)	0.662
Proportion of screen time above 3 hours/day (%)	76.8	78.3	75.4	0.491
Average sleep duration (hours/night)	7.23 (0.08)	7.35 (0.10)	7.12 (0.12)	0.141
Proportion of insufficient sleep (< 7 hours/day) (%)	65.1	64.6	65.5	0.859

* T-test for independent samples for the differences between male and female.

Tab. III. Physical activity choices and reasons for being active (%) among active Kuwaiti college students.

Variable	Male	Female	P-value *
Where do you exercise?			
Sport/recreational center	59.6	36.1	< 0.001
Health club/fitness center	28.3	12.5	
At home	7.6	36.2	
At university	4.0	13.4	
Other than the above	0.5	1.8	
Total (%)	100	100	
With whom do you exercise?			
With a friends/school mates	63.6	42.9	< 0.001
With no body	26.3	30.8	
With parents or relative	8.1	15.2	
Other than the above	2.0	11.1	
Total (%)	100	100	
When do you mostly exercise?			
Evening	70.2	50.0	< 0.001
Morning	7.6	20.1	
No specific time	13.6	15.2	
Noon/afternoon	8.6	14.7	
Total (%)	100	100	
Reason for being active			
For health benefits	71.2	46.4	< 0.001
For recreation	9.6	20.1	
For weight loss	6.1	19.1	
For competition	11.6	9.8	
To meet friends (social)	1.5	4.4	
Total (%)	100	100	

* Chi square test for the differences between observed and expected frequencies.

3 hours of screen viewing time per day was 76.8%, while those students with insufficient sleep duration was 65.1%, with no significant (< 0.05) differences in these parameters relative to gender.

Table III displays the participants' responses to questions related to place and timing of exercise as well as with whom they exercise. There were significant gender differences in those responses. The majority of males engaged in physical activity at sports or recreational centers (59.6%) followed by health clubs or fitness center (28.3%), whereas female exercise most at home (36.2%) followed by recreational center (36.1%). Again, males exhibited different patterns than females in responses to whom they exercise with. More than 63% of the males exercised with friends, while females exercised mostly alone (30.8%) or with parents or relatives (15.2%). In terms of timing of physical activity, more than 70% of the males and 50% of the females exercised in the evenings. However, one fifth of females preferred to exercise in the morning. The most important reasons for being physically active by the Kuwaiti college participants are also presented in Table III. There are more males (71.2%) than females (46.4%) exercising for health reason, whereas females engage in exercise mostly for recreation (20.1%) or weight loss purpose (19.1%).

Table IV shows cross tabulation of two activity energy expenditure cut-off values with screen viewing time, sleep duration, and fat percent categories for Kuwaiti

college students. At cut-offs 1 (above or below 600 METs-min/week), there was significantly different patterns for screen viewing time relative to activity levels ($p < 0.001$). Highly active participants were showing higher proportion (79.5%) of screen viewing time spent above 3 hours per day than low active students (56.9%) do, whereas the opposite is true for time spent below 3 hours in screen viewing time. No significant difference was shown in sleep duration relative to activity levels. However, categorizing body fat percentage into normal fat percent and obesity indicated a significant ($p = 0.012$) difference relative to activity cut-off score above or below 1200 METs-min/week (cut-offs 2), as active students were showing lower proportion (40.2%) of being in obesity category compared with low active students (54.2%).

Results of logistic regression analysis, adjusted for age, weight and BMI, for selected variables relative to activity energy expenditure in METs-min/week is shown in Table V. Male PE College students exhibited significantly higher activity energy expenditure than females (aOR = 2.668; CI = 1.239-5.747; $p = 0.012$). Also, highly active PE students showed lower proportion of time spent at less than 3 hours of screen viewing time (aOR = 0.517; CI = 0.279-0.958; $p = 0.036$). On the other hand, neither sleep duration nor body fat percentage exhibited any significant difference relative to activity energy expenditure levels of both cut-off criteria.

Tab. IV. Cross tabulations of two activity energy expenditure cut-off values with Screen viewing time, sleep duration, and fat percent categories for Kuwaiti college students.

Variable	Activity cut-off 1		P-value *	Activity cut-off 2		P-value *
	Low active (< 600 METs-min/week)	High active (> 600 METs-min/week)		Low active (< 1200 METs-min/week)	High active (> 1200 METs-min/week)	
Screen viewing time (hours/day)						
Low (< 3 hours)	43.1%	20.5%	< 0.001	26.9%	22.0%	0.300
High (3 + hours)	56.9%	79.5%		73.1%	78.0%	
Sleep duration (hours/night)						
Insufficient (< 8 hours)	66.7%	64.9%	0.800	67.3%	64.3%	0.579
Sufficient (8 + hours)	33.3%	35.1%		32.7%	35.7%	
Fat percent (%)						
Normal	46.0%	57.6%	0.122	45.8%	59.8%	0.012
Obesity	54.0%	42.4%		54.2%	40.2%	

* Chi-Square test for the differences in proportion.

Tab. V. Results of logistic regression analysis, adjusted for age, weight and BMI, for selected variables relative to activity energy expenditure in METs-min/week.

Variable	Activity level (Low versus High) *			
	aOR	(95% CI)	SEE	P-value
Age	1.109	0.988-1.246	0.059	0.080
Weight	1.028	0.976-1.083	0.026	0.292
BMI	0.893	0.756-1.054	0.085	0.182
Gender (female = ref)	1.00			
Male	2.668	1.239-5.747	0.830	0.012
Screen time (high = ref)	1.00			
Low	0.517	0.279-0.958	0.315	0.036
Sleep duration (sufficient = ref)	1.00			
Insufficient	0.862	0.522-1.423	0.256	0.561
Fat percent (obesity = ref)	1.00			
Normal fat percent	1.464	0.863-2.834	0.303	0.141

* Based on activity energy expenditure of < 1,200 or > 1,200 METs-min/week. The reference category is inactive. aOR = adjusted odds ratio for age, weight and BMI; CI = confidence interval; ref = reference category; SEE = standard error.

Discussion

The present study described the patterns and interrelationships of physical activity, sedentary behaviors and sleep duration among a randomly selected cohort of PE students at a major higher education institution in Kuwait. To our knowledge, this is the first study from the State of Kuwait to report physical activity, sedentary behaviors and sleep data for college age participants using a validated physical activity questionnaire that is widely used in the Arab countries [6, 14, 18-21]. The benefits of health-enhancing physical activity for humans are well-recognized [5]. Insufficient physical activity, on the other hand, is considered a major risk factor for NCDs and total mortality [5, 22].

The main finding of the present study indicated that the level of physical activity is fairly high among this group of College PE students. Males exhibited higher levels in most types of physical activity, however, females were more active in dance and household physical activity. In addition, despite having high levels of physical

activity, overweight or obesity prevalence, based on BMI classification, was fairly high, especially among males. The findings also indicate that large proportions of those college students had high screen viewing time and insufficient sleep. A recent international study including 1.9 million participants from 358 surveys and 168 countries reported a global age-standardized prevalence of insufficient physical activity of 23.4% in males and 31.7% in females, with a mean of 27.5% [23]. Based on the cut-off criteria of 1200 METs-min/week that was used in the present study, the proportions college PE students who scored below this cut-off level were 14.1% for males and 35.7% for females.

Our findings that was showing high prevalence of overweight or obesity among male participants, based on common BMI classification, deserve some explanation. The present study is comprised of active PE students, including some athletes with high lean body mass. Therefore, BMI use among athletes is not without limitations, and does not accurately reflect the actual body composition among the participants [24, 25]. This

is evident by the lower body fat percentage and higher body mass content of males compared with females. The high BMI may simply reflect increased large muscle mass due to the popular weight training practice among Kuwaiti young males, which does not confer less favorable health.

The present study indicated that a large percentage of males engaged in physical activity at sport or recreation centers, whereas more females were exercising at home. Similarly, a study conducted on Saudi medical students living in western Saudi Arabia showed that more females than males exercised at home [26]. However, exercise opportunities for females in Kuwait are increasing nowadays. Thus, in the present study, the percentage of females who reported exercising at recreation centers was nearly equivalent to that percentage of females who exercised at home. Compared to males, female participants in the present study showed significantly different reasons for engaging in physical activity. While females exercised mostly for recreation and weight loss, Kuwaiti young males mostly engaged in exercise for health and competition. This is consistent with findings reported in many Arab countries, as the most important reasons for being physically active among adolescents and adults were health, losing or maintaining body weight or for recreation [14, 19, 21, 26-29]. Also, in the majority of the above mentioned studies, there was a gender difference in the reason for being active. The finding that health reason is an integral part for motive to be active among PE students in the current study is very important, because those student will be PE teachers in the future and will be responsible for instilling positive health behaviors in their future students.

The current study revealed different patterns for screen viewing time relative to activity levels. Compared with less active students, more active PE students were spending greater proportion of time for more than 3 hours per day on screen viewing. This means that active students seem to be more sedentary. Research showed that sedentary behaviors appeared to be linked to adverse health outcomes in a way that is somewhat different from those ascribed to the lack of physical activity [30]. In addition, it is believed that physical inactivity and sedentary behaviors, such as screen viewing, appear to be independent entities and distinctly were associated with obesity and metabolic risk [31]. Moreover, a previous work conducted on Saudi youth showed that physical activity was more linked with healthy dietary choices, while screen viewing time was associated more with unhealthy dietary habits [32]. Also, among undergraduate Chinese medical students, low screen time and vigorous physical activity were found to be independently and concurrently associated with significantly lower stress [33]. It is possible that the reason behind this finding might be due to the fact that active PE students think they were meeting the physical activity recommendations, so they can be more relaxed and kept sitting the rest of the day. In other words, the PE students may have reduced their non-exercise activity thermogenesis (NEAT), as an earlier study had shown

that structured exercise program may lead to a reduction in spontaneous daily physical activity [34].

Getting good quality sleep is vital to the individual's physical and mental health [17]. Insufficient sleep and irregular sleep-wake patterns have been reported at alarming levels in the college student population [35]. In addition, vigorous physical activity and quality sleep were shown to be beneficial in helping college students to reduce stress and regulate depressive symptoms [36]. Also, among University students, physical activity and sufficient sleep duration were reported to have a positive effect on the health-related quality of life (HRQOL) of university students, whereas sedentary time was not related to HRQOL [37]. However, the present study showed that nearly two third of the PE College students had insufficient sleep and that neither physical activity nor screen viewing time significantly correlated with sleep duration. Similarly, poor quality of sleep was widely reported among undergraduate female students in eastern Saudi Arabia, and that insufficient sleep was associated with low physical activity and skipping breakfast [38]. Further comparison with our findings, a study involving Kuwaiti adolescents 15-19 year-olds revealed that more than 76% of males and above 74% of females had insufficient sleep duration of less than 7 hours per day [6]. Finally, there were several limitations to our study. We used a cross-sectional study design which does not imply causal relationship between the selected variables. Only PE students from the Physical Education Department at the College of Basic Education were recruited, thus more students from non-PE department should be recruited in future studies to examine the differences in activity levels, sedentary behaviors, sleep patterns, and body composition status. Also, future research may use a more objective method of assessing physical activity, despite the fact that in the present study a comprehensive and validated PA assessment instrument was used.

Conclusions

The findings of the present study indicated that despite having high activity levels, Kuwaiti PE College students had high prevalence of sedentary behaviors and insufficient sleep. Gender differences were found in physical activity levels but not in screen time or sleep duration. Results of logistic regression analysis, adjusted for age, weight and BMI, showed that highly active PE College students had higher proportion of sedentary behaviors. However, neither sleep duration nor body fat percentage exhibited any significant difference relative to activity energy expenditure levels. Future research should include the assessment of eating habits and nutritional intake among Kuwaiti PE students and compare the lifestyle behaviors of PE College students with those of non-PE College students. Efforts toward reducing sedentary behaviors and increasing sleep duration of Kuwaiti PE College students are needed to decrease unhealthy lifestyle behaviors and promote total health and well-being among college students.

Availability of data and materials

All data generated or analyzed during this study are included in this published article. Any additional data are available from the corresponding author on reasonable request.

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Conflict of interest statement

The authors declare no conflict of interest.

Authors' contributions

Conceptualization: MA, KA, AA, and HMA; data collection: MA, KA, AA, SA, and KA; statistical analysis: HMA; findings interpretation: MA, KA, AA, SA, KA, and HMA; drafting the paper: MA, KA, and HMA; critically revising the manuscript for intellectual content: AA, SA, and KA; all authors read and approved the final version of the manuscript.

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