Relationship Between Breakfast, BMI, Sleep, and Physical Activity with Academic Achievement Among Female Students Aged 12-16 Years Old

Tawfeg A. Elhisadi[1*], Shaima A. alshokry[2], Rasha F. bogeldain[3]

[1,2,3] Department of Public Health, Branch of Nutrition, College of Medical Technology, Derna, Libya

*Corresponding author: drelhisadi@cmtd.edu.ly

Abstract

A lack of such nourishment among adolescents can lead to various degrees of malnutrition, which may have implications on their health as well as their academic achievements (1). The human brain needs Sufficient energy specifically glucose and variety of micronutrients to perform cognitive functions. The aim of the study to identify the effect of some variables such as BMI, sleep, physical activity (PA), and breakfast on academic achievements. The study was conduct from June to July 2022 on the three intermediate schools, the subjects' only female aged from 12-16 years, and studying between 7th to 9th classes. The questionnaire data consist of 18 questions. The number of questionnaires distributed to 300 of participants and received 236 that has been 64 excluded. The 24-hours dietary recall (24HR) used in this study to provide quantitative information on individual diets. The mean age of participants was $13.89(\pm 1.016)$ range from 12 to 16 years old. The result showed that underweight, overweight and obese were 27.1%, 13.6% and 4.6% respectively. The study revealed that, 55.1% of the students slept from five to eight hours, while, 30.5%, and 14.4% slept more than 8 hours and Less than 5 hours respectively. The study revealed that normal BMI represented 54.7% when compared with obese, overweight and underweight represented 4.7%, 13.6% and 27.1% respectively. This study showed that normal BMI was major cause of good academic performance compared with unhealthy nutritional status; this difference was not strongly significant relationship ($p \geq 0.2$). The study showed that 65.3% had a less physical activity (PA), and had high academic achievements among participants represented 54.2%. The results of this study were students consumed breakfast represented 83.5% compared with 16.5% skipped breakfast. Skipping breakfast was associated with poor academic performance in the present study.

Keywords: Breakfast, BMI, Physical Activity, Sleep, Academic Achievements.

INTRODUCTION

For a healthful breakfast, children should include foods from a variety of food groups (e.g., whole grain, fruit, and dairy) to ensure that they receive a variety of nutrients and fiber (2). Nutrition and education are two synonyms and complementary to each other. Without proper food, the student cannot comprehend his lessons effectively, just as without nourishing the mind, no person, no matter how healthy he/she is, can be good in his/her society, while a person cannot recognize ideal nutrition. Breakfast is an important factor in enhancing the cognitive and academic performances by enhancing postprandial memory functions (3). Without learning it, it is not surprising that the issue of nutrition dominates a wide range of concerns of educators, public health men, and parents in various countries of the world. A person needs food in all stages of his life, as food determines to a large extent a person's ability to keep pace with each of those stages, and also determines his ability to absorb his lessons or perform his work appropriately. The aim of the study to identify the factors that effect on the academic achievements among female students aged 12–16-year-old such as breakfast, BMI, physical activity (PA), and

sleep spending time. Adequate sleep of high quality and optimum duration facilitates memory processing and learning. It helps maintain concentration, executive cognitive functions, sensorimotor integration, and memory processing (4).

MATERIAL AND METHODS

An institution based cross sectional study was conduct from June to July 2022 on the three intermediate schools, the subjects' only female aged from 12-16 years old age and studying between 7th to 9th classes. Questionnaire was distributed and collected by school administration; the questionnaire data consist of 18 questions. The number of questionnaires distributed to 300 of participants and received 236 that has been 64 excluded. The anthropometric measurements included weight and height. Students were weighing on personal digital scale without shoes in single layer of indoor clothing. Place the scale on firm flooring (tile), stand with both feet in the center of the scale. Height measured to the nearest 0.1-centimeter, hair ornament take-off during height measurement, and the height measurement on flooring.

The students with feet flat, together, and against the wall, her legs are straight, arms are at sides, and shoulders are level. Looking straight ahead and that the line of sight is parallel with the floor, measures the eyes are at the same level as the headpiece, accurately record. The Body Mass Index (BMI) was calculated according to WHO, as dividing body weight by squared height (kg/m^2). Record the BMI by interpretation as Underweight <18.50 kg/m^2, normal weight between 18.50-24.9 kg/m^2, overweight between 25.0- 29.9 kg/m^2, obese between 30-34.9 kg/m^2, and sever obesity > 35 kg/m^2.

STATISTICAL ANALYSIS

The Statistical Package for Social Sciences (SPSS version 26.0) was use. Descriptive statistics were use to describe the socio-demographic characteristics of participants. The significant association and the relation between different variables were evaluated using chi-square, with a significance level of $p \leq 0.05$.

RESULTS AND DISCUSSION

Total 236 female students participated aged 12-16 years old, in the study of which 67.8% were ≤14 years and 32.2% were >14 years old age. The mean age of participants was 13.89 (±1.016) range from 12 to 16 years old. The range of weight was 24.0 to 111.6 kg; the mean weight was 52.14kg (±12.72). The mean height was 1.55 (±0.066cm) ranged from 127 to 173cm. The height prevalence value of BMI was observed at normal weight 54.7%, with mean value of 21.54 kg/m2 (±4.93). The result showed that underweight, overweight and obese were 27.1%, 13.6% and 4.6% respectively as shown in table 1, 2 & figure 1.

Table 1: Assessment of nutritional status by Anthropometry (n=236).

Variable	Mean (±SD)
Age (years)	13.89years (±1.016)
Height (cm)	1.55cm (±0.066)
Weight (Kg)	52.143kg (±12.72)
BMI (kg/m2)	21.54 kg/m2 (±4.93)

Table 2: Sociodemographic details of the female student who participated in this study (n= 236).

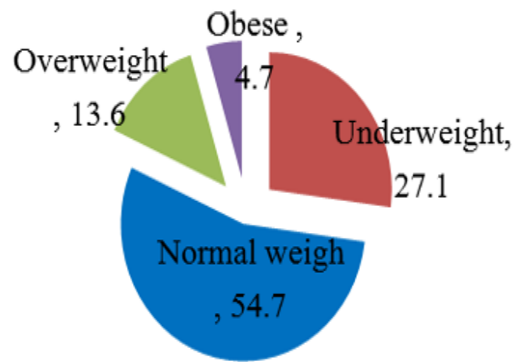| Parameter	No.	%
Age(years)		
≤14	160	67.8
>14	76	32.2
Height(cm)		
127-155	123	52.1
156-173	113	47.9
Weight (Kg)		
≤ 40	38	16.1
41-50	84	35.6
51-60	64	27.1
> 60	50	21.2
BMI (kg/m^2)		
Underweight (<18.5)	64	27.1
Normal weight (18.5-24.9)	129	54.7
Overweight (25.0-29.9)	32	13.6
Obese (>30.0)	11	4.6

Figure1: Percentage of distribution among students based on BMI.

The majority of participants in this study reported consumed breakfast. Overall, 83.5% of students reported never skipping breakfast, while 16.5% breakfast skipping (never, sometimes, often, or always) as shown in figure 2.
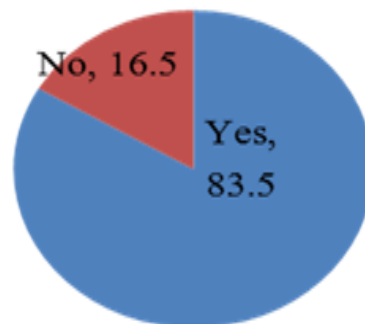

Figure 2: Percentage of students never skipping and breakfast skipping.

According to 24HR technique, food intake for 236 female students were obtain to determine type of food consumed during breakfast. 74.2% of student consumed tuna as a major food of breakfast, while 72.9%, 69.5% and 53% ate eggs, bread and milk. In this study, date consumed represented 5.9% while honey represented 7.2%, as shown in table 3. The relationship between breakfast consumed and academic achievement shown in table 4.

Table 3: Type of food consumed during breakfast by female students:

Type of foods	No	%
Eggs	172	72.9
Milk	125	53.0
Corn	52	22.0
Honey	17	7.2
Tuna	175	74.2
Date	14	5.9
Bread	164	69.5
Biscuit	78	33.1
Others	27	11.4

Table 4: Distribution of students based on association of score level with ate breakfast.

| Academic achievement | Breakfast | | P-Value |
	Yes No (%)	No No (%)	
Excellent	108 (45.8)	20 (8.5)	
Very good	58 (24.6)	11 (4.7)	
Good	22 (9.3)	5 (2.1)	0.850
Acceptable	9 (3.8)	3 (1.3)	
TOTAL	197 (83.5%)	39 (16.5%)	236 (100%)

The study revealed that, 97% of participants consumed lunch and 3% lunch skipping. Most of the students consumed rice 56.5% and chicken 56.5%, while 43.6%, 34.7%, and 22% consumed past, sandwiches, and fish respectively, as shown in table 5.

Table 5: Type of food consumed during lunch time.

Type of foods	No	%
Rice	133	56.4
Pasta	103	43.6
Legumes	58	24.6
Sandwiches	82	34.7
Meat	74	31.4
Chicken	133	56.4
Fish	52	22.0

The study showed that, 18.6% of the female student consumed meat one time weekly, 19.5% consumed two times, while 51.3% ate more than three time weekly as shown in table 6.

Table 6: Percentage of meat meal consumed weekly.

Meat consumed	No	%
Not once	25	10.6
One once	44	18.6
Two once	46	19.5
More than three once	121	51.3

These results suggest that the level of PA among female schoolchildren are not enough, the study show that 65.3% of female students are physical inactivity as shown in table 7.

Table 7: Percentage of PA among schoolchildren.

Physical Activity (PA)	No	%
Yes	82	34.7
No	154	65.3
TOTAL	236	100%

In our study 54.2% of the students had excellent score academic level, 29.2% had very good score level while 11.4% and 5.2% had a good and acceptable score academic level as shown in table 8 & 9.

Table 8: percentage of academic score level among female schoolchildren.

Score academic level	No	%
Excellent	128	54.2
Very good	69	29.2
Good	27	11.4
Acceptable	12	5.2
TOTAL	236	100%

Table 9: Distribution of students based on association of score level with BMI.

BMI	No.	%	Excel %	V. Good	Good	Acceptable	Total
Underweight (<18.5)	64	27.1	53.1	28.1	100%	7.8%	10.9%
Normal weight (18.5-24.9)	129	54.7	51.9	27.9	100%	5.4%	14.7%
Overweight (25.0-29.9)	32	13.6	68.75	31.2	100%	0%	0%
Obese (>30.0)	11	4.6	45.5	45.5	100%	0%	9%
Total	236						

This study revealed that the odds of (number of students) were higher by (54.7%) among students of normal weight by BMI measurement (18.5 – 24.9 kg\m2), and they have 51.9% of the academic achievement are excellent. Our study showed that normal BMI was major cause of good academic performance compared with unhealthy nutritional status (underweight) this difference was not strongly significant relationship ($p \geq 0.2$). This

study showed that students with overweight had a high excluded score level 68.7% because the overweight BMI of students had small size of sample.

There are previous studies that reported a significant relationship between underweight and academic achievement. Abebe et al, (2017) in Hawa Gelan district, southwest Ethiopia (5), showed that underweight students were less likely (p< 0.05) to achieve good academic performance as compared to students have normal weight the study was contradicts with our results.

The results in this study were identical with Luis and Oscar study (2021), which reported that being overweight had no effect on academic achievement (6). It is also important to bear in mind that small or insignificant association between overweight status and academic achievement do not necessarily imply that overweight is not important for academic achievement, because the effects of overweight may appear with a time lag. Erickson et al (2000). Overweight in adolescent girls is significantly associated with negative psychological outcomes, which may, in turn, affect their academic performance (7). In our results, the number of students who have obese BMI are very small represents 11students of the total number of the students which were their represented 4.7%, from the other hand small size sample of overweight in this study represented 32 students (13.6%). when compared with normal BMI which were represented 129 students (54.7%).

In the previous studies (8, 9, 10, and 11) showed that, the obese students are mostly less physically activated which led them to experience the lower school performance compared with normal BMI students. These results reversed with our study, which showed that 65.3% had a less physical activity and high school performance among participants represented 54.2%, 29.2%, 11.4%, and 5.2% of excellent, very good, good, and acceptable respectively. By Adole AA, Ware MB, (2014), cross sectional study conducted in southern Ethiopia also shown that habit of skipping breakfast affected the cognitive performance of early adolescents this could be due to deficiency in maintaining adequate levels of glucose throughout the day, which contributes to optimizing cognition (12). The previous results agree with our study that reported higher score in excellent grade and very good grade was 45.8%, and 24.6% respectively consumed breakfast as shown in figure 3. In present study shown that breakfast, skipping was associated with poor academic performance. Students never breakfast skipping more likely to have good academic achievement. The longitudinal study conducted among Australian children also revealed that over all academic achievement were higher in breakfast non-skippers than breakfast skipper (13). In this study 97% of participant-consumed lunch and 3% skipped, this is important because lunch is important meal and the greatest source of energy.
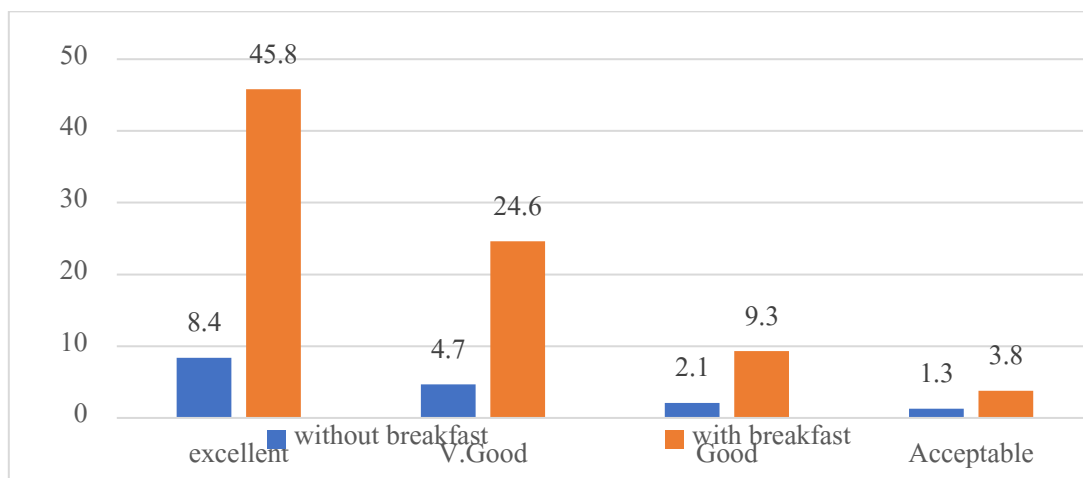

Figure 3: Distribution of students based on score level with and without consumed breakfast.

The study shows a lowest grade of academic achievement 5.2% among students who has slept less than 5 hours, when compared with heights grade were 54.2%, among students who has slept between 5 to 8 hours. Our results revealed that the peak of academic cognitive performance at adequate sleep between 5 to 8 hours.

Our results agree with previous study by Kachikis AB, Breitkopf CR (2012), revealed that sleep plays a vital role in the cognitive and neurodevelopmental outcome of children; therefore, adequate sleep is need to improve academic performance (14). Our results revealed that the participants of students in this study had good sleep quality between 5 to 8 hours, which has a positive impact on their academic achievements.

CONCLUSION

The study showed that normal BMI had a positive affect academic achievement but not found statistically significant (p>0.05) related to middle school children's academic achievement. Further studies are required to explore the relation between BMI and academic achievement in children and adolescents.

Breakfast plays an important role in how students work to gain and retain a true understanding of the content, which will open doors to their individual future as well as influence the future community as a whole. This study shows that better nutrition and keeping breakfast have a positive effect and contribute to raising their academic achievement.

Adequately Sleep quality has positive effects on cognitive performance, sleep plays a vital role in the cognitive and neurodevelopmental outcome of children; therefore, adequate sleep is need to improve academic performance, in our study had good sleep quality between 5 to 8 hours, which has a positive impact on their academic achievements. The study showed that 65.3% had a less PA, and had high academic achievements among participants represented 54.2%.

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