

Association Between Regular Breakfast Consumption and Academic Performance Among 6th-Grade Elementary School Male Students in Makkah, Saudi Arabia

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Abstract

Objectives: To determine the association between regular breakfast consumption and academic performance among 6th-grade elementary school male students in Makkah, Saudi Arabia.

Methods: Our cross-sectional study used a questionnaire for public and private elementary school children in Makkah, Saudi Arabia. Participants with known mental retardation, language barriers, and chronic diseases were excluded. The data analysis was performed using IBM SPSS V.26.

Results: In our study, 412 students were included. Most students (74.3%) obtained a high final degree between 80–100%. Most students (67.2%) believed having breakfast helps in obtaining high degrees. In addition, those who never had breakfast had a lower academic degree (P -value < 0.001).

Conclusion: The results of our study emphasized the significance of having breakfast on a daily basis for academic success, as students who reported consuming breakfast regularly were found to be more likely to achieve high academic scores.

Keywords: Breakfast, behavior, academic performance, children, adolescents, learning

Introduction

Breakfast is considered the most important meal of the day and is thought to have several benefits for diet quality, general well-being, cognitive function, and academic performance.¹ Children and adolescents, specifically, are highly affected by the nutritional value of breakfast in terms of brain activity and cognitive behavior.² Thus, breakfast consumption should be a regular habit from early childhood.² The American Academy of Pediatrics recommends that breakfast can improve dietary quality, maintain healthy body weights, and enhance cognitive function compared to non-consumers of breakfast.³ Children and adolescents who regularly have breakfasts were proven to have enhanced micro- and macronutrient intake, optimum body weights, and good physical activity.² Previous studies have linked consuming breakfast to low cholesterol levels, low rates of obesity, and cognitive behavior.^{3,4}

Although the benefits of breakfast are widely discussed, previous studies have shown that about 20% to 30% of children and adolescents miss out on breakfast, and the number is rising.^{1,5,6} Unhealthy breakfast habits were reported to cause metabolic problems such as impaired insulin regulation, elevated fat oxidation, inflammatory changes, and disturbed glucose homeostasis.⁶ Skipping breakfast was also found to be linked to psychological and behavioral disturbances, such as depression, bullying, and emotional distress.⁶ In addition, other meals cannot compensate for the micronutrient deficiency caused by skipping breakfast.⁶ The importance of breakfast, especially during childhood, arises from the fact that brain glucose metabolism in children is higher than in adults.¹ Furthermore, children have higher sleep demands than adults, and overnight fasting can consume stored

glycogen.¹ Breakfast compensates for the higher metabolic rate and provides glucose needed for supplying energy demands. Therefore, a breakfast meal can be fundamental for maintaining an adequate metabolic process.¹

Diet and lifestyle have a significant impact on academic achievement.⁷ Federal welfare programs were implemented according to the Child Nutrition Act in 1966, including School Breakfast Programs (SBP) and the National School Lunch Program (NSLP).⁸ SBP showed a higher nutritional privilege for wider percentage of students than lunch programs.⁸ Previous studies reported that children's academic performance was positively affected by SBPs.⁹ Moreover, good food quality and increased frequency of regular breakfast were linked consistently to higher academic performance.⁹

Education is a vital part of the 2030's Saudi Arabian vision.¹⁰ Children and adolescents' academic performance and cognitive function is an important aspect of the educational process and national interest. Thus, in this study, we focused on how nutritional habits such as regular breakfast meals can impact academic achievements. The objective of our study was to determine the association between regular breakfast consumption and academic performance among 6th-grade elementary school male students in Makkah, Saudi Arabia.

Materials and Methods

Study Design

We conducted the cross-sectional study to investigate the association between regular breakfast consumption and academic performance among 6th-grade elementary school male students in Makkah, Saudi Arabia.

Study Population

A total of 412 school students were recruited from elementary schools for boys in Makkah, Saudi Arabia. There were total 163 public and 24 private elementary schools for boys in Makkah. We took the list of schools from West Education Office Makkah which was 22 in number. We did random selection of five schools using computer generated table and this way we completed our selection of schools. Multi-stage cluster sampling technique was employed for selection of schools and students. After that, from each school 6th grade class was selected and from each class simple random sampling was done to select the participants. Participants were included if they were males, 6th-grade public and private school students (age range is 10–13 depend on the school system and the age at which the child was enrolled). Participants with known mental retardation, language barriers, and chronic diseases such as diabetes, hypertension, cardiovascular disease, renal disease, high cholesterol, and liver disease and those who refused participation were excluded from the study.

Sample Size Calculation

The sample size was calculated by Raosoft website for sample size calculation. With confidence level 95%, margin of error taken as 5%, prevalence of regular breakfast consumption was estimated as 50% since there is no regional study regarding regular breakfast consumption, we came up with total calculated sample size of 377 students. Accounting for non-response rate, we increased the sample size to be 412 participants.

Data Collection

Using a simple random technique, the researcher selected the students recruited from 6th grade class for the study. A web link of questionnaire was distributed to the students and their parents, so that accurate information could be gathered. A trained assistant has taken all students' weight (in kg) and height (in cm) measurements to calculate the Body Mass Index (BMI; Weight in kg/Height in m²) that was applied for the age in The Growth Charts for Saudi Children and Adolescents (<https://www.moh.gov.sa/HealthAwareness/EducationalContent/BabyHealth/Documents/Intermediate%20%20Compatibility%20Mode.pdf>).

The data were collected through a questionnaire, and the participants were handed a cover letter explaining the purpose of the study. The questionnaire contains several sections: demographic data, nutritional information, breakfast consumption variables, and academic performance. Breakfast consumption section included: 1) What was the breakfast place, 2) what did you eat in breakfast today, 3) who is your breakfast provider, 4) what is the time of breakfast taking, and 5) what is your breakfast duration. Contents of the breakfast were assessed by: 1) if student took cold drink with breakfast, 2) if student took hot drink with breakfast, and 3) type of breakfast meal. Question for academic performance was "what was your academic grade (percentage) in the previous semester".

Data Analysis

Data obtained from the participants were extracted into an Excel sheet and then revised. The statistical analysis was done using the computer program IBM SPSS (version 26.0, Armonk, NY, USA). Categorical variables were described in numbers

and percentages. A normality test was done for all continuous variables, and continuous, non-normally distributed variables were reported as the median and interquartile range (IQR). Comparisons between independent variables and the final academic degree of the students were conducted using the Chi-square test and Fisher exact test. *P*-values less than 0.05 were considered as statistically significant.

Ethical Considerations

The ethical review committee approved this study, and permission was taken from the General Administration of Education in Makkah and The School Managers of the affiliated elementary schools. The study participant's guardians were informed about the aim and procedures of the study, and their consent was taken. The participants' privacy was maintained as they were interviewed in separate rooms. All data collected was kept confidential and was used for research purposes only.

Results

Table 1 presents the basic characteristics of the 412 students included in the study. The table shows that the majority of the students was enrolled in Amourieh Primary School (30.8%), followed by Amer bin Rabia Primary School and Al-Muthanna Bin Haritha Primary School. Most of the students were 11 years old (93.1%), and the median (IQR) height, weight, and BMI of the students were 149 cm (IQR = 3), 40 kg (IQR = 13), and 18.26 (IQR = 8.9), respectively.

Regarding parental education, most mothers had a university degree (52.4%), while most fathers had a postgraduate degree (20.6%). In terms of family income, most families had a monthly income of more than 15000 SAR (37.6%). Regarding the final academic degree, most students (74.3%) obtained a high degree between 80% and 100%.

Most of the students (83%) had breakfast at school. Almost all students (96%) had breakfast on the day of the study. Homemade breakfast was the most common provider (45%), followed by breakfast provided directly by the school (29%). Most students (81%) had breakfast between 8:00 AM and 9:30 AM, taking more than 15 minutes to finish their breakfast (83%). All details are in Table 2.

Regarding cold drinks, it was found that 94.7% of students took cold drinks for breakfast; fresh juice was the most common type (62.2%). For hot drinks, only 17.2% of students take them for breakfast, and coffee was the most popular choice (52%). Regarding breakfast, sandwiches were the most commonly consumed food item (68.4%), followed by burgers (16.5%). Finally, most students included fruits in their breakfast (66%), followed by sweets and chocolates (24%). All details are shown in Table 3.

According to Table 4, most students (63.8%) eat breakfast every day of the week. However, some students (0.5%) reported not eating breakfast. The most common reasons for not eating breakfast among participants were trying to reduce weight (40.8%) and not liking the breakfast meal (38.8%). Regarding the importance of having breakfast, most students (67.2%) believed that having breakfast helps in obtaining good grades. In addition, a small percentage of students also believed that having breakfast helps them to be attentive (6.1%) and healthy (5.6%). Full details are in Table 4.

In Table 5, all demographic factors, including school name, age, education of the mother and father of the students,

Table 1. **Basic characteristics of the participating students, school and family**

Parameters	Category	Total Count (n = 412)	Percentage
School	Amourieh Primary School	127	30.8
	Amer bin Rabia Primary School	109	26.5
	Al-Muthanna Bin Haritha Primary School	109	26.5
	Hashem bin Utbah Primary School	56	13.6
	Sheikh Abdul Aziz bin Baz Primary School	11	2.7
Age (n = 406)	10	1	0.2
	11	378	93.1
	12	23	5.7
	13	4	1.0
Mother's Education	Illiterate	95	23.1
	Primary, intermediate, or secondary	32	7.8
	University degree	216	52.4
Father's Education	Postgraduate	69	16.7
	Illiterate	59	14.3
	Primary, intermediate, or secondary	68	16.5
Family income (n = 410)	University degree	200	48.5
	Postgraduate	85	20.6
	Less than 10000 SAR	144	35.1
	10000 to 15000 SAR	112	27.3
Final academic degree	More than 15000 SAR	154	37.6
	From 48–59%	85	20.6
	From 60–64%	15	3.6
	From 65–74%	3	0.7
Parameters	From 75–79%	3	0.7
	From 80–100%	306	74.3
	Median (IQR)		
Body Height, cm	149 (3)		
Body Weight, kg	40 (13)		
Body Mass Index	18.26 (8.9)		

Table 2. **Characteristics of the breakfast meal consumption among the participating students**

Parameters	Category	Total Count (n = 412)	Percentage
Breakfast place	School	342	83
	Home	42	10.2
	Car	28	6.8
Did you take the breakfast meal?	Yes	395	95.9
	No	17	4.1
Breakfast provider	Homemade breakfast	187	45.4
	Directly provided by the school	121	29.5
	From cafeteria outside	93	22.6
Time of breakfast taking	Caterer	11	2.7
	From 4:00 AM to 7:00 AM	71	17.2
	From 8:00 AM to 9:30 AM	332	80.6
Breakfast duration	After 9:30 AM	9	2.2
	Less than 15 minutes	70	17
	More than 15 minutes	342	83

Table 3. Contents of the breakfast taken by the participating students

Parameters	Category	Total Count (n = 412)	Percentage
If the student takes cold drinks for his breakfast	Yes	390	94.7
	No	22	5.3
Types of cold drinks taken for breakfast (n = 397)	Fresh Juice	247	62.2
	Cola	93	23.4
	Artificial Juice	35	8.8
	Water	12	3
	Milk	3	0.8
	Other	7	1.8
	Yes	71	17.2
If the student takes hot drinks for his breakfast	No	341	82.8
	Coffee	39	52
Types of hot drinks taken for breakfast (n = 74)	Tea	21	28.4
	Other	14	18.9
	Sandwich	282	68.4
	Burger	68	16.5
Type of breakfast meal	Pizza	30	7.3
	Snacks	22	5.3
	Other	10	2.4
	Fruits	272	66
	Sweets and Chocolates	99	24
If the breakfast includes one of these items	Dairy products	54	13.1
	Others	17	4.1

Table 4. The participating students' behavior toward the breakfast meal

Parameters	Category	Total Count (n = 412)	Percentage
The number of days per week at which students have breakfast	0	2	0.5
	1	43	10.4
	2	45	10.9
	3	16	3.9
	4	3	0.7
	5	14	3.4
	6	26	6.3
	7	263	63.8
The reason that makes the student not eats his breakfast (n = 98)	Reducing the weight	40	40.8
	He did not like the breakfast	38	38.8
	He did not have enough time	9	9.2
	He had no breakfast food	3	3.1
	Others	8	8.2
The importance of having breakfast	Helps in obtaining good grades	277	67.2
	Helps in being in a good mood	46	11.2
	Provides the student with energy	40	9.7
	Helps the student to be attentive	25	6.1
	Helps the student to be healthy	23	5.6
	Others	1	0.2

Table 5. Correlation between the demographic characteristics of the participating and their final academic degree

Factors		Academic degree		P-value
		From 80–100%	< 80%	
School	Amourieh Primary School	95 (74.8)	32 (25.2)	0.025*
	Amer bin Rabia Primary School	79 (72.5)	30 (27.5)	
	Al-Muthanna Bin Haritha Primary School	87 (79.8)	22 (20.2)	
	Hashem bin Utbah Primary School	34 (60.7)	22 (39.3)	
	Sheikh Abdul Aziz bin Baz Primary School	11 (100)	0 (0)	
Age	10 or 11 years	274 (72.3)	105 (27.7)	0.001*
	12 or 13 years	27 (100)	0 (0)	
Mother's Education	University degree or higher	282 (98.9)	3 (1.1)	<0.001*
	Less than a university degree	24 (18.9)	103 (81.1)	
Father's Education	University degree or higher	282 (98.9)	3 (1.1)	<0.001*
	Less than a university degree	24 (18.9)	103 (81.1)	
Family Income	Less than 10000 SAR	42 (29.2)	102 (70.8)	<0.001*
	From 10000 to 15000 SAR	110 (98.2)	2 (1.8)	
	More than 15000 SAR	152 (98.7)	2 (1.3)	

*= significant association.

Table 6. Correlation between breakfast meal consumption and final academic degree of the participating students

Factors		Academic degree		P-value
		From 80–100%	<80%	
Breakfast place	School	265 (77.5)	77 (22.5)	<0.001*
	Home	39 (92.9)	3 (7.1)	
	Car	2 (7.1)	26 (92.9)	
If the student has taken his breakfast meal	Yes	303 (76.7)	92 (23.3)	<0.001*
	No	3 (17.6)	14 (82.4)	
Time of breakfast taking	From 4:00 AM to 7:00 AM	7 (77.8)	2 (22.8)	0.030*
	From 8:00 AM to 9:30 AM	44 (62)	27 (38)	
	After 9:30 AM	255 (76.8)	77 (23.2)	
Breakfast duration	Less than 15 minutes	34 (48.6)	36 (51.4)	<0.001*
	More than 15 minutes	272 (79.5)	70 (20.5)	

*= significant association.

and family income, significantly affected the students' final degree. Among students who received scores from 80% to 100% on their final academic degree, those who attended Amourieh Primary School represented the highest percentage (74.8%; P -value = 0.025). Similarly, the students aged 12 or 13 years old showed a higher percentage regarding receiving scores from 80% to 100% on their final academic degree compared to those 10 or 11 years old (100% vs. 72.3%; P -value = 0.001). In addition, students with mothers and fathers who had a university degree or higher were more likely to receive scores from 80% to 100% on their final academic degrees than those with parents with less than a university degree, P -value < 0.001 for both. Finally, family income was also significantly correlated with a final academic degree; students with families earning less than 10000 SAR per month had a much lower likelihood of receiving scores from 80% to 100% compared to those from families earning more than 15000 SAR (P -value < 0.001).

It was found that having breakfast meals was correlated with receiving a high degree; the students who had their breakfast were more likely to receive scores from 80% to 100% compared to those who did not (76.7% vs. 17.6%) (P -value < 0.001). In addition, the breakfast place, time, and duration were significantly associated with receiving a high academic degree (P -value < 0.001, = 0.030, and < 0.001, respectively). Among students who had a final degree from 80% to 100%, the highest percentage was observed among those who had breakfast at home (92.9%), from 4:00 AM to 7:00 AM (77.8%) with a P -value = 0.03 and spent more than 15 minutes having their breakfast (79.5%) with a P -value less than 0.001. Full details are described in Table 6.

Among students with a final degree between 80–100%, the percentage of students who did not take hot drinks (82.4%) was significantly higher than those who took hot drinks with breakfast (35.2%) (P -value < 0.001). Moreover, the type of breakfast meal was significantly associated with the academic

final degree; the students who had a sandwich for their breakfast represented the highest proportion among those with a final degree between 80–100% (P -value <0.001). All details are shown in Table 7.

Regarding students' behavior toward breakfast, those who never had breakfast had a lower academic degree than those who had breakfast (P -value <0.001). On the other side, students who have breakfast daily had a significantly higher academic degree than those who have breakfast sometimes or never (P -value <0.001). In terms of the importance of having breakfast, the table shows that students who think having breakfast helps in obtaining good grades had a significantly higher academic degree compared to those who did not think so (P -value <0.001). All details are shown in Table 8.

Discussion

Breakfast is an important meal that gives students the energy to start their day after overnight fasting.¹ Children and adolescents demand good nutrition and a healthy lifestyle to become a habit that continues to adulthood.² This study was performed on male children whose majority age was 11. Almost all students had breakfast on the study day. Mostly they have a homemade breakfast, and about a third of the participants were provided breakfast by the school. The median (IQR) weight, height, and BMI of the students were 149 cm (IQR = 3), 40 cm (IQR = 13), and 18.26 (IQR = 8.9), respectively.

The present study investigated the frequency of breakfast consumption among children and their beliefs about the importance of having breakfast for academic performance and

cognitive function. Our results showed that most students (63.8%) reported eating breakfast every day of the week, which is consistent with previous studies that found breakfast to be the most consumed meal among children.¹¹ However, a small proportion of students (0.5%) reported not eating breakfast, which is a cause for concern given the well-established relationship between breakfast consumption and academic performance. On the other hand, a previous study reported that middle school students do not usually have breakfast.⁸

Importantly, a remarkable proportion of students in our study (67.2%) believed that having breakfast contributes to obtaining good grades, while a small percentage of students believed that breakfast consumption helps with attentiveness (6.1%) and overall health (5.6%). These findings are consistent with previous research showing a positive association between breakfast consumption and academic performance, cognitive function, and health outcomes among children and adolescents.^{1,11}

The present study provided evidence for the positive relationship between breakfast consumption and academic achievement among children and adolescents. Our results showed that students who consumed breakfast were more likely to achieve high academic scores than those who did not. This finding is consistent with previous research showing a positive association between breakfast consumption and academic performance.^{4,9} A systematic review and meta-analysis by Adolphus et al. found that breakfast consumption was associated with improved cognitive performance, academic achievement, and school attendance.¹ Moreover, in a British study, adolescents who rarely ate breakfast were found to be significantly less

Table 7. Correlation between the breakfast meal contents and final academic degree of the participating students

Factors		Academic degree		P-value
		From 80–100%	<80%	
If the student takes cold drinks with his breakfast	Yes	287 (73.6)	103 (26.4)	0.182
	No	19 (86.4)	3 (13.6)	
If the student takes hot drinks with his breakfast	Yes	25 (35.2)	46 (64.8)	<0.001*
	No	281 (82.4)	60 (17.6)	
Type of breakfast meal	Sandwich	274 (97.2)	8 (2.8)	<0.001*
	Other	32 (24.6)	98 (75.4)	

*= significant association.

Table 8. Correlation between participating students' behavior toward breakfast meal and final academic degree

Factors		Academic degree		P-value
		From 80–100%	< 80%	
The number of days per week at which students have breakfast	Never	1 (50)	1 (50)	<0.001
	Sometimes	43 (29.3)	104 (70.7)	
	Everyday	262 (99.6)	1 (0.4)	
The importance of having breakfast	Helps in obtaining good grades	268 (96.8)	9 (3.2)	<0.001
	Helps in being in a good mood	2 (4.3)	44 (95.7)	
	Provides the student with energy	14 (35)	26 (65)	
	Helps the student to be attentive	26 (65)	14 (35)	
	Helps the student to be healthy	18 (78.3)	5 (21.7)	
	Others	1 (100)	0 (0)	

likely to achieve high grades in Mathematics than low/middle socioeconomic status (SES) adolescents who frequently consumed breakfast [(OR): 0.35, 95% (CI): 0.17–0.72].⁹

The present study found that the type of breakfast meal was significantly associated with academic achievement among students. Specifically, students who reported having a sandwich as their breakfast meal were more likely to achieve high academic scores than those who consumed other types of breakfast meals (P -value <0.001). Regarding breakfast choices, sandwiches were the most popular food item among students, with a consumption rate of 68.4%, followed by burgers at 16.5%. Fruits were the most common addition to breakfast, with 66% of students including them in their meals, while sweets and chocolates were consumed by 24% of the participants. This is consistent with the findings of a previous study, which reported that the type of food is associated with academic achievement.⁸ Furthermore, eating meat or eggs regularly for breakfast improved academic achievement. Students who consumed meat or eggs for breakfast 6–7 days a week had a mean score difference of 0.232 compared to those who consumed it 0–2 days per week ($P = 0.043$).⁸

One potential limitation of this study was that it was conducted on a relatively small sample size of male children, which may limit the generalizability of the findings to other age groups or gender. Additionally, the study relied on self-reported data on breakfast consumption and academic performance, which may be subject to recall and social desirability biases.

Conclusion

Our study provides important insights into the relationship between breakfast consumption and academic achievement among school male children in Saudi Arabia. The findings highlight the importance of regular breakfast consumption for academic success, with students who reported eating breakfast daily more likely to achieve high academic scores. The study also emphasizes the importance of breakfast composition. The significant proportion of students who believed that having breakfast contributes to obtaining good grades suggests that promoting regular breakfast consumption is an important strategy for improving academic performance among children in Saudi Arabia. These findings have important implications for parents, educators, and policymakers in Saudi Arabia, emphasizing the need to promote healthy and balanced breakfast options to support children's academic success. Further research is recommended to have better insights about this topic.

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Conflict of Interest

None. ■

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