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# Assessment of breakfast eating habits and its association with cognitive performance of early adolescents (11-13 years) in Shebedino District, Sidama Zone, Southern Ethiopia

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**Abstract:** *Background*: Regular consumption of breakfast is associated with improved cognitive performance and nutrient intake in adolescents. Despite breakfast's positive attributes, many children go to school without breakfast. The objective of this study was to assess the association between breakfast eating habits and cognitive performance among early adolescents aged 11-13 years old in the study area. *Method*: A cross sectional study was conducted from June to July 2012. Structured questionnaire was used to capture breakfast eating habits, socio-economic and demographic factors. Kaufman Assessment Battery for Children -II tests was used for cognitive performance measurement. A representative sample size of 211 participants was selected randomly from 4 *kebeles*. The data was analyzed with SPSS version 16.0 software. *Results*: Of the 208 interview, 52% were girls while 48% were boys with mean (±SD) age of 12.01±0.82 years. Breakfast skipping prevalence was 42.3%. Regular breakfast eating habits were significantly ($P<0.001$) associated with Simultaneous scale and Pattern Reasoning. Regular breakfast eating habit and mother education were significantly ($P<0.001$) associated with Sequential scale explaining 13.7% variation. Regular breakfast eating habits were also significantly associated with Pattern Reasoning explaining 31.6 % variation. *Conclusion*: Irregular consumption or skipping breakfast and socio-demographic factors have beneficial influence on cognitive performance of adolescents. The important predictors of cognitive performance were breakfast eating habits and maternal education. We recommended that, parents and adolescents should be educated and trained on healthy breakfast eating patterns and good nutrition practices for healthy cognitive development of adolescents.

**Keywords:** Cognitive function, Breakfast, Adolescent, Shebedino District, Sidama Zone, Southern Ethiopia

## 1. Introduction

Proper nutrition is commonly believed to be important for school performance. It is considered to be an essential prerequisite for the potential to learn in children [1]. Although breakfast has been called the most important meal of the day, it is skipped most frequently [2]. The importance of breakfast is underscored. Regular consumption of breakfast is associated with improved cognitive performance and nutrient intake in adolescents [3]. Skipping breakfast may result in an inadequate nutrient intake that is not compensated at other times during the day [4]. Eating breakfast might be particularly important during adolescence because adolescents have high nutritional needs, due to brain development processes and physical growth, while at the same time; they have the highest rate of breakfast skipping among school-aged children [5 and 6].

For adolescents, breakfast consumption has been associated with learning and better school performance [7]. Despite breakfast's positive attributes, many children go to school without breakfast. The importance of breakfast for academic achievement is reflected in the effects of breakfast on cognitive performance [8]. Researchers noted

that skipping breakfast detrimentally affects problem solving, short-term memory [9]; attention and episodic memory [10] in children. Conversely, when children consume breakfast, performance is enhanced on measures of vigilance attention, arithmetic, problem solving tasks, and logical reasoning [11]. Other study on confectionery snacks consumed by children in the morning indicated that long-term memory may also be positively affected by food consumption [12].

Breakfast skippers had lower intakes of fat, carbohydrate, and protein [4]. Breakfast is seen as an important first source of energy for the day, so that the brain can cope with the demands of the morning [13]. The effect of breakfast on cognitive performance may be by providing essential nutrients to the brain as well as alleviating hunger. Eating breakfast provides energy for the brain and improves learning. The effect of glucose deprivation is noticeable by a fall in blood glucose level of sufficient degree, which is rapidly followed by disturbance in cerebral function. The gap of about 10 to 12 hours between dinner and breakfast causes low blood glucose levels, and habitually missing breakfast can adversely affect cognitive performance [14]. The gradual decline of insulin and glucose level could determine a stress response, which interferes with different aspects of cognitive function, such as attention and working memory. It is plausible that the decline in cerebral iron level is likely to result from diet that is deficient in heme intensifies the stress associated with overnight and morning fast [14]. Sustained contribution of breakfast to a person's health status over time is particularly relevant for children whose daily dietary intake barely meets the requirements [15]. Breakfast eaters tend to have higher basal metabolism, and have less craving for the food. Children who skip breakfast but eat later on in the day may catch up their daily nutrient requirements but are unlikely to attend and concentrate on the teacher's lecture in the morning session because they are hungry. If the transitory metabolic changes due to skipping breakfast were to occur frequently, they would be likely to have a cumulative adverse effect that may place a child's school progress at risk [16].

Different reviews indicate that only few studies have investigated the relationship between breakfast skipping and cognitive performance in adolescents in different countries [1; 17; 5 and 6]. Exploring the relationship between breakfast eating habit and cognitive performance is important to design better intervention mechanisms among adolescents. So the present study was undertaken with the objective to assess breakfast eating habits and its association with cognitive performance in the study population.

# 2. Materials and Methods

The study was conducted in *Shebedino* District, Sidama Zone, in Southern Ethiopia from June to July 2012. The District is located at1500 to 3000 altitude above sea level and 6°46' and 7°45' latitude North and 39° and 40° longitude East with annual average temperature 16°C-25°C and annual rainfall 800-1600mm. It is one of the 19 Districts in Sidama Administrative Zone. The District has 32 rural and 3 urban *Kebeles*. The total population of the District is estimated to be 232, 964. The economic activities of the District are agriculture mainly focusing on coffee, maize, barley, *teff*, *ense*t, sugarcane, and *khat* production and rearing of animals, and trade. A cross-sectional study design was employed to assess the association between breakfast eating habits and cognitive function in early adolescents (11-13 years of age). This age group was selected because they characterized by the onset of puberty and increased cognitive development as well as their brain needs more nutrients than the brains of older adolescents [18]. Besides, adolescents have high nutritional need, due to brain development processes and physical growth, while at the same time they have the highest rate of breakfast skipping among school-aged children [5 and 6]. The total sample size was 211 which was calculated using G*power version 3.1.3 [19]. The study employed two stage cluster sampling technique. Initially all *kebeles* were listed. Probability Proportional to Size (PPS) sampling technique was used to select four representative *kebeles* from list that gives the required sample size ensuring proportional sample size from selected clusters. Within each selected cluster, an appropriate number of individuals were allocated based on estimated number of adolescents. Individuals were randomly selected by following procedure: walking to the center of selected *kebeles*, a direction was chosen randomly by spinning a pencil on the ground and the direction was noted when stopped. The number of households was counted along this line by walking in the direction from center to the outer perimeter. A random number table was used to obtain a number between one and the number of households counted. By walking to the selected household, the adolescents were examined along the randomly chosen line. Then, the next nearest house was visited until the last was surveyed in the randomly chosen line. The same procedure was repeated until enough samples from the *kebele* were collected [20]. All adolescents who were permanent resident in the study area for more than six months and aged 11-13 years were included in the study while those adolescents who have health problems (like visual impairment, and hearing impairment) that are reported to affect their capacity to learn and achieve well [21 and 22] were excluded from the study.

### *2.1. Data Collection*

Training was provided for data collectors, supervisor. Pre-test was done on 10% of the sample size and they were excluded from the final sample. Principal investigator did three cognitive tests with the help of two medical students and one undergraduate student.

Demographic characteristics and socioeconomic status were assessed using questions adapted from the Ethiopia Demographic and Health Survey 2012 report [23]. Food consumption patterns of respondents were assessed using a

standardized food frequency questionnaire [24]. The Kaufman Assessments Battery (KABC-II) was used to assess adolescents' cognitive performance which is made up of a series of tests which measure Sequential processing, Simultaneous processing and planning ability [26]. From the tests which measure Sequential processing (short term memory), Number Recall, Word Order and Hand Movement were used. For measuring Simultaneous processing the Rover and Triangles were used and planning (fluid reasoning) was measured by using Pattern

Data were analyzed using descriptive and analytical statistical measures. A univariate analysis was conducted to obtain summary statistics (frequencies, percentage, means and standard deviations) of the variables investigated. Pearson's correlation was conducted to check the relationship between the cognitive tests. Linear regression was used to identify variables which predicted cognitive test scores. Multiple linear regressions were done to evaluate variables which strongly predicted cognitive performance. Independent sample t-test was used to compare cognitive test scores and breakfast eating habits. All the analyses were performed with SPSS version 16.0

Ethical approval was obtained from the Ethical Committee of Hawassa University. Permission was obtained from *Shebedino* District Administration. Written consent was obtained from adolescent and their parents or care giver.

# 3 The study Results

### *3.1. Demographic and Socioeconomic Conditions of Study Participant*

Characteristics of the study participants are shown in Table 1. Self-reported age (Mean (SD)) was 12 (0.8) years. 32 % of subjects had completed 11 years of age, 35.6% had completed 12 years of age and 31.7% had completed 13 years of age. About 52% were girls and 48% boys. The mean observed family size was 6.9±1.9 persons per household. The majority of primary care takers (93.3%) were married, while the remaining was either divorced or widowed. The proportion of parents with no education was higher among mothers (44.2%) than fathers (20.2%).

***Table 1.*** *Family characteristics of the study participants in Sidama, SNNPR, June, 2012 (n=211)*

| Characteristics | n | % |
|---|---|---|
| Maternal marital status (n = 208) | | |
| Married | 194 | 93.3 |
| Divorced | 2 | 1 |
| Widowed | 10 | 4.8 |
| Maternal education (n = 204) | | |
| No education | 92 | 44.2 |
| 1-6 | 37 | 17.8 |
| 7-8 | 64 | 30.8 |
| 9-12 | 7 | 3.4 |
| Higher education | 4 | 1.9 |
| Paternal education (n = 199) | | |
| No education | 2 | 20.2 |
| 1-6 | 40 | 19.2 |
| 7-8 | 85 | 40.9 |
| 9-12 | 25 | 12 |
| Higher education | 7 | 3.4 |
| Maternal occupation (n = 203) | | |
| Housewife | 195 | 93.8 |
| Employed (government) | 6 | 2.9 |
| Self employed | 2 | 1 |
| Fathers occupation (n = 199) | | |
| Farmers | 171 | 82.2 |
| Employed (government) | 17 | 8.2 |

Moreover the proportion of parents who had more than a high school education was lower in mothers (3.4%) than fathers (12%). The majority of the mothers (93.8%) and fathers (82.2%) were housewives and farmers respectively and 13% of fathers and 2.9% of mothers were involved in income earning activities.

### *3.2. Breakfast Eating Habits of Study Participants:*

With regard to breakfast eating patterns, 57.7% of adolescents regularly consumed breakfast, 42.3% consumed it irregularly (skipping 2 or 3 times per week).

Foods and drinks consumed by the study participants during the week preceding the survey are presented in the Table 2. About 47% responded that they consume cereal foods more than 3 times per day, 37.5% never consumed meat, 73.6% never consumed eggs, 65% never consumed iodized salts, 40.1% consumed caffeinated drinks more than once a day which inhibits iron absorption. Almost all of the participants had consumed *enset* (*E. ventricosum*) and kale frequently (more than once per day) which are staple foods for this community.

***Table 2.*** *Percentage of participants who consumed different food groups during a week preceding the survey in Sidama Zone (n= 208)*

| >1/day | 1/day | 3-6x/day | >=1/wk | 2x/month | Never |
|---|---|---|---|---|---|
| Cereals | 15.9 | 22.2 | 47.1 | 9.6 | 2.4 | 2.8 |
| Animal sources | 6.2 | 12.5 | 45.2 | 65.9 | 2.7 | 17.3 |
| Kale | 90 | 6 | 3 | 1 | --- | |
| Cabbage | 1.4 | 8.7 | 8.2 | 13.5 | 26.9 | 41.3 |
| Vegetables | 1.9 | 7.2 | 8.7 | 9.1 | 24.5 | 48.6 |
| Sweet potatoes | 4.8 | 8.2 | 13 | 22.1 | 26.9 | 25.6 |
| Any meat | 1 | 7.7 | 3.8 | 10.6 | 39.4 | 37.5 |
| Fruits | 3.8 | 9.6 | 11.1 | 24 | 23.1 | 28.4 |
| Pulses | 10.1 | 17.3 | 19.2 | 21.2 | 18.8 | 18.8 |
| Peanuts | 3.4 | 4.3 | 4.8 | 6.7 | 14.4 | 66.4 |
| Iodized salts | 25.5 | 1.4 | 4.3 | 0.5 | 3.4 | 64.9 |
| Tea and coffee | 40.4 | 27.4 | 28.8 | 1.9 | 1.4 | 0.1 |
| "*Enset* sources" | 92 | 3 | 5 | --- | --- | -- |
| Eggs | 2.9 | 2.9 | 0.5 | 3.4 | 16.8 | 73.6 |

***Table 3.*** *Participants cognitive test scores in Sidama Zone, Southern Ethiopia, June2012 (n= 208)*

| Tests | Mean (SD) | Minimum | Maximum | Maximum |
|---|---|---|---|---|
| Score1 | | | | |
| Number Recall | 8.0 (2.04) | 1 | 14 | 22 |
| Word Order | 11.07 (2.57) | 6 | 22 | 31 |
| Hand Movement | 7.45 (2.72) | 2 | 17 | 23 |
| Rover | 12.8 (3.89) | 5 | 31 | 44 |
| Triangles | 11.31 (3.46) | 2 | 26 | 29 |
| Pattern Reasoning | 5.44 (2.64) | 0 | 15 | 36 |
| Sequential scale2 | 26.51 (5.81) | 13 | 45 | 76 |
| Simultaneous scale3 | 24.11 (6.41) | 8 | 49 | 73 |

[1]the maximum score that could be attained for a test as administered
[2]Number Recall + Word Order + Hand Movement, 3Triangles + Rover

### *3.3. Cognitive Performance Test Scores of Study Participants*

Mean maximum and the minimum test scores for each sub set and the maximum score that could be attained for a test was administered are presented in table 3.

Pearson's correlation coefficients for cognitive tests are presented in table 4. Correlations between cognitive test scores were strongly positive.

***Table 4.*** *Pearson's correlation coefficients for cognitive tests*

| NR. | Rov. | WO. | PR. | HM. | Tri. | Seq. | Simu. |
|---|---|---|---|---|---|---|---|
| NR.1 | 1 | | | | | | |
| Rov.2 | 0.43** | 1 | | | | | |
| WO.3 | 0.55 ** | 0.48 ** | 1 | | | | |
| PR4 | 0.44 ** | 0.49 ** | 0.39** | 1 | | | |
| HM.5 | 0.46 ** | 0.43 ** | 0.33** | 0.63 ** | 1 | | |
| Tri.6 | 0.45 ** | 0.55** | 0.47** | 0.56** | 0.48** | 1 | |
| Seq.7 | 0.81 ** | 0.57 ** | 0.83** | 0.63** | 0.78 ** | 0.59 ** | 1 |
| Simu. 8 | 0.5** | 0.88** | 0.55 ** | 0.60** | 0.52** | 0.85** | 0.66** |

[1]NumberRecall, [2]Rover, [3]Word Order, [4]PatternReasoning', [5]HandMovement, [6]Tiangles, [7]Sequential, [8]Simultaneous
**Correlation is significant at the 0.01 level.

### *3.4. Breakfast Eating Habits and Cognitive Performance*

***Table 5.*** *Cognitive test scores of study participants according to breakfast eating habits in, Sidama Zone (n= 208)*

| Variables | Every day (n=120) | Sometimes (n=88) | P-valuea |
|---|---|---|---|
| Number Recall | 8.3± 2.1 | 7.6±1.9 | 0.013* |
| Word Order | 11.1±2.4 | 11.1±2.8 | 0.96 |
| Hand Movement | 7.9±2.7 | 6.9±2.7 | 0.006* |
| Triangles | 11.6±3.4 | 10.9±3.5 | 0.15 |
| Rover | 13.4±3.8 | 11.9±3.8 | 0.007* |
| Pattern Reasoning | 6.5±2.7 | 4.0±1.9 | 0.001* |
| Sequential scale | 27.3±5.6 | 25.5±5.9 | 0.032* |
| Simultaneous scale | 25.0±6.1 | 22.9±6.6 | 0.016* |

*Difference is significant at level 0.05
[a]Independent sample t-test

Comparison of adolescents cognitive test scores by breakfast eating habits is presented in Table 5. Adolescents who consumed breakfast irregularly tend to have lower test scores than did adolescents who regularly consumed breakfast. It was found that there were significant differences in the cognitive test scores with regular breakfast eaters achieving the highest mean scores compared to irregular breakfast eaters ($P$<0.05).Those adolescents who had consumed breakfast regularly achieve higher scores in Sequential and Simultaneous scale (P= 0.032) and (P= 0.016) respectively

Multiple linear regression analysis of variables that individually predict Patten Reasoning, Sequential and Simultaneous test scores of adolescents are presented in table 6. The results show that regular breakfast eating habit and education of mother were significantly (P<0.001) associated with Sequential scale (short term memory) explaining 10 % variation. Regular breakfast habit and education of mother were significantly associated with Simultaneous scale explaining 15 % variation and breakfast eating habits and maternal education were significantly associated with Pattern Reasoning explaining 31.6% variation

***Table 6.*** *Multiple linear regression analysis of variables that individually predict Patten Reasoning, Sequential and Simultaneous test scores of adolescents in Sidama Zone, Southern Ethiopia, June 211 (n = 208).*

| Variables | Beta | SE | P-value |
|---|---|---|---|
| Sequential scale | | | |
| Breakfast eating habits | 0.180 | 0.804 | 0.01* |
| Maternal education | 0.266 | 0.364 | 0.001* |
| Adj. R squared = 0.103 | | | |
| Simultaneous scale | | | |
| Breakfast eating habits | 0.23 | 0.858 | 0.001* |
| Maternal education | 0.170 | 0.389 | 0.009* |
| Adj. R squared = 0.159 | | | |
| Pattern Reasoning | | | |
| Breakfast eating habits | 0.537 | 0.32 | 0.001* |
| Maternal education | 0.099 | 0.145 | 0.092 |
| Adj. R squared = 0.316 | | | |

# 4. Discussion

The results of the this study showed that the prevalence of breakfast skipping was high, 42.3% of the study participants were skipping breakfast 2 or 3 times per week. This is higher as compared to other countries. Study conducted in India showed that 62.3% of the adolescents habitually consumed breakfast, whereas 33.8% consumed it irregularly skipping it 2 or 3 times per week [26]. Another study done in Hong Kong showed that 30.5% of the early adolescents skip breakfast for at least one day in a week [27]. Similar study indicated that as children enter the critical growth spurt, they are even less likely to eat breakfast, with 17% of 12 and 13 year olds responding they rarely consume breakfast. As reported that 19% of American and 12% of Australian adolescents consumed breakfast irregularly, respectively [28]. Similarly, study done in Japan showed that over 15% of school age children do not eat breakfast regularly [29]. A National Child Hunger Survey of Canada reported that 42% of school age children do not regularly consume breakfast [30].

Independent sample t-test analysis showed that there were significant differences of cognitive test scores between regular and irregular breakfast eaters. [13] Assessed the effects of breakfast on cognitive performance reported that skipping breakfast can have adverse effects on cognitive performance of school aged children. Investigated the effects of breakfast on children's cognitive performance had reported that study subject's cognitive performance was enhanced after eating breakfast as compared to omitting breakfast. A study done in rural Peru showed that a school breakfast program had a significant and positive effect on short term memory, arithmetic and reading comprehension [31].

Other study done in Indian children aged 11-13 years old reported significant association between regular breakfast consumption patterns and immediate recall memory test as well as letter cancellation test (attention-concentration) [26]. Studies had reported that regular breakfast eaters had shown to have improved short-term memory function and increased alertness [6 and 32] and adolescents who were not consuming-breakfast had a decline in performance on verbal fluency test [33; 34 and 35]. Similarly, other study showed that children who ate breakfast regularly demonstrated improved problem-solving ability, short-term memory, attention, and episodic memory in comparison to those who did not eat breakfast, as well as better cognitive performance than breakfast skippers [8].

Multiple linear regression analysis of variables that individually predicted adolescent's cognitive performance showed that breakfast eating habits was significant predictor of the Sequential scale (short term memory), Simultaneous scale (Visual processing) and Pattern Reasoning (fluid reasoning) (Adj. $R^2 = 0.103$, $P < 0.01$), (Adj. $R^2 = 0.159$, $P < 0.001$) and (Adj. $R^2 = 0.316$, $P < 0.001$) respectively after controlling for other confounding variables.

Study conducted in Indian adolescents reported significant association between family type, regular breakfast habit and science marks [26]. The same study reported significant association between education of mother, regular breakfast habits and English mark of children's. Other experimental study which had tested the effects of breakfast on memory and mood found that consuming breakfast regularly resulted in better scores on different types of memory tests which were conducted among university students in Wales [45]. The same study reported that eating breakfast regularly improves learning and cognitive performance of the children [45]. Other studies had also shown that eating breakfast regularly improves standardized test scores, problem solving tasks and memory performance among children [37and 6]. Study done in Iraq reported that children skipping breakfast in the morning have 7.4 times more risk to have low intelligence compared to those who had taken breakfast every day and there is strong relationship between breakfast eating habits and intelligence quotient of children [38]. Similarly, a cross sectional study conducted on junior high school boys and girls in Norway reported that eating breakfast seldom or never was associated with approximately a 2-fold increased odds for less favorable school grades compared with eating breakfast every day [3].

Another study reported that the educational status of family members significantly influenced children's intelligence level [39]. Several studies showed that missing breakfast detrimentally affects children's cognitive performance, like problem solving and short-term memory [9]; attention and episodic memory [10]. Conversely, when children consumed breakfast, performance is enhanced on measures of vigilance attention, arithmetic, problem solving tasks, and logical reasoning [11].

The possible explanation could be the gradual decline of insulin and glucose levels could cause a stress response in children, which interferes with different aspects of cognitive performance, such as attention and working memory [14]. Reference [40] suggested that skipping breakfast can pose serious problems for children daily nutritional intake. The deficiencies of important micronutrients such as iron and vitamin B-12 had shown significant impact on children's cognitive development [40]. Alternatively, breakfast skippers run the risk of becoming malnourished which has been linked to delayed cognitive development [41]. Children who skip breakfast are at an increased nutritional risk due to the fact that the nutrients that were not consumed during breakfast are not usually replaced at later meals. Specific nutrients that breakfast skippers are up to two thirds deficient of the Recommended Dietary Allowance are vitamins A, B6, and D, calcium, magnesium, riboflavin, folacin, zinc, phosphorus, and iron [28]. Finally, breakfast skipping has been shown to have a negative relationship with the intake of many if not most vitamins and minerals [42].

Study done by [43] found that carbohydrate breakfast intake was associated with improved performance of a short term memory task whereas a protein breakfast was associated with reduced forgetting in a paragraph recall task. The possible explanation is academic performance may be related with cognitive development of the individual.

Meta-analysis study reported that among the skills that improved after breakfast consumption were verbal fluency, arithmetic, tests of attention, memory, creativity and cognitive functioning [1]. Similarly, one study indicated that children who do not eat breakfast had reduced memory function, poorer attention spans and reduced performance in tasks requiring concentration when compared with those who consumed an adequate breakfast [44]. Another study reported positive effects of breakfast on memory [45], reasoning [46], creativity or idea generation and problem solving ability.

Study related with maternal educational status and cognitive performance of children reported significant association between maternal educational status and cognitive performance of children, particularly this association was seen in verbal test scores [47]. Another study done on Spanish adolescents indicated that parent's educational and occupational level was positively associated with verbal and reasoning ability in males and females [48].

### *4.1. Strengths of the Study*

This study is the only study in that administrative area and assessed largely unexplored area of the research in study area, namely, assessed the relationship between breakfast eating habits, anthropometric status and cognitive performance.

The breakfast eating was counted from Monday to Sunday that might increase the reliability and validity of our understanding of this phenomenon.

### *4.2. Limitations of the Study*

- Variables such as genetic variations which were not measured in this study could be potential confounders of cognitive function.
- The study was cross sectional and we did not explore the nutritional content or quality and quantity of breakfast consumed.
- The fact that this research used cross-sectional study design, it is impossible to establish causal association between the dependent and independent variables.

## 5. Conclusion

Findings of present study indicated that adolescent breakfast skipping prevalence was 42.7% skipping 2 or 3 times per week which indicates that breakfast skipping is the major problem among adolescents' in the study area. This study shows that breakfast skipping and cognitive function are related. Significant relationship was observed between cognitive function and breakfast eating habit. Healthy eating is essential for adolescents to achieve their full academic potential, mental growth and lifelong health and wellbeing. This finding indicates the need to implement intervention programs to reduce breakfast skipping problems and its consequences in the study area. The results also strongly suggest that omitting breakfast interferes with cognitive function in adolescents. At the very least, breakfast consumption improves cognitive performance. Breakfast is still considered the most important meal of the day. It is a healthy habit linked to long-term health. Breakfast eating habits and maternal education of study participants may have larger effect on cognitive development of adolescents.

## Recommendations

Breakfast eating habits is important factors for optimal cognitive development thus more attention should be given to the regular consumption of breakfast, through implementing school breakfast program, providing nutritional education, and other health promotion activities. Nutrition education should attempt to educate adolescents, parents, teachers and school community about the importance of regular habits of eating breakfast because majority of adolescents spend their time in the school.

Attention should be given for household socioeconomic status through enhancing household income that may have impact on adolescent cognitive development through affecting household food supply. Maternal schooling should be improved because mother has the role in the creation of a stimulating intellectual environment for their children in order to reduce possible socioeconomic inequalities, ensure optimal and equal development, social support and opportunities to succeed related to cognitive development in their offspring. Further studies recommended looking into both long-term and short-term effects of skipping breakfast on cognitive performance and the relationship between breakfast eating patterns (including quality and quantity of food) and cognitive function in Ethiopian adolescents.

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