



Breakfast Consumption Pattern and Cognitive Skills of School Children in Relation to the Parental Components

Suvarna Maigur ^{a++*} and Manjula Patil ^{b#}

^a Department of Human Development and Family Studies, College of Community Science, University of Agricultural Sciences, Dharwad-580005, Karnataka, India.

^b University of Agricultural Sciences, Dharwad-580 005, Karnataka, India.

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Breakfast provides body and brain with fuel and it differs qualitatively from eating after overnight fast during sleep. A study was conducted to examine the influence of parental factors on breakfast consumption and cognitive skills of higher primary school children at University of Agricultural Science Dharwad (2021-22). Study sample comprised of 60 children from rural and 60 children from urban (9-13 years) in Dharwad district who attended higher primary school (5th, 6th and 7th). Breakfast consumption and demographic information was assessed by using self-structured questionnaire. Socio economic status developed by Aggarwal *et al*, 2005 was used to assess parent education and parent occupation. The cognitive skills of children were assessed by using Wechsler's Intelligence Scale for School Children (WISC-III). Results revealed that, children with

⁺⁺ M. Sc. (Home Science.);

[#] Associate Professor and Scientist AICRP (WIA) MARS;

^{*}Corresponding author: Email: maigursuvarna40@gmail.com;

younger age parents had higher cognitive scores compared to older age parents, parent's education and occupation showed significant association and differences with regular and irregular breakfast consumers. Thus, study results indicate that, there is a need for guidance/ counseling, orientation programme to children and their parents to encourage their regular breakfast consumption.

Keywords: Breakfast consumption; lifestyle factors; blood glucose; metabolic rate.

1. INTRODUCTION

Breakfast provides body and brain with fuel and it differs qualitatively from eating after overnight fast during sleep. A daily breakfast consumption has been contributed in positive health outcomes. "It is a fact that gap between dinner and breakfast is so high that an individual is really starving without a breakfast, there is a possibility of low blood glucose level and low metabolic rate, irritability and fatigue" (Marika, 2003; Williams et al., 2009). "Breakfast is an important factor in the health of children as the body is low in reserve energy and there is need for frequent supply of needed energy for a day. Missing breakfast can also negatively impact lifestyle factors, social and behavioral outcomes" (Suvarna Maigur & Manjula Patil, 2022). Majority of parents think having breakfast improved their children's cognitive achievements. The parent's education has an effect on the children having breakfast daily. Higher the parents education, more the children consuming breakfast (Abdulrahman et al. (2020).

"The children belong to higher parents education and unemployed fathers skip more breakfast due to the reason of 'no appetite' followed by absence of favorite food" (Azad et al. 2013; Louise, 2015). "Students whose mothers had a low level of education and students with a low value of breakfast consumption had a higher likelihood of skipping breakfast. Mothers' high value of breakfast and encouragement of children to eat breakfast were directly related to an increase in children's perceived importance of breakfast consumption. Hence, with this background a need was felt to conduct a study with the objective to examine the influence of parental factors on breakfast consumption and cognitive skills of higher primary school children" (Suvarna Maigur & Manjula Patil, 2022; Smith, 2001).

2. MATERIALS AND METHODS

The population of the study comprised of school going children in the age group of 10-13 years

residing in the rural and urban area of Dharwad taluk, Dharwad district, Karnataka state. Four localities were selected from the Dharwad city and four villages were located from the rural areas of Dharwad taluk. From each locality and villages a sample of 15 children were randomly selected (boys and girls). Thus, a total of 120 school children were selected for the study.

2.1 Tools Used for Assessment

Structured Schedule for Breakfast Consumption: The schedule is used to assess the information on breakfast consumption pattern and age of parents. Criteria for selection of children based on breakfast consumption pattern: According to number of days of breakfast consumption per week, children were categorised as regular and irregular breakfast consumers. Children who consumed breakfast for more than 5 days in a week they were considered as regular breakfast consumers, if less than 5 days, they were considered as irregular breakfast consumers (Hazzaa et al. (2019).

Socio Economic Status: Socio economic status developed by Aggarwal et al. (2005) was used. This assess parent's education and occupation.

Wechsler's Intelligence Scale for School Children (WISC-III): The Wechsler's Intelligence scale for school children (WISC-III) is an individually administered clinical instrument for assessing the cognitive abilities of 6-16 years old children. This scale consists of 13 subtests, each measuring different aspects of intelligence. They are organized into two groups as performance subtests and verbal subtests as Table 4.

In addition to the verbal performance and full scale IQ scores, four factors based index scores were also calculated.

Scoring and IQ index: Each subtest has specific scoring pattern. Guidelines are given in manual in detail. On the raw scores, equivalent scaled scores are calculated and by totaling sum

of scaled scores for verbal and per performance and full scaled scores are calculated. With the respective items of the scaled scores for four factors ie., verbal comprehension, perceptual

organization, freedom from distractibility and for processing speed are calculated, finally for sum of scaled scores IQ are calculated and classifies as Table 6.

Table 1. Age of the father and mother: Age of father and mother of selected children was categorized as follows

Father's age	Mother's age
>30 years	>25 years
30-35 years	25-30 years
<35 years	<30 years

Table 2. Education of the mother and father: Education of the father and mother was categorized as below based on the Aggarwal *et al.* (2005) scale

Category	Score
Illiterate	0
Just literate but not schooling	1
< Primary but attended school for at least one year	2
Primary pass but <10 th	3
10 th class pass but < Graduation	4
Graduation	5
Post graduation (non technical incl. Ph.D.)	6
Professional qualification with technical degree or diploma e.g. Doctor, Engg, CA, MBA etc.	7

Table 3. Occupation of the mother and father: Occupation of the mother and father was classified based on Aggarwal *et al.* (2005) scale

Category	Score
Unemployment(None of the family member is employed)	0
Self employed with income < 5000 (labourer, house wife)	1
Self employed with income > 5000 (shops, petty business)	2
Service at shops, transport, own cultivation of land	3
Service in private sector or independent business (employing 2-20 persons)	4
Service in central/ state/ public undertaking (owner of a company employing > 20 persons)	5

Table 4. Intelligence Scale for School Children grouped as performance sub-tests and verbal sub-tests

Performance Tests	Verbal Tests
1. Picture completion	2. Information
3. Coding	4. Similarities
5. Picture arrangements	6. Arithmetic
7. Block design	8. Vocabulary
9. Object assembly	10. Comprehension
11. Symbol search	12. Digit span
13. Mazes	

Table 5. Four factors-based index scores

Factor-I Verbal comprehension	Factor-II Perceptual organization	Factor-III Freedom from distractibility	Factor-IV Processing speed
Information Similarities Vocabulary Comprehension	Picture organization Picture arrangement Block design Object assembly	Arithmetic Digit span	Coding symbols search

Table 6. Scoring and IQ index0

Composite score rang	Classification
130 and above	Extremely high
120 – 129	Very high
110 – 119	High Average
90 - 109	Average
80 – 89	Low average
70 – 79	Very low
69 and below	Extremely low

3. RESULTS AND DISCUSSION

3.1 Distribution of Rural and Urban Children by Parental Characteristics

Contents of Table 7 showed that, In case of rural fathers, majority (78.30%) of them belonged to the age group of 30-35 years followed by above 35 years age group. Among urban fathers, higher percentage of them (71.70%) belonged to age group of 30-35 years followed by age group of above 35 years. With regard to age of the rural mothers, around 55.00 per cent of them belonged to the age group of 25-30 years followed by 38.30 per cent of mother belonged to the age group of above 30 years. In case of urban mothers, about 71.70 per cent of them belonged to age group of 30-35 years, 20.00 per cent belonged to age group of above 30 years.

With regard to education of rural fathers, around 40.00 per cent of them were completed their 10th class but less than graduation followed by 30.00 per cent had completed their primary pass but less than 10th. In case of urban fathers, around 58.30 per cent of them had completed their graduation followed by 30.00 per cent were in 10th class pass but less than graduation. With respect to education of rural mothers, around 36.70 per cent of them were in category of just literate but not schooling followed by 33.30 per cent had less than primary but attended school for at least one year. Among urban mothers, about 26.70 per cent of them were in primary pass less than 10th category followed by 25.00 per cent of mothers were in 10th class pass but less than graduation category.

With regard to occupation of rural fathers, about 33.30 per cent of them were self employed with income more than 5000 as well as service at shops/home followed by 30.00 per cent of them had service in private sector/business. In case of urban fathers, around 50.00 per cent had service in private sector/ business followed by 45.00 per cent were service at shops/home. With regard to occupation among rural mothers, about 55.00

per cent of them were self employed with income less than 5000 followed by mothers with 26.70 per cent were unemployed. In case of urban mothers, about 33.30 per cent of them were self employed with income less than 5000, followed by 25.00 per cent were self employed with income more than 5000.

It was observed that, with respect to regular intake of breakfast among rural children, around 68.30 per cent of them were having breakfast regularly and remaining 31.70 per cent were irregular consuming the breakfast. In case of urban children, 66.70 per cent of children were having breakfast regularly and about 33.30 per cent were irregular in breakfast consumption. Priya *et al.* (2010) reported that, majority of children were regular breakfast eaters. Another study conducted by Siong *et al.* (2018) revealed that, the overall prevalence of 75.60 per cent of them being regular breakfast eaters, which 11.7 per cent were breakfast skippers and 12.7 per cent were irregular breakfast eaters.

3.2 Association between Cognitive Indices of Regular and Irregular Breakfast Consumers by Father's Age

Result of the Table 8 indicated that, in case of regular breakfast consumers, in high average of cognitive skills, more per cent of children whose fathers age was between 30-35 years followed by above 35 years in both rural and urban areas. However, on analysis there was non significant association was found between father's age and regular and irregular breakfast consumers and cognitive skills in rural and urban children.

3.3 Association between Cognitive Indices of Regular and Irregular Breakfast Consumers by Mother's Age

Result of the Table 9 indicated that, in case of irregular breakfast consumers, in average level

of cognitive skills, higher per cent of children whose mothers age was above 30 years followed by between 25-30 years in both rural and urban areas. The modified chi- square value showed

non significant association was found between mothers age and regular and irregular breakfast consumers and cognitive skills in rural and urban children.

Table 7. Distribution of rural and urban children by parent's characteristics

		N=120			
Parents characteristics	Category	Rural (n = 60)		Urban (n=60)	
		N	%	N	%
Age of the fathers	< 30 years	1	1.70	4	6.70
	30 - 35 years	47	78.30	43	71.70
	> 35 years	12	20.00	13	21.70
	Total	60	100.00	60	100.00
Age of the mothers	< 25 years	4	6.70	5	8.30
	25 - 30 years	33	55.00	43	71.70
	> 30 years	23	38.30	12	20.00
	Total	60	100.00	60	100.00
Education of fathers	Professional qualification with technical degree or diploma e.g. Doctor, Eng, CA, MBA	-	-	-	-
	Post graduation	-	-	4	6.70
	Graduation	14	23.30	35	58.30
	10 th class pass but < Graduation	24	40.00	18	30.00
	Primary pass but < 10 th	18	30.00	3	5.00
	< Primary but attended school for at least one year	4	6.70	-	-
	Just literate but not schooling	-	-	-	-
	Illiterate	-	-	-	-
	Total	60	100.00	60	100.00
Education of mothers	Professional qualification with technical degree or diploma e.g. Doctor, Eng, CA, MBA	-	-	-	-
	Post graduation	-	-	2	3.30
	Graduation	1	1.70	9	15.00
	10 th class pass but < Graduation	2	3.30	15	25.00
	Primary pass but < 10 th	10	16.70	16	26.70
	< Primary but attended school for at least one year	20	33.30	14	23.30
	Just literate but not schooling	22	36.70	4	6.70
	Illiterate	5	8.30	-	-
	Total	60	100.00	60	100.00
Occupation of fathers	Service in central/state/public undertaken	-	-	1	1.70
	Service in private sector/ business	18	30.00	30	50.00
	Service at shops/home	20	33.30	27	45.00
	Self employed with income > 5000	20	33.30	2	3.30
	Self employed with income < 5000	2	3.30	-	-
	Unemployed	-	-	-	-
	Total	60	100.0	60	100
Occupation of mothers	Service in central/state/public undertaken	-	-	3	5.00
	Service in private sector/ business	1	1.70	3	5.00
	Service at shops/home	1	1.70	13	21.70
	Self employed with income > 5000	9	15.00	15	25.00
	Self employed with income < 5000	33	55.00	20	33.30
	Unemployed	16	26.70	6	10.00
	Total	60	100.00	60	100.00
Consumption of breakfast	Regular	41	68.30	40	66.70
	Irregular	19	31.70	20	33.30
	Total	60	100.00	60	100.00

Table 8. Association between cognitive indices of regular and irregular breakfast consumers by father's age

N = 120

Father's age	Rural (n=60)			Modified χ^2	Irregular BC			Modified χ^2
	Regular BC							
	High average	Average	Total		Average	Below average	Total	
30-35	16(48.49)	17(51.51)	33(100.00)	1.65 ^{NS}	10(66.64)	5(33.33)	15(100.00)	2.12 ^{NS}
>35	3(37.50)	5(62.50)	8(100.00)		2(50.00)	2(50.00)	4(100.00)	
Total	19(46.34)	22(53.65)	41(100.00)		12(63.16)	7(36.84)	19(100.00)	
Urban (n=60)								
	High average	Average	Total	4.63 ^{NS}	High average	Average	Total	3.42 ^{NS}
30-35	23(65.71)	12(34.29)	35(100.00)		2(10.00)	10(90.00)	12(100.00)	
>35	2(40.00)	3(60.00)	5(100.00)		1(12.50)	7(87.50)	8(100.00)	
Total	25(62.50)	15(37.50)	40(100.00)		3(15.00)	17(85.50)	20(100.00)	

NS-Non Significant

Table 9. Association between cognitive indices of regular and irregular breakfast consumers by mother's age

N = 120

Mother's age	Rural (n=60)			Modified χ^2	Irregular BC			Modified χ^2
	Regular BC							
	High Average	Average	Total		Average	Below average	Total	
25-30	14(56.00)	11(44.00)	25(100.00)	1.52 ^{NS}	8(66.66)	4(33.34)	12(100.00)	1.78 ^{NS}
>30	5(31.25)	11(68.75)	16(100.00)		4(57.15)	3(42.85)	7(100.00)	
Total	19(46.34)	22(53.65)	41(100.00)		12(63.16)	7(36.84)	19(100.00)	
Urban (n=60)								
	High Average	Average	Total	0.83 ^{NS}	High Average	Average	Total	1.52 ^{NS}
25-30	20(60.60)	13(39.40)	33(100.00)		2(13.33)	13(86.67)	15(100.00)	
>30	5(71.43)	2(28.57)	7(100.00)		1(20.00)	4(80.00)	5(100.00)	
Total	25(62.50)	15(37.50)	40(100.00)		3(15.00)	17(85.00)	20(100.00)	

NS-Non Significant

Table 10. Association between cognitive indices of regular and irregular breakfast consumers by father's education

N=120

Father's education	Rural (n=60)			Modified χ^2	Irregular BC			Modified χ^2
	Regular BC							
	High Average	Average	Total		Average	Below average	Total	
Graduation	5(62.50)	3(37.50)	8(100.00)	4.18 ^{NS}	4(66.67)	2(33.33)	6(100.00)	4.18 ^{NS}
10 th class pass but < Graduation	8(53.34)	7(46.66)	15(100.00)		6(66.67)	3(33.33)	9(100.00)	
Primary pass but < 10 th	6(33.33)	12(66.67)	18(100.00)		2(50.00)	2(50.00)	4(100.00)	
Total	19(46.35)	22(53.65)	41(100.00)		12(63.16)	7(36.84)	19(100.00)	
Urban (n=60)								
	High Average	Average	Total	10.69 [*]	High average	Average	Total	9.33 [*]
Graduation	19(67.86)	9(32.14)	28(100.00)		2(18.18)	9(81.82)	11(100.00)	
10 th class pass but < Graduation	6(50.00)	6(50.00)	12(100.00)		1(11.12)	8(88.88)	9(100.00)	
Total	25(62.50)	15(37.50)	40(100.00)		3(15.00)	17(85.00)	20(100.00)	

NS-Non Significant * significant level of 0.05 level

Table 11. Association between cognitive indices of regular and irregular breakfast consumers by mother's education

N=120

Mother's education	Rural (n=60)			Modified χ^2	Irregular BC			Modified χ^2
	Regular BC							
	High Average	Average	Total		Average	Below average	Total	
Primary pass <10 th	6(85.71)	1(14.29)	7(100.00)	7.21*	4(60.00)	2(40.00)	5(100.00)	16.18*
< primary but attended school for at least one year	11(91.67)	1(8.33)	12(100.00)		4(50.00)	4(50.00)	8(100.00)	
Just literate but not schooling	2(9.10)	20(90.90)	22(100.00)		4(80.00)	1(20.00)	5(100.00)	
Total	19(46.35)	22(53.65)	41(100.00)		12(63.16)	7(36.84)	19(100.00)	
Urban (n=60)								
	High average	Average	Total	5.69 ^{NS}	High average	Average	Total	10.86*
Graduation	6(66.67)	3(33.33)	9(100.00)		1(50.00)	1(50.00)	2(100.00)	
10 th class pass but < graduation	6(60.00)	4(40.00)	10(100.00)		-	5(100.00)	5(100.00)	
Primary pass <10 th	6(54.55)	5(45.45)	11(100.00)		1(20.00)	4(80.00)	5(100.00)	
< primary but attended school for at least one year	7(75.00)	3(25.00)	10(100.00)		1(12.50)	7(87.50)	8(100.00)	
Total	25(62.50)	15(37.50)	40(100.00)		3(15.00)	17(85.00)	20(100.00)	

NS-Non Significant * significant level of 0.05

Table 12. Association between cognitive indices of regular and irregular breakfast consumers by father's occupation

N=120

Father's occupation	Rural (n=60)			Modified χ^2	Irregular BC			Modified χ^2
	Regular BC							
	High average	Average	Total		Average	Below average	Total	
Service in private sector/ business	6(60.00)	4(40.00)	10(100.00)	8.95*	4(50.00)	4(50.00)	8(100.00)	2.37*
Service at shops/ home.	8(66.67)	4(33.33)	12(100.00)		5(62.50)	3(37.50)	8(100.00)	
Self employed with income >5000	16(84.21)	3(15.78)	19(100.00)		1(33.33)	2(66.67)	3(100.00)	
Total	19(46.35)	22(53.65)	41(100.00)		12(63.16)	7(36.84)	19(100.00)	
Urban (n=60)								
	High average	Average	Total	11.10*	High average	Average	Total	3.36 ^{NS}
Service in private sector/ business	16(64.00)	9(36.00)	25(100.00)		2(33.33)	4(66.67)	6(100.00)	
Service at shops/ home.	11(71.42)	4(28.57)	15(100.00)		1(7.69)	13(92.31)	14(100.00)	
Total	25(62.50)	15(37.50)	40(100.00)		3(15.00)	17(85.00)	20(100.00)	

NS-Non Significant * significant level of 0.05

Table 13. Association between cognitive indices of regular and irregular breakfast consumers by mother's occupation

N=120

Mother's occupation	Rural (n=60)			Modified χ^2	Irregular BC			Modified χ^2
	Regular BC							
	High average	Average	Total		Average	Below average	Total	
Self employed with income >5000	4(66.67)	3(33.33)	7(100.00)	4.60*	3(66.67)	1(33.33)	4(100.00)	6.65*
Self employed with income <5000	12(46.16)	14(53.84)	26(100.00)		4(57.15)	3(42.85)	7(100.00)	
Unemployed	3(37.50)	5(62.50)	8(100.00)		5(62.50)	3(37.50)	8(100.00)	
Total	19(46.35)	22(53.65)	41(100.00)		12(63.16)	7(63.84)	19(100.00)	
Urban (n=60)								
	High average	Average	Total	0.65*	High average	Average	Total	0.29*
Service at shops, home	8(80.00)	2(20.00)	10(100.00)		1(11.11)	8(88.89)	9(100.00)	
Self employed with income >5000	6(66.67)	3(33.33)	9(100.00)		--	6(100.00)	6(100.00)	
Self employed with income <5000	9(50.50)	9(50.00)	18(100.00)		1(50.00)	1(50.00)	2(100.00)	
Unemployed	2(60.67)	1(39.33)	3(100.00)		1(33.33)	2(66.67)	3(100.00)	
Total	25(62.50)	15(37.50)	40(100.00)		3(15.00)	17(85.00)	20(100.00)	

* significant level of 0.05

3.4 Association between Cognitive Indices of Regular and Irregular Breakfast Consumers by Father's Education

In relation to father's education, significant association and difference was found between breakfast consumption and cognitive skills of urban ($f=1.26$ and 7.75) children (Table 10). However non significant association and difference was observed with rural children. It is observed that fathers who had higher education (graduation), their children tend to have higher cognitive skills scores than other category children. Fathers with more education used more diverse academics, spend time with their children and also they are more conscious about the child's education and literacy. The findings of the present study are in conformity with results Hazzaa *et al.* (2019) which shows that, there were significant differences between daily versus non-daily breakfast consumers with father's education ($p < 0.001$), with a clear positive trend between daily breakfast intake with increase in fathers education. Another study Jan Mohamed *et al.* (2015) revealed that higher parental education were significantly associated with skipping breakfast.

3.5 Association between Cognitive Indices of Regular and Irregular Breakfast Consumers by Mother's Education

With regard to mother's education, a significant association and difference was found with rural regular and irregular ($x^2=7.21$ and 16.18) and urban irregular ($x^2=10.86$) breakfast consumers with nonsignificant result on urban regular breakfast consumers (Table 11). The reason might be that less educated mothers were less likely to provide children with adequate cognitive stimulation and bring negative effects on child abilities. As mother's education increases there was significant increase in the children cognition. These results are in line with the results of Hesham *et al.* (2011) who revealed that, children of mothers with low educational levels had significantly lower IQ scores ($t \frac{1}{4} 3.256$; $P \frac{1}{4} 0.001$) than the children of mothers with at least 6 years of formal education. Another study by Mohammed *et al.* (2014) showed that, the prevalence of breakfast consumption was 52.3 per cent, statistically decreasing with mothers age. In a study by Aneley and Zelalem (2019) it was noted that, skipping breakfast was to the

extends of 32.5 per cent among students whose mother were in educated.

3.6 Association between Cognitive Indices of Regular and Irregular Breakfast Consumers by Father's Occupation

Results revealed to father's occupation showed significant influence on breakfast consumption and cognitive skills of rural regular and irregular ($x^2=8.95$ and 2.37) and urban regular ($x^2=11.10$) breakfast consumers but non significant association was found urban irregular breakfast consumers. Significant difference was observed in regular and irregular breakfast consumers both rural and urban except rural regular breakfast eaters (Table 12). Children whose fathers who were in service in private sectors/business was found to be advanced in cognitive scores compared to children whose fathers working with other categories. The reason could be that, parents who work in cognitively stimulating jobs provide intellectual stimulating and emotional nurturing home environments for children. The findings of the present study are in conformity with results of Hazzaa *et al.* (2019) who found significant difference and association between breakfast eaters and breakfast skippers with higher paternal occupation status providing good cognitive scores of the children.

3.7 Association between Cognitive Indices of Regular and Irregular Breakfast Consumers by Mother's Occupation

With regard to mother's occupation, it is observed that, significant association and difference was found with cognitive skills of regular and irregular breakfast consumers in rural ($x^2=4.60$ and 6.65) and urban ($x^2=0.65$ and 0.29) children. Mothers who were self employed with income more than 5000 (rural) and service ay shops/home (urban), children had higher cognitive scores than the other categories of mothers (Table 13). Hazzaa *et al.* (2019) also found associated significant difference between breakfast eaters and breakfast skippers with higher maternal occupation status was good cognitive scores among children. Results of study by Lara *et al.* (2014) showed that, "significantly higher proportion of working mothers reported more breakfast eaters compared to less proportion of mother working". In a study conducted by Hesham *et al.* (2011) found that, "children of working mothers had

significantly better IQ scores than the children of mothers with no employment". From the Reem *et al.* (2017) study, it was observed that, "mother's occupation level were significantly associated with the daily consumption of breakfast and they were performed better in cognitive tests".

4. CONCLUSION

Children with younger age parents had higher cognitive scores compared to older age group parents. In urban areas, father's education had significant association and difference between regular and irregular breakfast consumers. Mother's education had significant influence and difference in mean score of regular and irregular breakfast consumers in both rural and urban areas. However, children whose parents were completed their higher education had better cognitive scores. Parents occupation showed significant association and difference with regular and irregular breakfast consumers in both rural and urban areas. Fathers who had service in private sector/business and mothers who were self employed with income more than 5000 had better cognitive scores. Further, it is recommended that a breakfast importance training for parents to be explored, in order to encourage and improve breakfast consumption pattern among children.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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