

Identify the Main Factors of Dietary Patterns that Cause Stunting among School-age Children

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ABSTRACT

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Internationally one of the important indicators of nutritional status and health in populations is child growth. The cumulative impact of malnutrition, which begins before birth, is evident in the percentage of children with a low height for their age. This study aimed to reveal the nutritional factors that promote stunting among school-age children. The study included fifty school-age stunted children from 6-12 years chosen randomly from the Short Stature Clinics at the National Nutrition Institute, Ministry of Health, Cairo, Egypt, after having a medical examination by the physicians. Children with stunting due to non-nutritional reasons were excluded. Anthropometric, laboratory, clinical, and dietary evaluations were made. Also, socioeconomic, and nutritional awareness were evaluated. Results of the study indicated that the primary reasons for stunting are a lack of nutritional awareness among children and their mothers, with a percentage of $52\% \pm 12\%$ and $45.3\% \pm 11.3\%$, respectively, and insufficient economic level. Most of the children in the study neglected breakfast and had poor nutritional habits in the frequency of unhealthy foods. **In conclusion**, nutritional awareness, and poor eating habits were the main causes of stunting among school-aged children. So, nutritional multimedia awareness should be encouraged.

Keywords: Stunting factors, dietary pattern, and stunting causes.

INTRODUCTION

The accumulation impact of malnutrition which begins before birth, and frequent infections appear in the percentage of children with a low height for their age (**WHO, 2019**).

Despite the significant decline in stunting rates worldwide in recent years, the present prevalence is still greater than the anticipated global rates, which is a cause for concern. Globally, stunting rates have fallen from 33% in 2000 to 22% in 2020. However, the fall in rates has not been uniform among areas. While Asia witnessed a roughly 41 % reduction, from 37 % in 2000 to 21 % in 2020, Africa saw a 26 % decline, from 42 percent to 31 % (**UNICEF, 2021**). Stunting was common, particularly among students in rural communities (**Adenuga et al., 2017**).

A study conducted by **El-Shafie et al. (2020)** on 33150 Egyptian schoolchildren has shown that it is estimated that 17% of Egyptian children aged 6-11 years had stunted development, although anemia and stunting were noticed at 9.9%, while data on the prevalence of stunted growth among schoolchildren in Middle

Eastern countries is still rare. But the study which was conducted on a random sample of 300 students from three primary government schools at Baltiem in Kafr-El-sheik governorate in Egypt, noticed that 14 % of the children had stunting (**Sheta et al., 2023**).

Several nutritional factors cause stunting. For example, **Diyah et al. (2024)** reported that children's appetites pose a danger of producing nutritional deficiencies that can have a detrimental influence on health, such as stunting.

Unlike other abnormal growth cases such as obesity in childhood, stunting is still undetected and understudied, especially in schools (**Song et al., 2018**). Stunting is linked to delayed mental development, low academic performance, and decreased intellectual capacity. It is a significant predictor of human capital and societal growth (**Prendergast and Humphrey, 2014**).

The current research aims to reveal the nutritional factors that promote stunting among school-age children.

METHODOLOGY

Sample:

Inclusion:

- The current study included boys and girls fifty school-aged children chosen randomly from the Short Stature Clinics in the National Nutrition Institute, Ministry of Health, Cairo, Egypt.
- Anthropometric Measurements: (Height, and weight measurements). The height was measured using the Raven Mini meter. The children with stunting were detected (height below -2 SD) according to the World Health Organization (WHO, 2019).
- Both breastfed; formula-fed or mixed.

Exclusion

The children with stunting due to non-nutritional reasons.

Participants underwent to:

Dietary Assessment:

A food frequency questionnaire was done. The dietary intake included a detailed description of all food consumed including the cooking method, and the amount of each ingredient in the recipe was recorded.

Education and Income Level

All the children's parents asked about the education level and the income adequacy.

Nutritional Awareness

Evaluation

All the children and their mothers received the nutritional awareness evaluation questionnaire, which differed from the questionnaire for their mothers.

Statistical Analysis:

Data was analyzed by SPSS statistical package version 21. The results are reported as percentages and mean \pm SD statistically significant will be considered at $P < 0.05$ (Snedecor and Cochran 1967).

Ethical considerations:

The Scientific Research Morals Board confirmed the research of the General Authority for Hospitals and Educational Institutes under the reference number (IN 000142/2023).

RESULTS

Table (1) illustrates that 25 of the cases were boys and the other 25 were girls and that the

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mean age of the study sample was 10.1 ± 2.2 years.

Table (2) shows that the average \pm standard deviation of boys' height was 118.8 ± 10.6 cm, and weight averaged 23.1 ± 4.8 kg as standard deviation (SD). Also, it illustrates that the girls' mean \pm SD height was 122.6 ± 9.9 cm, and weight averaged 24.6 kg with a standard deviation of ± 5.7 kg.

Table (3) demonstrates that around 51% of the children's parents had a basic or lower level of education, and 78 % of the study sample did not have enough income.

Table (4) shows that the nutrition awareness levels of stunted children and their mothers were 52 %, and 45 % respectively.

Figure (1) illustrates that most of the study sample children 84 % had breastfeeding, the mean exclusive breastfeeding was 4.8 months ± 2.0 SD, and the mean weaning age was 18.8 months ± 3.8 SD, 10.9 % had artificial feeding, and only 4.3 % had a mix of breastfeeding and artificial feeding.

Table (5) demonstrates that the mean number of eating times was 3 times ± 0.5 SD, and the majority of children (68.1 %)

neglect breakfast, because of loss of appetite (75 %), having no time for breakfast or ignorance of the importance of the breakfast (12.5 %) for the recent two reasons.

Tables (6; 7), show that 62% of the children drank milk less than 3 times/week, and around 4 % of the sample didn't drink milk daily or weekly. About half of the children did not eat cheese daily or weekly, and only around a quarter of the children ate cheese daily or more than three times/week. Around $\frac{3}{4}$ the sample ate meat less than 3 times weekly. The majority of the children ate fish, cooked vegetables, and fruit rich in vitamin A less than 3 times/week, about half of them ate egg and leaf vegetables less than three times/week, more than half of them ate fresh fruits, and nuts less than three times/week, and more than half of them didn't have herbals, honey, and olive oil. On the other hand, around half of the children had soft drinks, sugar, chips, processed meat, canned juice, and packed sweets. While more than a third of the sample had processed cheese more than three times weekly. Around half of the children's family used artificial ghee daily.

DISCUSSION

The present research found that around half of the children's parents had a basic or low level of education, and most of the study sample did not have enough income. These results considered low education level, and low income as the main factors of school-age stunting. Align with a previous study in Egypt that reported that the main social variables that have a significant impact on stunting were having illiterate moms or women who could only read and write, low-income households, and big family sizes, which increased the risk of stunted children by more than three times compared to having highly educated mothers, middle-income families, and small families. Having illiterate fathers or fathers who could only read and write carried more than twice the chance of their children being stunted (**Metwally et al., 2020b**).

There is no association between family income and stunting since low-income families may manage nutritious and healthful meals using simple and inexpensive items, allowing women to satisfy nutritional demands throughout pregnancy

and avoid stunting. A high family income does not always cover all of the mother's food demands, therefore it is not a guarantee of adequate nutrition. According to **Agustin and Rahmawati, (2021)**, poverty, a lack of health education, poor nutrition, and improper parenting can all contribute to delayed growth and development in toddlers. Insufficient maternal knowledge may also contribute to stunting.

On the other hand, **Nurwasilah et al., (2024)** found no link between mother education level, family income level, and the prevalence of stunting in toddlers at Madiun City Health Centre.

As stated in Table (4) indicates, the results emphasize the relationship between stunting in school-aged children and their mother's nutritional awareness. The results supported the study of **Soliman et al., (2024)** on mothers' perceptions of healthy lifestyles among their primary school children with stunting, which found that over one-third of the mothers surveyed had limited awareness of stunting, and there was a strong relationship between mothers' overall knowledge and socio-demographic characteristics

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such as age, education level, marital status, family size, domicile, and income. The mother's degree of education has an impact on her family's health, particularly their nutritional status. Maternal education also influences parenting for children since women are the primary food managers at home, therefore it has a significant impact on the nutritional status of all family members (**Noviyanti et al., 2020**).

Husnaniyah et al., (2020); Sari and Zelharsandy, (2022) reported that maternal knowledge significantly impacts the incidence of stunting. Low family income has a direct influence on stunting because it pushes families to consume fewer nutritious meals to satisfy their nutritional requirements. Furthermore, due to low food quality, an increasing number of malnourished children, result in nutritional challenges among toddlers (**Yanti and Fauziah, 2021**).

Also, the previous study found a substantial correlation ($P < 0.01$) between children's height, dietary awareness, stated habits, and overall lifestyle without a statistically significant correlation

with their gender (**Sheta et al., 2023**).

Figure (1): The present study did not reveal that there was a relation between breastfeeding and stunting, where most of the study school-aged stunting children had breastfeeding and the weaning age average was 18.8 months. The suspected cause of stunting in the present study sample was inadequate complementary food practices. This result aligns with **Handoussa, (2010)** who revealed that the major cause of stunting in Egypt is mothers' lack of understanding of the importance of a good diet, especially during pregnancy. In Egypt, the majority of the irreversible damage from malnutrition occurs within the first 24 months of life and pregnancy. Furthermore, mothers lack the required awareness of infant and young child feeding practices and what a child should ingest throughout the first 24 months of life (**Alanwar et al., 2018**). Previous studies in contrast had illustrated that breastfeeding was considered one of the factors that showed significant association with childhood stunting (**Frempong and Annim, 2017**).

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Table (5) shows that the prevalence of negative nutritional habits among school-aged children revealed that nutritional habits are considered one of the main factors of stunting, these results align with **Sheta *et al.*, (2023)**. In addition, **Metwally *et al.*, (2020a)** reported that children who did not eat breakfast and had less than three meals per day had a fourfold higher risk of stunting compared to those who ate more than three meals per day. Skipping breakfast or morning snacks, not eating on time, and eating less than three meals per day increased the risk of stunting by more than twice, and Normal children consumed more nutrient-rich foods (vegetables, fruits, protein, and dairy products) compared to stunted children who consumed more energy-dense foods (French fries, chips, biscuits, chocolate, pancakes/cakes, ice cream, and candies) and carbohydrates grains. Normal children consumed half of their diet as nutrient-rich dairy, legumes, or meat, compared to 28% of stunted children. This conclusion contradicts the findings of **(Akpene *et al.*, 2021)**, who investigated the link between nutrition and physical activity

knowledge and body mass index for age among school-aged children in Ghanaian schools. They demonstrated that there was no significant link between nutrition awareness, overall nutritional practice, and BMI-for-age among the investigated children. The discrepancy in results might be attributed to the amount of knowledge about good nutrition, which leads to improvements in dietary behavior that aid in the maintenance of a normal body mass index **(Akpene *et al.*, 2021)**.

Results of food frequency as stats in Tables (6), and (7) reflect the negative nutritional habits of the sample due to lack of nutritional awareness, and low income, where the percentage, and frequency of consumption for healthy food was low, while the percentage, and frequency consumption of unhealthy food was high. These results align with **Sheta *et al.*, (2023)** who reported that that 59.3% of the 300 primary school students studied had an unhealthy lifestyle and found a substantial correlation ($P < 0.01$) between children's height, dietary understanding, nutritional practices, and overall lifestyle. A study in Egypt by **Metwally *et al.*,**

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(2020a) demonstrated that stunted schoolchildren ate more energy-dense foods (French fries, chips, biscuits, chocolate, pancakes /cakes, ice cream, and candies) and carbohydrates than normal children. Another study discovered that an education-based nutrition and lifestyle intervention program improved nutrition knowledge, diet quality, lifestyle, and nutritional status in schoolchildren aged 10 to 12 over time (Kendel *et al.*, 2023).

CONCLUSION

The study indicated that the primary reasons for stunting are lack of nutritional awareness among children and their mothers, with a percentage of 45.3% ± 11.3% for mothers and 52% ± 12% for children, as well as insufficient economic level. 68.1% of children neglect breakfast, and the percentage, and frequency of consumption of healthy food were lower than the percentage, and frequency of consumption of unhealthy food.

RECOMMENDATIONS

- Nutritional multimedia awareness should be encouraged.
- Implementing nutritional education research for

schoolchildren, and parents to promote their healthy status and growth.

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Table (1): Distribution of the studied sample according to their sex and Mean Age

Sex	NO	%
Boys	25	50
Girls	25	50
Age	Mean	± SD
	10.1	±2.2

Table (2): Anthropometric Measurements for the Study Sample Boys and Girls

Anthropometric Measurements	Boys		Girls	
	Mean	SD ±	Mean	SD ±
Weight	23.1	±4.8	24.6	±5.7
Height	118.8	±10.6	122.6	±9.9

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Table (3): The Variety and Percentage of Socioeconomic Data for the Study Sample

Data		No	%
Father Education	Illiterate	5	10.00
	Read and write	6	12.00
	Basic	12	24.00
	Secondary	15	30.00
	University	12	24.00
Mother Education	Illiterate	11	22.00
	Read and write	7	14.00
	Basic	10	20.00
	Secondary	13	26.00
	University	9	18.00
Income level	Enough	11	22.00
	Not enough	39	78.00

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Table (4): The Study Sample Mothers and Children Awareness

Awareness	Mean %	± SD %
Mothers Awareness	45.3	± 11.3
Children Awareness	52	± 12

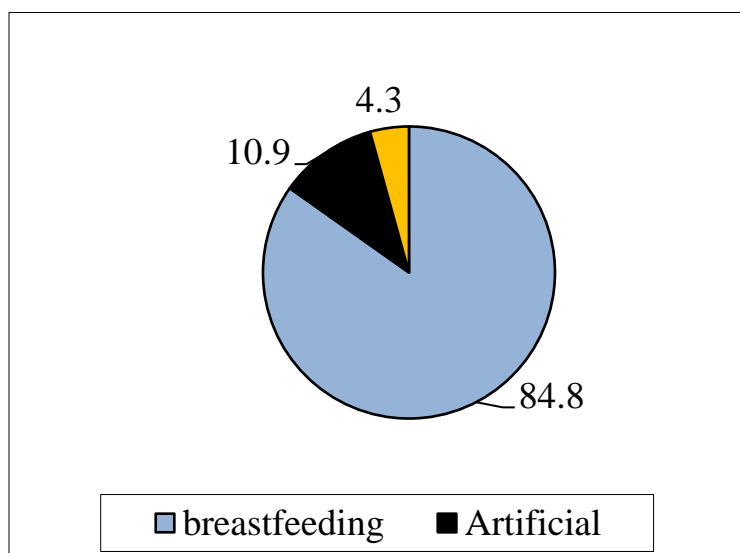


Figure (1) Distribution of Feeding Type for the Study Sample.

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Table (5): Eating Habits for the Study Sample Children

Food Habits		No	%
Main Meal	Breakfast	3	6.4
	Lunch	36	76.6
	Dinner	8	17.0
Having Breakfast	Yes	15	31.9
	No	32	68.1
Reason no Breakfast	Ignorance	4	12.5
	No appetite	24	75.0
	No time	4	12.5
Have Fast Food	Yes	10	21.3
	No	37	78.7
Have Snacks	Yes	47	94.0
	No	3	6.0
Meals Number		Mean	SD
		3.0	0.5

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Table (6): Food Frequency of Healthy Food for the Study Sample Children

Food Items	Daily		≥3 Times/Week		<3 Times/Week		No intake	
	No	%	No	%	No	%	No	%
Leaf Vege.	20	40.0	6	12.0	24	48.0	0	0.0
Cooked Vege.	3	6.0	7	14.0	40	80.0	0	0.0
Fresh Fruits	10	20.0	12	24.0	28	56.0	0	0.0
Fruits Rich in Vit. A	0	0.0	2	4.0	48	96.0	0	0.0
Nuts	6	12.0	1	2.0	30	60.0	13	26.0
Milk	10	20.0	7	14.0	31	62.0	2	4.0
Cheese	11	22.0	6	12.0	11	22.0	22	44.0
Meat	1	2.0	10	20.0	38	76.0	1	2.0
Fish	1	2.0	1	2.0	45	90.0	3	6.0
Eggs	13	26.0	13	26.0	22	44.0	2	4.0%
Herbals	9	18.0	2	4.0	9	18.0	30	60.0
Honey	8	6.0	0	0.0	15	30.0	27	54.0
Olive Oil	6	12.0	1	2.0	1	2.0	42	84.0

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Table (7): Food Frequency of Unhealthy Food for the Study Sample Children

Food Items	Daily		≥3 Times/week		<3 Times/week		No intake	
	No	%	No	%	No	%	No	%
Canned Juice	3	6.0	2	4.0	25	50.0	20	40.0
Packed– Sweets	6	12.0	6	12.0	25	50.0	13	26.0
Chips	28	56.0	8	16.0	10	20.0	4	8.0
Processed Cheese	4	8.0	16	32.0	18	36.0	12	24.0
Processed meat	2	4.0	7	14.0	25	50.0	16	32.0
Soft drinks	8	16.0	6	12.0	23	46.0	13	26.0
Sugar	22	44.0	2	4.0	26	52.0	0	0.0
Artificial Ghee	26	52.0	6	12.0	2	4.0	16	32.0

تحديد العوامل الرئيسية للنمط الغذائي المسببة لقصر القامة لدى الأطفال في سن المدرسة.

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1. قسم التغذية وعلوم الأطعمة – كلية الاقتصاد المنزلي- جامعة حلوان
2. قسم التغذية الاكلينيكية بالمعهد القومي للتغذية، وزارة الصحة القاهرة، مصر.

الملخص العربي

على المستوى الدولي، يعد نمو الأطفال أحد المؤشرات المهمة للحالة التغذوية والصحية لدى السكان. ويظهر التأثير التراكمي لسوء التغذية الذي يبدأ من قبل الولادة في نسبة الأطفال ذوي الطول المنخفض بالنسبة لأعمارهم. يهدف البحث الحالي إلى الكشف عن العوامل الغذائية التي تعزز قصر القامة لدى الأطفال في سن المدرسة. شملت الدراسة الحالية خمسين طفلاً مصاب بقصر القامة في سن المدرسة تم اختيارهم عشوائياً من عيادات قصار القامة التابعة للمعهد القومي للتغذية، وزارة الصحة، القاهرة، مصر، بعد إجراء الفحص الطبي من قبل طبيب متخصص واستبعاد الأطفال الذين يعانون من قصر القامة لأسباب غير غذائية. تم إجراء تقييمًا للقياسات البشرية والمختبرية والسريرية والغذائية والاجتماعية والاقتصادية ومستوى الوعي الغذائي. وأشارت الدراسة إلى أن الأسباب الرئيسية لقصر القامة هي قلة الوعي الغذائي لدى الأطفال وأمهاتهم، بنسبة 45.3% للأمهات و52% للأطفال، فضلاً عن عدم كفاية المستوى الاقتصادي. معظم الأطفال يهملون وجبة الإفطار، ولديهم عادات الغذائية السيئة تظهر في معدل تكرار تناولهم للأطعمة الغير صحية. وفي الختام، كان الوعي الغذائي والعادات الغذائية السلبية هي الأسباب الرئيسية لقصر القامة بين الأطفال في سن المدرسة. لذا توصي الدراسة بتشجيع نشر الوعي الغذائي باستخدام وسائل الاعلام المختلفة.

الكلمات المفتاحية: قصر القامة، عوامل قصر القامة، النمط الغذائي، أسباب قصر القامة.