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Original Article

Evidence Based Assessment of Physical Growth among Primary School Children

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ABSTRACT

Background: School children are the most important segment in the society. Their physical growth presents a general health status of a community as a whole. **Aim:** Apply evidence-based assessment of physical growth among primary school children. **Design**: A descriptive cross-sectional research design was used. **Setting:** The study was conducted at three primary Governmental schools at Baltiem in Kafr –El-sheik governorate, Egypt. **Sample:** Simple random sample of 300 students enrolled at the selected setting. **Tools**: Included (1) An interviewing questionnaire including socio-demographic characteristics, and past medical history (2) Nutritional knowledge and reported practices questionnaire, (3) Lifestyle assessment questionnaire, (4) Physical examination and (5) Bio physiological measurements. **Results:** The main results revealed that 14.0% of the studied children had short stature and 11% had long stature. In addition, 11.7% of the studied children were underweight and 15.3% were overweight, also 8% were obese. Also the results indicated that 59.3% of the studied children had unhealthy lifestyle. **Conclusions:** The study concluded that two third of children had normal weight, less than one quarter of the studied children were underweight. Moreover , three quarters of studied children had normal stature, and one quarter had short and long stature. Also, it concluded that more than half of the studied children had unhealthy lifestyle. In addition, the study clarified that Evidence Based Practice tool is a good reference for assessing physical growth of school children. **Recommendation:** Nutritional educational programs should be directed to school children, teachers, and parents to enhance their knowledge and practice regarding healthy growth and development.

Keywords: Evidence based assessment, Physical Growth, Primary School Children.

Introduction

Childhood is a broad term usually applied to the phase of human development between infancy and adulthood. Childhood is the time during which human beings develop their physical bodies and their mental abilities. Also, it is a time of freedom from the responsibilities of adult life, a time in which parents, or other responsible adults, take care of the child, fulfilling his or her needs and keeping them safe **(Modjadji, 2021).**

Primary school children represent an important social group in the society because they are more vulnerable to malnutrition; underweight or

obesity. The school-age years are a time of continued maturation of the child's physical, social, and psychological characteristics. Also, the children move toward abstract thinking and seek approval of peers, teachers, nurse, and parents. Continuous nutritional assessment of the children is very important for the evaluation of their health, growth and nutritional status **(Koabar et al., 2018).**

Evidence based assessment (EBA) is an approach to psychological and physical assessment that is consistent with the principles of evidence-based practice found in improving health professions. At its core, EBA relies on research and theory to guide the selection of constructs to be assessed for a specific assessment purpose, the methods and measures to be used in the assessment, and the manner in which the assessment process unfolds. It is important for nurses to apply evidence based practice in all aspects of physical growth in children to maintain optimal **(Perry et al., 2022).**

Child growth is one of the most important health indicators from early infancy until puberty and remains one of the major public health concerns. It occurs through a complex, organized process characterized by predictable developmental stages and events. Growth is an indicator of the health and nutritional status of children **(Modjadji, 2021).**

There are many factors affecting physical growth among school children as genetic, environment, gender, physical and mental wellbeing, family and social life, education, exercise, sleep, cultural nourishment and socioeconomic condition but the growth and development of children largely depends on the diet **(Eze et al., 2017).**

Therefore, the assessment of growth is an important part of pediatrics and community child health. Poor growth is a common side effect of many local and systemic conditions and its identification acts as a useful early warning of a possible problem. The process of growth assessment involves single or multiple measurements of height and/or weight, and sometimes more specialized measurements, plotted on suitable reference charts and interpreted appropriately. Poor growth is reflected by an extreme measurement centile on a single occasion, or evidence of marked centile crossing over time **(Horak, et al., 2019).**

School health nurses play an important role in caring for children, preventing malnutrition and treating those who are already at risk of malnutrition. Nurses are experts in the regular guidance of children weight and height to notice signal of malnutrition at an early stage, encourages the mothers to maintain healthy feeding for their children, providing vitamins, regular health check-up, and providing the guidelines and counselling to the family about appropriate balance in diet **(Sharma& Sapkota, 2021).**

School health nurses are responsible to support parents and families in their real caregiving and finding the good choices for their child dietary

habits. Also, they support the children by assessing the prevalence of physical growth through observing sign and symptoms of malnutrition and give health education about nourishment for school children to improve nutritional status and maintain normal growth **(Hockenberry & Wilson, 2018).**

Significance of the study:

Globally, physical growth among primary school children is becoming a major public health concern. More than 200 million school age children are stunted and underweight so, if no action is taken at this rate, about one billion school children will be growing up with impaired physical and mental development. Despite the economic growth observed in developing countries, malnutrition particularly under nutrition is still highly prevalent **(Horak, et al., 2019).**

In 2018, a study were conducted in Sohag cities reported to that overweight and obesity prevalence was 11.24%, 16.5% and 12.28, 14.6% respectively **(Mohammed et al., 2017)**. Another study was done in Menoufia governorate indicated that overweight and obesity among children from 6-12 years; was 23.7% and 19.5% respectively **(Abd El-Fatah et al., 2019)**.

In Egypt, a study was carried out on 33150 Egyptian children aged 6–11 years old indicated that the prevalence of underweight was 8.2%, while obesity and overweight represented 21.8%. Overall short stature constituted 17%. **(Alkalash, et al., 2020).**

No studies have been conducted in Kafr El-Sheikh governorate about physical growth of school age. For this reason, this study was conducted to apply evidence-based assessment of physical growth among primary school children at Kafr El-Sheikh Governorate.

Aim of the study

The study aimed to apply evidence-based assessment of physical growth among primary school children.

Research questions:

Q1: What is the state of physical growth among primary school children?

Q2: What is the prevalence of physical growth deviations among primary school children?

Q3: What is the state of lifestyle practices among primary school children?

Subjects and methods:

Research design

A descriptive cross-sectional research design was used to achieve the aim of this study.

The setting of the study:

This study was carried out in three Governmental primary schools at Baltiem in Kafr –El-sheikh governorate, Egypt.

Study Sample:

A simple random sample of 300 out of 4774 students were selected from previous mentioned areas. The selection was done after writing the list of all students' name of two classes chosen randomly from each school and then selecting one

hundred students by choosing odd numbers (1,3,5,7…..etc.).

Sample size:

In order to calculate the sample size required in a community of 4774 students, the Epi website (Open Source Statistics for Public Health, USA) was used**, with the following sample size equation:**

Sample size N = [DEFF* Np(1-p)] / [($d^2/Z^2_{1-\alpha/2}$*(N-1)+p*(1-p)]

The study sample were chosen based on the following:

Inclusion criteria:

Children from 6 years to 12 years were able to express information.

Exclusion Criteria:

Children with a physical handicap.

Tools for data collection:

The researchers used five different instruments:

First tool: The researchers developed an interview questionnaire after reviewing the relevant literature. It consisted of two parts:

Part I: Socio-demographic characteristics of children.

Part II: Past medical history of the children.

Second tool: Nutritional knowledge and practices questionnaire was adopted from **Wilson and Ciliska (1984)** to assess nutritional knowledge and practices of the children. It included thirty closed- ended question, which was classified into two parts:

Part I: Nutritional knowledge which consisted of ten questions.

Knowledge scoring system:

Each item took 2 points when the answer was correct and complete, one score was given when the answer was correct, but incomplete and a point of zero was given when the answer was don't know or incorrect answer. The total score of nutritional knowledge ranged between 0-20 points. The scoring system was divided into three categories: "good knoweldge" when the student attained > 75% (16-20 points), "fair knowledge" when the student attained 50-75 % (10-15 points), and "poor knowledge" when the student achieved < 50% (0- 9 points) of the overall score.

Part II: Nutritional reported practices, which consisted of twenty questions.

Nutritional reported practice-scoring system:

The response of each item of practice score was given as follows: 2 points for always, one score for sometimes, and zero point for never. The total practices were calculated, and practice points were considered. The total score of nutritional practice ranged between 0-40 points. The scoring system was categorized as follow:

"good practice" when the student attained > 75% (30-40 points), "fair practice" when the student attained 50-75 % (20-30 points), and "poor practice" when the student achieved < 50% (0- 19 points) of the overall score.

Reliability of the instrument II was done by using test re-test method. It was performed by administrating the same instrument to the same students under similar conditions on two occasions with two weeks apart and the two results were compared. The instrument confirmed high internal

consistency and demonstrated to be reliable. The correlation coefficient was 0.83

Third tool: Lifestyle assessment questionnaire:

It was adopted from **Wilson and Ciliska (1984)** to assess lifestyle for children; it consisted of twenty one closed ended questions which was classified into four items as the following:

- **Healthy habits** included six questions
- **Exercise** consisted of three questions
- **Rest and sleep** included four questions
- **Psychological stress** consisted of eight questions.

Lifestyle scoring system:

The response of each item of practice score was given as follows: 2 points for always, one score for sometimes, and zero point for never. The total practices were calculated, and practice points were considered. The total score of lifestyle practice ranged between 0-42 point. The scoring system was categorized as follow: "healthy lifestyle" when the student attained > 75% (32-42 points), and "unhealthy lifestyle" when the student attained < 75 % (0-31 points of the overall score.

Reliability of the instrument III was done by using test re test method. It confirmed high internal consistency and indicated to be more reliable. The correlation coefficient was 0.84

Fourth tool: Physical examination

The researcher conducted physical examination to assess signs and symptoms of malnutrition as pale skin, loss of plasters in nails, loss of hair and dental caries. It was done by checking children, skin, nails, hair, eye, nose, ear, mouth, teeth, neck, abdomen, back, and legs to determine any abnormalities.

Fifth tool: Bio-physiological measurements

The researcher performed these measurements to assess physical growth of primary school children. It included weight and height.

Weight & Height: it was measured by using Detecto and Toll Scale. The results of weight and height were represented on an Egyptian growth chart.

BMI-percentile- underweight (BMI <5 percentile), healthy weight (BMI=5th -84th percentile), overweight (BMI = 85-94 percentile), or obese (BMI >94)

Reliability of the instrument indicated the tool was strongly reliable and the correlation coefficient was 0.85.

Validity of the tools:

All tools were tested for its content validity by a jury of five experts in the field of Family and Community Health Nursing. The tools were tested for its accuracy and internal validity. Modification required for completeness and clarity were incorporated into instruments.

Administrative and Ethical Considerations:

An official letter to conduct the study obtained from Dean of the faculty of nursing and Ethics committee approval was obtained before starting the study. An approval letter was given to the director of each setting to permit collecting of research data. Written informed consent was taken. The rights of privacy and safety of subjects were secured and they were informed to withdraw from the study whenever they wanted.

Pilot study:

A pilot study was conducted on 10% of the total sample (30 students) to test the instruments' feasibility, applicability, and understandability. Students participated in the pilot study were taken from another classes and excluded from the main study sample. Modifications were performed based on the results of pilot study.

Procedure of data collection: -

- The data was collected in the academic year 2021-2022. The data was collected in six months (3 months in the first term from September till December and 3 months in the second term from mid of February till the mid of May)
- At the beginning of the study, the researcher introduced herself to studied students; the purpose and nature of the study were explained to gain their cooperation with promise of close confidentiality of data.
- Written consent was obtained from children, parents after explanation of the purpose and nature of the study.
- The researchers collected the data from each student in the classroom. Each child take about 15 minutes, the researcher was able to interview 6-7 child/ day, two days / week. The data was collected from the three schools from 8.30 A.M till 12.30 P.M in the first period of the school day.
- After collection of data, the researcher performed physical examination for each child to determine any abnormalities and assess any signs of malnutrition.

-Then, the researcher measured children, weight and height by asking each student to stand on the center of a digital balanced scale (Detecto and Toll Scale) for measuring weight and height.

-Weight and height of each student was measured after calibrating of the scale to the nearest 0.1 kg and 0.1 cm, respectively. For height measurement, the student was instructed to keep shoulder, buttocks, and heel touching the wall, the head in a horizontal position, the arms was down and relaxed. For weight measurement, the student was instructed to wear light clothes, removing shoes, belt, cap, the hairstyle or any other material that might interfere with their actual height and weight.

-Data of weight and height assessment was plotted on Egyptian Growth charts to estimate weight for age and height for age. Body mass index was computed to estimate thinness, overweight, and obesity according to WHO classification.

Statistical analysis:

The statistical analysis of data was done by using the computer software of Microsoft Excel Program and Statistical Package for Social Science (SPSS) version 25. Data were presented using descriptive statistics in the form of frequencies and percentage for categorical data, the arithmetic mean (X) and standard deviation (SD) for quantitative data. Qualitative variables were compared using chi square test (X2). In addition, R- test were used to identify the correlation between the study variables.

Significance of results were considered as follows:

- P-value > 0.05 Not significant (NS)
- P-value < 0.05 Significant (S).

Results

Table (1) shows that, 41.3% of the studied children weight ranged between 20-<30 kg, the mean ± SD of weight was 30.63 ± 7.05 kg. Also, 40.7% of the studied children height ranged between 120-<130 cm, the mean ± SD of height was 128.8 ± 11.19 cm. Moreover, 14.0% of the studied children have short stature. Furthermore, 11.7% of the studied children are underweight.

Figure (1) presents that 52.7% of the studied children have poor level, 29.0% of them have fair level and 18.3% of them have good level of total knowledge and reported practices.

Figure (2) reveals that, 59.3% of the studied children have unhealthy lifestyle. While, 40.7% of them have healthy lifestyle.

Table (2) clarifies that, there was highly statistically significant relation between children' body mass index and their age at $P < 0.01$. Also, there were statistically significant relation with their educational year at $P < 0.05$. While, there is no statistically significant relation with their gender and residence at $P > 0.05$.

Table (3) illustrates that there was highly statistically significant relation between body mass index of the studied children and their total nutritional knowledge and reported practices and their total reported lifestyle at $P < 0.01$.

Table (4) demonstrates that, there was highly statistically significant relation between children' height and their age and educational year at $P < 0.05$. While, there is no statistically significant relation with their gender and residence at $P > 0.05$.

Table (5) shows that there was highly statistically significant relation between height of the studied children and their total nutritional knowledge and reported practices and their total reported lifestyle at $P < 0.01$

Table (1): Frequency distribution of the studied children according to their biophysiological measurements (n=300)

Items	No.	%
Weight Kg		
< 20	32	10.7
20-	124	41.3
30-	76	25.3
40- & more	68	22.7
Mean ±SD **30.63 ± 7.05**		
Height cm		
< 120	48	16.0
120-	122	40.7
130-	90	30.0
140- & more	40	13.3
Mean ± SD **128.8 ± 11.19**		
Height		
Short stature	42	14.0
Normal stature	225	75.0
Long stature	33	11.0
Body mass index		
Underweight	35	11.7
Normal weight	194	64.7
Overweight	46	15.3
Obese	25	8.3

Figure (1): Percentage distribution of the studied children according to their total nutritional knowledge and practices (n=300).

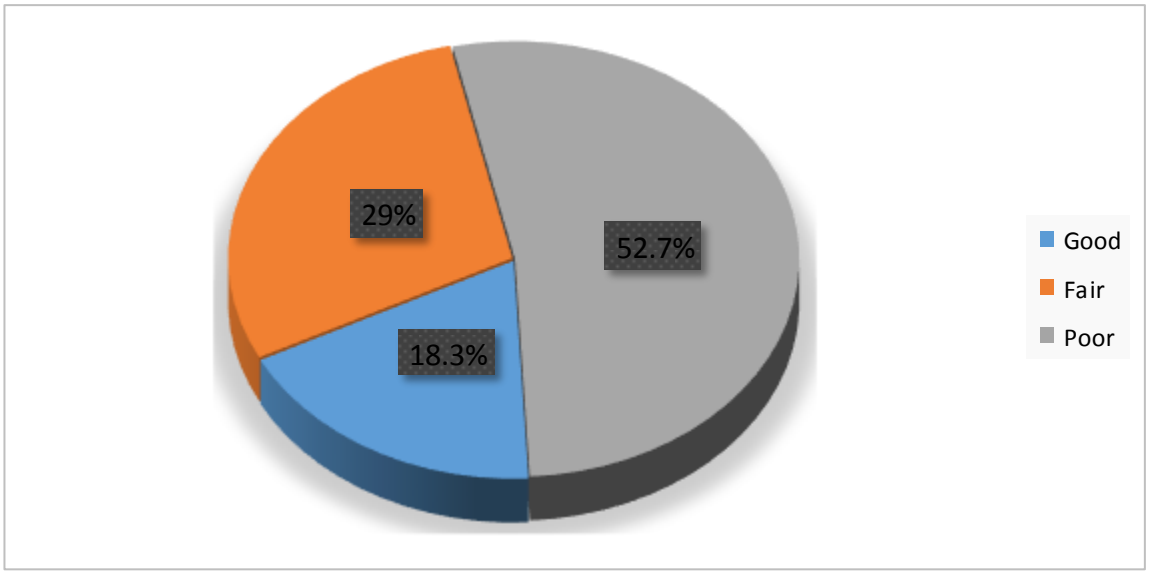

Figure (2): Percentage distribution of the studied children according to their total reported lifestyle (n=300).

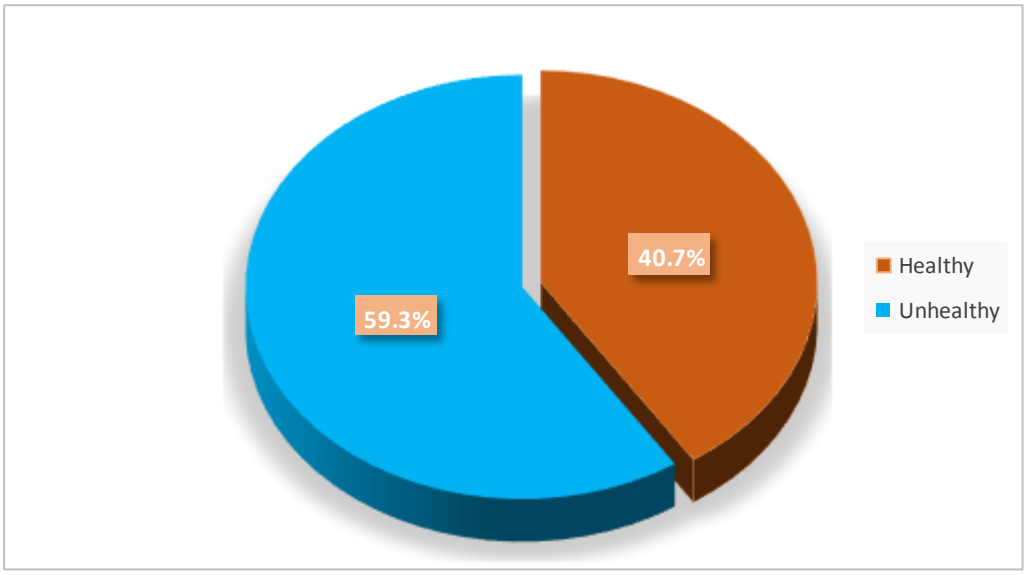

Table (2): Relationship between socio-demographic characteristics of the studied children and their body mass index (n=300).

Socio-demographic characteristics		Body mass index								X^2	P-Value
		Underweight (n=35)		Healthy weight (n=194)		Overweight (n=46)		Obese (n=25)			
		No.	%	No.	%	No.	%	No.	%		
Age (Years)	6-<8	20	57.1	10	5.2	22	47.8	13	52.0	14.37	0.001**
	8-<10	10	28.6	100	51.5	16	34.8	9	36.0		
	10-12	5	14.3	84	43.3	8	17.4	3	12.0		
Educational year	First	15	42.9	13	6.7	10	21.7	10	40.0	10.93	0.037*
	Second	10	28.6	25	12.9	20	43.5	9	36.0		
	Third	5	14.3	44	22.7	3	6.5	2	8.0		
	Fourth	3	8.6	38	19.6	7	15.2	2	8.0		
	Fifth	2	5.7	38	19.6	4	8.7	2	8.0		
	Sixth	0	0.0	36	18.6	2	4.4	0	0.0		
Gender	Male	15	42.9	100	51.5	9	19.6	8	32.0	5.089	0.121
	Female	20	57.1	94	48.5	37	80.4	17	68.0		
Residence	Rural	18	51.4	75	38.7	11	23.9	10	40.0	9.008	0.076
	Urban	17	48.6	119	61.3	35	76.1	15	60.0		

Table (3): Relationship between total nutritional knowledge, reported practices and total reported lifestyle of the studied children and their body mass index (n=300)

Total nutritional knowledge and reported practices and total reported lifestyle		Body mass index								X2	P-Value
		Underweight (n=35)		Normal weight (n=194)		Overweight (n=46)		Obese (n=25)			
		No.	%	No.	%	No.	%	No.	%		
Levels of total nutritional knowledge and reported practices	Good	0	0.0	55	28.3	0	0.0	0	0.0	31.93	0.000**
	Fair	0	0.0	82	42.3	5	10.9	0	0.0		
	Poor	35	100.0	57	29.4	41	89.1	25	100.0		
Levels of total reported lifestyle	Healthy	0	0.0	122	62.9	0	0.0	0	0.0	40.20	0.000**
	Unhealthy	35	100.0	72	37.1	46	100.0	25	100.0		

Table (4): Relationship between socio-demographic characteristics of the studied children and their height (n=300).

Socio-demographic characteristics		Height of the studied children						X^2	P-Value
		Short stature (n=42)		Normal stature (n=225)		Long stature (n=33)			
		No.	%	No.	%	No.	%		
Age (Years)	6-<8	25	59.5	20	8.9	20	60.6	10.69	0.024*
	8-<10	12	28.6	113	50.2	10	30.3		
	10-12	5	11.9	92	40.9	3	9.1		
Educational year	First	18	42.9	25	11.1	5	15.2	9.289	0.031*
	Second	12	28.6	40	17.8	12	36.4		
	Third	6	14.3	45	20.0	3	9.1		
	Fourth	4	9.5	39	17.3	7	21.2		
	Fifth	2	4.8	40	17.8	4	12.1		
	Sixth	0	0.0	36	16.0	2	6.1		
Gender	Male	20	47.6	104	46.2	8	24.2	6.098	0.108
	Female	22	52.4	121	53.8	25	75.8		
Residence	Rural	25	59.5	78	34.7	11	33.3	7.192	0.095
	Urban	17	40.5	147	65.3	22	66.7		

T**able (5):** Relationship between total nutritional knowledge, reported practices and total reported lifestyle of the studied children and their height (n=300).

Total nutritional knowledge and reported practices and total reported lifestyle		Height of the studied children						X2	P-Value
		Short stature (n=42)		Normal stature (n=225)		Long stature (n=33)			
		No.	%	No.	%	No.	%		
Levels of total nutritional knowledge and reported practices	Good	0	0.0	55	24.4	0	0.0	36.98	0.000**
	Fair	0	0.0	82	36.5	5	15.2		
	Poor	42	100.0	88	39.1	28	84.8		
Levels of total reported lifestyle	Healthy	0	0.0	122	54.2	0	0.0	35.74	0.000**
	Unhealthy	42	100.0	103	45.8	33	100.0		

Discussion

Primary school children are the wealth of any nation because they are economical productive future generation. So, general health of primary school children requires more attention from parents, school personal and health care personal **(Verma et al., 2021).**

Therefore, the present study aimed to apply evidence-based assessment of physical growth among primary school children.

Concerning bio-physiological measurements of the studied children, these results indicated that two third of children had normal weight, less than one quarter of the studied children were underweight. Furthermore, three quarters of them had normal stature, and one quarter had short and long stature These findings are in the same context with **Koabar et al., (2018)** who carried out an Egyptian study to assess nutritional status of primary school children in Kallin District, Kafr El-Sheikh Governorate. They revealed that the minority of the studied children were underweight.

The results of this study reported that, three quarter of the studied children had normal stature. While, fourteen percent of them had short stature. These results are in agreement with **Ahmed & Abd Elsalam, (2017)** who studied mothers' knowledge and perception about short stature of their children. They revealed that only eight percent of the studied sample had short stature. The prevalence of short stature was higher in male students than in

female. This similarity in results might be due to the average weight and height is affected by life styles of children with a variation according to socio-demographic characteristics.

Regarding total nutritional knowledge and practices of the studied children, the present study found that more than half of the studied children had poor level of total nutritional knowledge and practices. Also, more than one quarter of them had fair level and the minority of them had good level of total knowledge and practices.

These findings are in similarity with a study conducted in Kenya by **M'mbaya (2021)** to determine nutrition knowledge, attitudes and consumption of sugar sweetened beverages among school students in Kakamrga country. The researcher reported that more than half of the children had moderate total nutrition knowledge and poor total dietary practices.

Also, these findings are consistent with **Husain et al., (2021)** who conducted provided implementation of healthy lifestyle program to the children whether from school or family which improve lifestyle.

Concerning relationship between socio-demographic characteristics of the studied children and their body mass index, the present results illustrated that there were highly statistically significant relation between children' body mass index, their age, and their educational year. While, there were no statistically significant relation with their gender and residence.

This finding agreed with **Carayanni et al., (2020)** who studied effects of Body Mass Index (BMI), demographic and socioeconomic factors on organized physical activity (OPA) participation in children aged 6-15 years in Greece. They clarified that there were statistically significant relation between body mass index of children and their age. The agreement in results might be due to that measurement of BMI| depends on student height and weight and their formula can be calculated based on the student's age.

Regarding relationship between body mass index of the studied children and their total nutritional knowledge and practices and their total lifestyle, the present study found that there was highly statistically significant relation between body mass index of the studied children and their total nutritional knowledge and practices and their total lifestyle.

These findings agreed with a study done by **Bartosiewicz et al., (2020)** in Poland who studied children's body mass index depending on dietary patterns, the use of technological devices, the internet and sleep on BMI in children. They reported that there was highly statistically significant relation between children' body mass index and their nutritional knowledge, practice and lifestyle.

This finding is in contrast with **Amenya et al., (2021)** who studied the relationship between nutrition and physical activity knowledge and body mass index-for-age of school-aged children in selected schools in Ghana. They illustrated that no significant relationship was found between

nutrition knowledge, total nutritional practice and BMI-for-age among the studied children. The difference between the results might be due to the level of knowledge about healthy nutrition leading to improvement in dietary practice which help in maintaining normal body mass index.

According to the relationship between socio-demographic characteristics of the studied children and their levels of height, the present results illustrated that there was highly statistically significant relation between children' height and their age and educational year. While, there is no statistically significant relation with their gender and residence.

This finding agrees with **Starc et al., (2020)** at their study to assess differences in body height between the contemporary Western Balkan children and the WHO growth references core sample. They clarified that there was statistically significant relation between body height and children age.

In the same line, this finding is in accordance with **Rodriguez et al., (2020)** at a study entitled eight and body-mass index trajectories of school-aged children and adolescents. They reported that children height did not affect by gender and residence but there was a relation between children' body height and their history of illness.

For relationship between body height of the studied children and their total nutritional knowledge and practices and their total lifestyle, the present study found that there was highly statistically significant relation between height of the studied children and their total nutritional knowledge and practices and their total lifestyle.

This result is congruent with a study done by **Hamulka et al., (2018)** about the effect of an education program on nutrition knowledge, attitudes toward nutrition, diet quality, lifestyle, and body composition in Polish teenagers. They reported that there was highly statistically significant relation between children' body height and their nutritional knowledge, attitudes, diet quality and lifestyle.

CONCLUSION

Based on the findings of the present study, it can be concluded that:

Two third of children had normal weight, less than one quarter of the studied children were underweight. Moreover , three quarters of studied children had normal stature, and one quarter had short and long stature. Also, it concluded that more than half of the studied children had unhealthy lifestyle. While, less than half of them had healthy lifestyle. In addition, there was highly statistically significant relation between physical growth of the studied children and their total nutritional knowledge, reported practices and their total reported lifestyle. Furthermore the study clarified that Evidence Based Practice tool is a good reference for assessing physical growth of school children

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RECOMMENDATIONS

Based on the results of the present study, the following recommendations were suggested:

1-Continuous assessment of physical growth of school children is important for regular check of the health status of these sectors of the community.

2-Nutritional educational programs should be directed to school children, teachers, and the parents to enhance their knowledge and practice regarding healthy growth

3-Educational program about evidence-based nutrition should be provided to the families of children.

4- Further studies should be done to expand understanding of the special needs of primary school children regarding health physical growth.

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