Risk Factors, Impacts and Anthropomtric Profile of Low Growth Status; Weight- and Height-for-Age among Preparatory School Children in Cairo, Egypt

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Abstract: Introduction: Low growth status in children is an important public health problem. Risk factors include low socioeconomic level, under nutrition and some chronic diseases. Objectives: The aim of the present study was to define the prevalence of low growth status in students, to study its risk factors, to define anthropometric profile of the low growth students and to determine the impacts of low growth on the school students in Cairo, Egypt. Research setting: The study was conducted in two public and two private preparatory schools in Al-Marg, Cairo. Subjects and methods: A cross-section, analytical study design was chosen to perform this research on 1523 students. The students were subjected to specific anthropometric measurements and examined clinically. The low growth students' parents and the controls' parents were interviewed. Results: The study showed that 34.1% of the students were low growth and 73.6% of them were found in public schools. All the anthropometric measurements were statistically significant lower among boys and girls in the studied group compared to controls. Also, the measurements were statistically significant lower among boys and girls belonging to consanguineous parents in low growth group compared to those belonging to non consanguineous parents in normal growth group. In addition, the measurements were statistically significant lower among boys compared to girls in the low growth status group. The most important significant risk factors for low growth status were; the student had >1 sibling with low growth status (OR=11.6), incubator admission more than 7 days (OR=8.3), low stature parent(s) (OR=3.7), bad environmental sanitation (OR=3.5), student had congenital heart diseases (OR=3.0) and had history of low birth weight (OR=2.7). Parental low stature, low socioeconomic level and siblings with low growth status were the most important risk factors as weighted by partial F-test (F=2.7, 2.4 and 2.2; respectively). Lastly, 39.7% of the students with low growth had school absenteeism 3-5 days/month (P=0.00) and 24.3% of them had results <50.0% at the first term exam (P=0.00). Conclusions and recommendations: Low growth status is prevalent among school students' especially in public schools in Cairo. Also, most of low growth status risk factors can be manipulated, so this health problem and its negative impacts can be prevented. Health education, good antenatal care, health promotion, improving environmental sanitation, and regular health screening and treatment of children at all occasions are an important essentiality.

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1. Introduction

Childhood is the time of intense growth; it is the period in which the velocity of individual's growth had a rapid increase **(Heald & Gong, 1999** and **WHO, 2009)**. Further, early childhood is the most important phase for overall development throughout the lifespan **(WHO, 2009)**. Also, adolescence is the period of intensified preparation for the coming role of adulthood and characterized by the dramatic physical changes of puberty **(Hamilton, 1998)**. School children are considered one of the most important sectors of population due to their continuous growth and development at all levels. They are a vulnerable group, so great attention should be paid for them **(Abdel-Wahab and Mahmoud, 1987)**.

Globally, societies that invest in children and families in the early years, whether rich or poor have the most literate and numerate populations. These are also the societies that have the best health status and lowest levels of health inequality in the world **(WHO, 2009)**.

Growth in childhood is determined by many factors, which include environmental factors such as nutrition, which is influenced by infection and illness **(Heald and Gong, 1999)**. Poor linear growth is a well described complication of many childhood diseases such as chronic kidney disease (CKD) **(Greenbaum *et al.*, 2011)**. Also, consanguinity has a great effect on growth in childhood; newborns belonging to consanguineous parents have significant decrease in mean birth weight **(Jaber *et al.,* 1997** and **Mumtaz *et al.,* 2006)**. The prevalence of these risk factors and their effect on development and human potential are substantial. Furthermore, risks often occur together or cumulatively, with concomitant increased adverse effects on the development of the world's poorest children **(Walker *et al.,* 2007)**.

Growth failure is associated with increase morbidity and mortality in children. It is estimated that as many as 182 million children in developing countries are affected **(Schroeder and Brown, 1994)**. Growth failure; indicated by stunting, wasting and underweight conditions; can be assessed by anthropometric indices of height-for-age, weight-for-age and weight-for-height. Stunting is a consequence of long-term poor nutritional intake and is the best indicator of growth retardation in children over an extended period, because stunting has been associated with poorer cognition and school achievement in later childhood **(Chang *et al.,* 2002)**.

Anthropometry is the study of the measurements of the human body in terms of the dimensions of bone, muscle and adipose tissue. Anthropometric measurements are sensitive indicators of the health and well-being of entire population **(Eveleth and Tanner, 1990)**. They remain the most practical and useful mean for the assessment of the nutritional status of the population, particularly children. It is the single universally applicable, inexpensive and non-invasive method and reflects both health and nutrition and predicts performance **(DeOnis and Habicht, 1996)**. The height and weight retardation could be used as a useful indicator to identify high-risk children with poor health, under nutrition and low socioeconomic status **(Kafafi & Abdel-Mottaleb, 1992** and **Delgado *et al.,* 1999)**. About 43.0% of children in developing countries were stunted and 9.0% were wasted **(De Onis and Habicht, 1996)**. In Egypt, during 1995-2002, 21.0%, 11.0% and 5.0% of children were suffering from stunting, underweight and wasting, respectively **(UNICEF, 2004)**.

Low resource availability during prenatal or postnatal development gives rise to a stunted and/or poorly performing individual **(Gluckman *et al.,* 2005)**. So, the strategies to promote child development and to prevent or ameliorate the loss of developmental potential were assessed. The most effective early child development programs provide direct learning experiences to children and families, are targeted toward younger and disadvantaged children, are of longer duration, high quality, and high intensity, and are integrated with family support, health, nutrition, or educational systems and services. Despite convincing evidence, program coverage is low. To achieve the Millennium Development Goals of reducing poverty and ensuring primary school completion for both girls and boys, governments and civil society should consider expanding high quality, cost-effective early child development programs **(Engle *et al.,* 2007)**.

Study Objectives

A- Ultimate objective:

Improve quality of health of the school children in Egypt.

B- Immediate objectives:

1- To determine the prevalence of the low growth status among preparatory school children in Cairo, Egypt.

2- To determine the sociodemographic, life style and health behavior, environmental, and morbid risk factors of the low growth status among preparatory school children in Cairo, Egypt.

3- To define anthropometric profile of the low growth students among preparatory school children in Cairo, Egypt.

4- To determine the impact of the low growth status on the school absenteeism and scholastic achievement of preparatory school children in Cairo, Egypt.

2. Subjects and Methods

A- Technical Design:

I- Research Questions:

What is the prevalence of low growth status among preparatory school children in Cairo? Is there sociodemographic, environmental, morbid and health care behavior risk factors effects on this prevalence? What is the anthropometric profile of the low growth students among the studied school children in Cairo? Are there effects of low growth status on school absenteeism and scholastic achievement on school children among this studied group in Cairo?

II- Study Setting:

This study was conducted in Al-Marg region, east district of Cairo, a purposively selected area, as there were facilities to conduct the study in this area.

III- Study Sample:

Two public and two private preparatory schools in Al-Marg were included in this study. In each school all of the students aged between 11 and 14 years were recruited in the study. Most of the students aged 11 years were found in private schools. The total number of students was 1869, while the eligible number of students was 1523; 871 from public schools and 652 from private schools. For each low growth student a control one was chosen from the students' class list, the name after the case name. Also, siblings of the cases and controls were examined to define percent of the low growth subjects among both of them.

IV- Study Design:

A cross-section, analytical study design was chosen to investigate this study problem.

V- Study Tools and Methods:

a- Clinical Examinations:

1- Anthropometric measurements:

Specific measurements were done to all students included in the study. The measurements were performed using standardized instruments. The weight and height were used to define weight-for-age and height-for-age. Methods adopted for performing the measurements were according to **Rockville (1998)** and **Cogill (2003)**. Each child was subjected to the following measurements:

1-1- Weight:

Weight (per kg) was measured by using a portable balance, with a child wear light outer garment and without shoes. Child's weight was recorded to the nearest 100 gm after subtraction of the average weight of outer garment.

1-2- Standing height:

Height (per cm) was measured in standing position by using a measuring stick, which was fixed to a vertical wall. The child stands erect on the floor with his/her back to the wall. Child's height was recorded to the nearest 1 cm.

1-3- Mid arm circumference:

The mid arm circumference (per cm) was measured in standing position using a tape-line. The measuring tape is placed around the right upper arm at a marked point midway between acromion and olecranon processes. The mid arm circumference was recorded to the nearest 1 cm.

1-4- Waist circumference:

The waist circumference (per cm) was measured in standing position using a tape-line. The tape is placed around the trunk in a horizontal plane at the level of the highest point of the iliac crest at the mid-axillary line. The measurement was made at minimal respiration to the nearest 1 cm.

1-5- Triceps skin fold:

The triceps skin fold (per mm) was measured with Holtain skin fold caliper. The point on the posterior surface of the right upper arm that located in the same area as the marked midpoint for the upper arm circumference was measured. The skin fold thickness was measured to the nearest 0.1 mm.

1-6- Sub-scapular skin fold:

The sub-scapular skin fold (per mm) was measured with Holtain skin fold caliper. The measurement was taken on the right side of the body at marked point directly below and medial to the inferior angle of the scapula. The skin fold thickness was measured to the nearest 0.1 mm.

To reduce intra-individuals errors, weight and height were measured twice by two of the researchers and the mean value was used for the analysis. The weight-for-age was used to denote underweight as an overall indicator for malnutrition, while height-for-age was used as an indicator for stunting (chronic malnutrition) **(Botero-Garcés *et al.*, 2009)**. Values of weight and height were applied to the percentiles, where normal values were considered from 5^{th} to 95^{th} percentiles **(Vaughan III, 2007)**. The calculation of percentiles was based on normalized curves. Percentiles from the reference population have a uniform distribution and are useful since they are easy to interpret **(Van Den *et al.*, 1996)**. Weight-for-age reflects body mass relative to chronological age. In many populations, it is the only indicator used, primarily because of the simplicity of collecting, only, one measurement **(Gorstein, 1989)**. Height-for-age reflects achieved linear growth and its deficits indicate long-term cumulative inadequacies of health or nutrition **(WHO, 1995)**.

2- Physical examinations:

The state of health of each student was evaluated. Complete physical examinations either general or local was done to the cases and controls to detect those with physical deformities, heart diseases…etc. Also, needed laboratory examinations were done.

b- Interview Questionnaire:

A standardized questionnaire was used to collect data relevant to topic of the study. One of the student's parents or caregivers was submitted to an interview directly concerning the student's personal information, socioeconomic status, history of immunization, home and environmental factors that could be influence child growth patterns…etc. The child age was obtained from the birth certificate, which kept at the school. Socioeconomic status was calculated according to a scoring system of education and occupation of the student's family head; (1), (2) and (3) scores equal low, middle and high education and occupation. The summation of the two scores of education and occupation equal socioeconomic level; the low level (2-3), middle level (4) and high level (5-6) summation scores. Parental consanguinity was classified into the following categories: first-cousin marriages (the child's parents are cousins), second-cousin marriages (the child's grandparents are cousins), and not related (the child's parents are neither first-cousin marriages nor second-cousin marriages). Scholastic achievement was determined according to results of the first term exam; excellent (≥85.0%), very good (≥75.0%), good (≥65.0%), passed (≥50.0%) and failed (<50.0%).

B- Operational Design

I- Preparatory Phase:

1- Administrative phase:

Permission to implement this study was obtained from the educational affairs in the schools.

2. Ethical consideration:

A verbal consent from all the students' parents to participate in the study was taken after full explanation of the aims of the study. The parents were assured that the researcher's will investigate and treat all morbid cases and their morbid siblings and the parents will be informed.

3. Pilot study:

Before starting the practical phase a pilot study was done on 60 students and their siblings to test feasibility of the questionnaire. The questionnaire was accordingly modified. The pilot study was guided by the following tasks:

i. Testing the form; design, content and language at the study sites.

ii. Identifying the time and resources needed for the fieldwork.

II- Practical Phase:

This phase took about 6 months. The data were collected through field visits. Sibling(s) and parents of every case and his/her controls were invited to examine their growth status.

III- Analysis Phase:

Proportion, mean (M) ± standard deviation (SD), Yates corrected Chi-square (χ^2), t-test, stepwise regression analysis (partial F-test) and odds ratio (OR) were the statistical methods used in analysis of data. P value <0.05 was accepted as a level of significance, while confidence interval (CI) or exact confidence limits (ECL) were used as levels of significance for OR.

3. Results

As regard growth status of the studied school children **(Table 1)**, 399 (26.2%) of the students had low weight-for-age growth status (<5th percentile), 1081 (71.0%) of the students had normal weight-for-age growth status (5th - 95th percentile) and 43 (2.8%) of the students had over weight-for-age growth status (>95th percentile). Also, 519 (34.1%) of the students had low height-for-age growth status (<5th percentile), 961 (63.1%) of the students had normal height-for-age growth status (5th - 95th percentile) and 43 (2.8%) of them had over height-for-age growth status (>95th percentile). Collectively, 519 (34.1%) of the studied students had low growth status (weight- and height-for age).

Table (1): Distribution of the studied school children aged 11-14 years in both public and private preparatory schools in Al-Marg, Cairo according to their growth status.

Variables	Students in both schools (n=1523)	
	No.	%
Weight-for-age		
Low weight-for-age growth status: <5th percentile	399	26.2
Normal weight-for-age growth status:		
5th percentile	351	23.0
25th percentile	289	19.0
50th percentile	274	18.0
75th–95th percentile	167	11.0
Total	1081	71.0
Over weight-for-age growth status: >95th percentile	43	2.8
Height-for-age		
Low height-for-age growth status: <5th percentile	519	34.1
Normal height-for-age growth status:		
5th percentile	337	22.1
25th percentile	274	18.0
50th percentile	259	17.0
75th–95th percentile	91	6.0
Total	961	63.1
Over height-for-age growth status: >95th percentile	43	2.8
Low growth status (weight- and height-for-age)		
<5th percentile	519	34.1

As regard personal risk factors of the low growth school children and their controls **(Table 2)**, the male sex is significant risk factor (OR=1.86, 95.0% CI: 1.45-2.40). Students from public schools were at more risk to be low growth (OR=2.40, 95.0% CI: 1.83-3.14). Also, low weight at birth was significant risk factor (OR=2.71, 95% CI: 1.50-4.92). At the same time, history of incubator admission for more than 7 days was significant risk factor (OR=8.32, 95% ECL: 3.49-24.01). Respecting birth order, the first birth was significant risk factor (OR=1.92, 95% CI: 1.49-2.48). Also, student having 2 and ≥3 siblings represented significant risk factors (OR=1.40, 95% CI: 1.08-1.80 and OR=1.57, CI: 1.17-2.11, respectively). At the same time, student's work besides schooling represented significant risk factor (OR=1.88, 95% CI: 1.21-2.91). Further, history of parental consanguinity is significant risk factor (OR=1.69, 95% CI: 1.16-2.46). In details, if the parents are first cousin (OR=2.25, 95% CI: 1.19-4.26) and if the parents are second cousin (OR=1.74, 955 CI: 1.10-2.76). Also, low stature parent(s) is significant risk factor (OR=3.06, 95% CI: 2.32-4.04). Further, the risk is insignificant if only one parent is low stature (OR=1.17, 95% CI: 0.76-1.80) and increase significantly if the two parents are low stature (OR=3.70, 95% CI: 2.69-5.10). At the same time, low growth sibling(s) is significant risk factor (OR=6.11, 95% CI: 4.59-8.15). The risk is significant if one sibling is low growth (OR=1.58, 95% CI: 1.13-2.20) and increases by about 6-folds if more than one sibling are low growth (OR=11.61, 95% CI: 7.45-18.20). Lastly, bad environmental sanitation is significant risk factor (OR=3.50, 95% CI: 2.63-4.66).

As respect socioeconomic risk factors of the low growth school children and their controls **(Table 3)**, low educational levels (illiterates, and read and write) of the head of students' families was significant risk factor (OR=1.53, 95% CI: 1.19-1.98). While, high educational level (secondary and university) of the head of students' families was significant protective factor (OR=0.66, 95% CI: 0.47-0.91). At the same manner, low occupational level (unskilled labor) of the head of students' families was significant risk factor (OR=1.52, 95% CI: 1.18-1.96). While, high occupational level (professional) of the head of students' families was significant protective factor (OR=0.61, 95% CI: 0.44-0.85). Collectively, low socioeconomic level of the head of students' families was significant risk factor (OR=1.53, 95% CI: 1.18-1.97). While, high socioeconomic level of the head of students' families was significant protective factor (OR=0.64, 95% CI: 0.66-0.88).

Regarding life-style and health care behavior risk factors of the low growth school children and their controls **(Table 4)**, no antenatal care and/or mother delivered at home is significant risk factor (OR=2.24, 95% CI: 1.72-2.91). Further, student when baby not strictly received obligatory vaccines is significant risk factor (OR=1.37, 95% CI: 1.02-1.84). Also, eating unhealthy diet is significant risk factor (OR=2.48, 95% CI: 1.86-3.31). At the same time, no practicing exercise is significant risk factor (OR=2.22, 95% CI: 1.72-2.87). Also, no early seeking for medical advice is significant risk factor (OR=1.31, 95% CI: 1.02-1.70). Further, no compliance with treatment is significant risk factor (OR=1.34, 95% CI: 1.04-1.72).

As respect morbid conditions' risk factors among the low growth school children and their controls **(Table 5)**, presence of the followings conditions are significant risk factors; hepato- and/or spleenomegally (OR=3.57, 95% ECL: 1.11-14.98), heart diseases in general (OR=2.07, 95% CI: 1.08-3.99) and the congenital one increase risk (OR=3.08, 95% ECL: 1.25-8.66), parasitic infections (OR=2.76, 95% CI: 1.94-3.94), anemia (OR=2.25, 95% CI: 1.71-2.97), bronchial asthma (OR=2.15, 95% CI: 1.25-3.71), and diabetes (OR=2.06, 95% CI: 1.03-4.16). While, renal diseases (OR=6.06, 95% ECL: 0.73-279.20), blood diseases (OR=4.05, 95.0% ECL: 0.80-39.25), and physical disabilities (OR=3.01, 95% ECL: 0.24-158.40) are insignificant risk factors. Lastly, malignant diseases are undefined risk factor.

As regard results of the anthropometric measurements of the studied low growth school children and normal growth group **(Table 6)**, all the mean values of weight (kg), height (cm), mid arm circumference (cm), waist circumference (cm), triceps skin fold (mm) and sub-scapular skin fold (mm) were lower among low growth boys and girls compared to controls boys and girls with statistically significant differences (P=0.000 for each of them).

Regarding results of the anthropometric measurements of the studied low growth school children and control group belonging to consanguineous and non consanguineous parents **(Table 7)**, all the mean values of weight (kg), height (cm), mid arm circumference (cm), waist circumference (cm), triceps skin fold (mm) and sub-scapular skin fold (mm) were lower among low growth students (boys and girls) compared to their controls (boys and girls) with statistically significant differences (P=0.000 for each of them).

As respect results of the anthropometric measurements of the studied low growth boys and girls school children **(Table 8)**, all the mean values of weight (kg), height (cm), mid arm circumference (cm), waist circumference (cm), triceps skin fold (mm) and sub-scapular skin fold (mm) were lower among low growth student boys compared to girls with statistically significant differences (P=0.000 for each of them).

As regard stepwise regression analysis of risk factors affecting the low growth school children **(Table 9)**, low stature parent(s), low socioeconomic level, low growth siblings, parasitic infections, congenital heart diseases, bad environmental sanitation and first cousin parental consanguinity are the most important risk factors as weighted by partial F-test in occurrence of low growth status (F=2.7, 2.4, 2.2, 1.7, 1.5, 1.3 and 1.3; respectively).

Respecting the impacts of low growth status on school students **(Table 10)**, 39.7% and 23.3% of the low growth students and controls had school absenteeism 3-5 days/month with statistically significant differences (P=0.000). Regarding scholastic achievement, 24.3% and 13.9% of the low growth students and controls had results of the first term exam <50.0% with statistically significant differences (P=0.000).

Table (2): Distribution of the studied low growth school children aged 11-14 years and controls in the public and private preparatory schools in Al-Marg, Cairo according to their personal characteristics risk factors.

Personal characteristics	Low growth students (n=519)		Normal growth students (n=519)		OR§ (95% CI¶) OR§ (95% ECLŧ)*
	No.	%	No.	%	
Age (years):					
11-	197	38.0	184	35.5	1.11 (0.86-1.45)
12-	183	35.2	199	38.3	0.88 (0.67-1.14)
13-14	139	26.8	136	26.2	1.03 (0.77-1.37)
Sex:					
Male	288	55.5	208	40.1	1.86 (1.45-2.40)
Female	231	44.5	311	59.9	0.54 (0.42-0.69)
Type of school:					
Public (n=871 student)	382	73.6	279	53.8	2.40 (1.83-3.14)
Private (n=652 student)	137	26.4	240	46.2	0.42 (0.32-0.55)
History of low weight at birth:					
Yes	46	8.9	18	3.5	2.71 (1.50-4.92)
No	473	91.1	501	96.5	0.37 (0.20-0.67)
History of incubator admission >7 days:					
Yes	46	8.9	6	1.2	8.32 (3.49-24.01)*
No	473	91.1	513	98.8	0.12 (0.04-0.29)*
Birth order:					
First	301	58.0	217	41.8	1.92 (1.49-2.48)
In between	50	9.6	105	20.2	0.42 (0.29-0.61)
Last	168	32.4	197	38.0	0.78 (0.60-1.02)
Number of siblings:					
0-1	127	24.5	213	41.0	0.47 (0.35-0.61)
2	239	46.0	197	38.0	1.40 (1.08-1.80)
≥3	153	29.5	109	21.0	1.57 (1.17-2.11)
History of child work besides schooling:					
Yes	67	12.9	38	7.3	1.88 (1.21-2.91)
No	452	87.1	481	92.7	0.53 (-0.34-0.83)
+ve history of parental consanguinity:					
No	431	83.0	463	89.2	0.59 (0.41-0.86)
Yes:	88	17.0	56	10.8	1.69 (1.16-2.46)
First cousin	34	6.6	17	3.3	2.25 (1.19-4.26)
Second cousin	54	10.4	39	7.5	1.74 (1.10-2.76)
Parent(s) with low stature:					
No	273	52.6	401	77.3	0.33 (0.25-0.43)
Yes:	246	47.4	118	22.7	3.06 (2.32-4.04)
One parent	54	10.4	47	9.0	1.17 (0.76-1.80)
Two parents	192	37.0	71	13.7	3.70 (2.69-5.10)
Sibling(s) with low growth status:					
No	205	39.5	415	80.0	0.16 (0.12-0.22)
Yes:	314	60.5	104	20.0	6.11 (4.59-8.15)
One sibling	112	21.6	77	14.8	1.58 (1.13-2.20)
More than one sibling	202	38.9	27	5.2	11.61 (7.45-18.20)
Bad environmental sanitation:					
Yes	416	80.2	278	53.6	3.50 (2.63-4.66)
No	103	19.8	241	46.4	0.29 (0.21-0.38)

OR§: Odds ratio CI¶: Confidence interval ECLŧ: Exact confidence limits

Table (3): Distribution of the studied low growth school children aged 11-14 years and controls in the public and private preparatory schools in Al-Marg, Cairo according to their socioeconomic risk factors.

Items of socioeconomic status	Low growth students (n=519)		Normal growth students (n=519)		OR§ (95% CI¶)
	No.	%	No.	%	
Head of the family education:					
Illiterate, read and write	267	51.4	212	47.6	1.53 (1.19-1.98)
Elementary	171	33.0	193	32.2	0.83 (0.64-1.08)
Secondary and university	81	15.6	114	20.2	0.66 (0.47-0.91)
Head of the family occupation:					
Unskilled labor	254	48.9	201	38.7	1.52 (1.18-1.96)
Semi-skilled/skilled labor	184	35.5	198	38.2	0.89 (0.69-1.16)
Professional	81	15.6	120	23.1	0.61 (0.44-0.85)
Socioeconomic level:					
Low	260	50.1	206	39.7	1.53 (1.18-1.97)
Middle	178	34.3	196	37.8	0.86 (0.66-1.12)
High	81	15.6	117	22.5	0.64 (0.46-0.88)

OR§: Odds ratio CI¶: Confidence interval

Table (4): Distribution of the studied low growth school children aged 11-14 years and controls in the public and private preparatory schools in Al-Marg, Cairo according to their life style and health care behavior risk factors.

Life style and health care behavior risk factors	Low growth students (n=519)		Normal growth students (n=519)		OR§ (95% CI¶)
	No.	%	No.	%	
Mother not strictly received antenatal care and/or delivered at home:					
Yes	361	69.6	262	50.5	2.24 (1.72-2.91)
No	158	30.4	257	49.5	0.45 (0.34-0.58)
Student not strictly received obligatory vaccines:					
No	141	27.2	111	22.7	1.37 (1.02-1.84)
Yes	378	72.8	408	77.3	0.73 (0.54-0.98)
Eating unhealthy diet:					
Yes	413	79.6	317	61.1	2.48 (1.86-3.31)
No	106	20.4	202	38.9	0.40 (0.30-0.54)
Practicing exercise:					
No	316	60.9	214	41.2	2.22 (1.72-2.87)
Yes	203	39.1	305	58.8	0.45 (0.35-0.58)
Early seeking for medical advice:					
No	228	42.8	194	37.4	1.31 (1.02-1.70)
Yes	291	57.2	325	62.6	0.76 (0.59-0.98)
Compliance with treatment:					
No	244	47.0	207	39.9	1.34 (1.04-1.72)
Yes	275	53.0	312	60.1	0.75 (0.58-0.96)

OR§: Odds ratio CI¶: Confidence interval

Table (5): Distribution of the studied low growth school children aged 11-14 years and controls in the public and private preparatory schools in Al-Marg, Cairo according to their morbid conditions risk factors.

Morbid conditions	Low growth students (n=519)		Normal growth students (n=519)		OR§ (95% CI¶) OR§ (95% ECLt)*
	No.	%	No.	%	
Parasitic infections:					
No	387	74.6	462	89.0	0.36 (0.25-0.51)
Yes:	132	25.4	57	11.0	2.76 (1.94-3.94)
Oxyrius (worm/ova)	112	21.7	49	9.4	2.64 (1.81-3.85)
Entamoeba histolytic	110	21.3	47	9.1	2.70 (1.84-3.96)
Giardia lamblia (cyst)	90	17.4	41	7.9	2.45 (1.63-3.69)
Hymenolepis (H) nana (ova)	79	15.2	38	7.3	2.27 (1.48-3.49)
Trichuris trichiura (ova)	7	1.2	2	0.2	3.53 (0.67-34.99)*
Strongloides	5	0.9	0	0.0	Undefined
Ascaris (ova)	4	0.8	2	0.4	2.01 (0.29-22.27)*
S. hematobium (ova)	2	0.4	1	0.2	2.00 (0.10-118.45)*
> one infection	178	34.4	89	17.2	2.52 (1.87-3.41)
Chronic parasitic infections	143	27.6	79	15.2	2.12 (1.54-2.91)
Anemia:					
Yes:	211	40.7	121	23.3	2.25 (1.71-2.97)
Chronic	132	25.4	71	13.7	2.15 (1.55-3.00)
No	308	59.3	398	76.7	0.44 (0.34-0.59)
Heart disease:					
No	485	93.5	503	96.9	0.48 (0.25-0.93)
Yes:	34	6.5	16	3.1	2.07 (1.08-3.99)
Congenital	21	4.0	7	1.4	3.08 (1.25-8.66)*
Acquired	13	2.5	9	1.7	1.46 (0.58-3.73)
Hepatomegally/spleenomegally:					
Yes	14	2.7	4	0.8	3.57 (1.11-14.98)*
No	505	97.3	515	99.2	0.28 (0.07-0.09)*
Bronchial asthma:					
Yes	47	9.1	23	4.4	2.15 (1.25-3.71)
No	472	90.9	496	95.6	0.47 (0.27-0.80)
Diabetes mellitus:					
Yes	28	5.4	14	2.7	2.06 (1.03-4.16)
No	491	94.6	505	97.3	0.49 (0.24-0.97)
Blood diseases:					
Yes	8	1.5	2	0.4	4.05 (0.80-39.25)*
No	511	98.5	517	99.6	0.25 (0.03-1.25)*
Renal diseases:					
Yes	6	1.2	1	0.2	6.06 (0.73-279.20)*
No	513	98.8	518	99.8	0.17 (0.00-1.37)*
Malignant diseases:					
Yes	3	0.60	0	0.00	Undefined
No	516	99.4	519	100.00	0.00 (0.00-0.84)*
Physical disabilities (motor):					
Yes	3	0.60	1	0.2	3.01 (0.24-158.40)*
No	516	99.4	518	99.8	0.33 (0.01-4.16)*

OR§: Odds ratio CI¶: Confidence interval ECLt: Exact confidence limits

Table (6): Means and standard deviations of the anthropometric measurements of studied school children boys and girls aged 11-14 years with low and normal growth in both public and private preparatory schools in Al-Marg, Cairo.

Anthropometric measurements	Low growth students (n=519) M±SD	Normal growth students (n=519) M±SD	t-value	P-value
Boys (n=288 & n=208)				
Weight (kg)	33.9 ± 5.9	38.4 ± 6.8	- 7.682	0.0000
Standing height (cm)	142.5 ± 7.4	147.2 ± 8.3	- 6.925	0.0000
Mid arm circumference (cm)	17.9 ± 4.5	20.7 ± 2.4	- 8.944	0.0000
Waist circumference (cm)	52.9 ± 6.0	62.0 ± 5.1	- 18.198	0.0000
Triceps skin fold (mm)	5.7 ± 2.1	7.5 ± 3.2	- 7.085	0.0000
Sub-scapular skin fold (mm)	5.4 ± 2.3	7.3 ± 3.5	- 6.835	0.0000
Girls (n=231 & n=311)				
Weight (kg)	36.3 ± 7.9	42.1 ± 8.4	- 8.227	0.0000
Standing height (cm)	146.7 ± 7.2	150.1 ± 7.0	- 5.501	0.0000
Mid arm circumference (cm)	19.4 ± 3.7	21.2 ± 2.8	- 6.193	0.0000
Waist circumference (cm)	56.8 ± 6.0	63.2 ± 6.9	- 11.515	0.0000
Triceps skin fold (mm)	8.5 ± 4.1	12.1 ± 4.6	- 9.594	0.0000
Sub-scapular skin fold (mm)	8.9 ± 4.1	12.9 ± 4.5	-10.772	0.0000

Table (7): Means and standard deviations of the anthropometric measurements of studied school children boys and girls aged 11-14 years with low growth from consanguineous and non consanguineous parents in both public and private preparatory schools in Al-Marg, Cairo.

Anthropometric measurements	Low growth students from consanguineous parents (n=88) M±SD	Normal growth students from non consanguineous parents (n=463) M±SD	t-value	P-value
Boys from consanguineous and non consanguineous marriage (n=52 & n=191)				
Weight (kg)	33.2 ± 5.6	38.9 ± 6.5	- 6.278	0.0000
Standing height (cm)	141.6 ± 7.3	147.8 ± 8.5	- 5.234	0.0000
Mid arm circumference (cm)	17.5 ± 4.5	20.9 ± 2.5	- 5.233	0.0000
Waist circumference (cm)	52.5 ± 5.9	62.6 ± 5.3	- 11.178	0.0000
Triceps skin fold (mm)	5.4 ± 2.1	7.7 ± 3.7	- 5.814	0.0000
Sub-scapular skin fold (mm)	5.1 ± 2.3	7.5 ± 3.7	- 5.763	0.0000
Girls from consanguineous and non consanguineous marriage (n=36 & n=272)				
Weight (kg)	35.6 ± 7.8	42.9 ± 8.7	- 5.203	0.0000
Standing height (cm)	145.7 ± 6.9	150.8 ± 7.4	- 4.131	0.000008
Mid arm circumference (cm)	18.9 ± 3.8	21.5 ± 2.9	- 3.956	0.0001
Waist circumference (cm)	56.1 ± 5.8	63.9 ± 7.1	- 7.371	0.0000
Triceps skin fold (mm)	8.0 ± 3.4	12.6 ± 4.8	- 7.221	0.0000
Sub-scapular skin fold (mm)	8.4 ± 3.7	13.1 ± 4.6	- 6.944	0.0000

Table (8): Means and standard deviations of the anthropometric measurements of studied school children boys and girls aged 11-14 years with low growth in both public and private preparatory schools in Al-Marg, Cairo.

Anthropometric measurements	Low growth boys (n=288) M±SD	Low growth girls (n=231) M±SD	t-value	P-value
Weight (kg)	33.9 ± 5.9	36.3 ± 7.9	- 3.838	0.000007
Standing height (cm)	142.5 ± 7.4	146.7 ± 7.2	- 6.523	0.0000
Mid arm circumference (cm)	17.9 ± 4.5	19.4 ± 3.7	- 4.167	0.000002
Waist circumference (cm)	52.9 ± 6.0	56.8 ± 6.0	- 7.359	0.0000
Triceps skin fold (mm)	5.7 ± 2.1	8.5 ± 4.1	- 9.434	0.0000
Sub-scapular skin fold (mm)	5.4 ± 2.3	8.9 ± 4.1	- 11.594	0.0000

Table (9): Stepwise regression analysis of factors affecting low growth status among children in public and private preparatory schools in Al-Marg, Cairo.

Factors affecting low growth status among school children	β-Coefficient	Partial F-test
Parents with low stature	-0.0052	2.7
Low socioeconomic level	-0.0061	2.4
Siblings with low growth status (> one sibling)	-0.0051	2.2
Parasitic infections	-0.0048	1.7
Congenital heart diseases	-0.0052	1.5
Bad environmental sanitation	-0.0041	1.3
History of parental consanguinity (first cousin)	-0.0043	1.3

Adjusted F=1.2

Table (10): Distribution of the studied low growth school children aged 11-14 years and controls in the public and private preparatory schools in Al-Marg, Cairo according to their school absenteeism and scholastic achievement.

Variables	Low growth students (n=519)		Normal growth students (n=519)		Yates χ^2	P-value
	No.	%	No.	%		
School absenteeism:						
0-2 day/month	227	43.7	303	58.4	21.69	0.000
3-5 days/month	206	39.7	121	23.3	31.50	0.000
≥6 days/month	86	16.6	95	18.3	0.43	0.512
Scholastic achievement:						
≥85.0%	134	25.8	164	31.6	3.96	0.04
≥65.0%	97	18.7	103	19.8	0.15	0.690
≥50.0%	162	31.2	180	34.7	1.26	0.261
<50.0%	126	24.3	72	13.9	17.53	0.000

4. Discussion

Low growth status in children has many risk factors. The present study tries to exploring some of these risk factors and draws a picture of the low growth students, boys and girls, in preparatory schools in Cairo, Egypt. The suspected risk factors include socioeconomic, demographic, parental consanguinity, environmental, nutritional and some morbid conditions. Also, low growth status might have impacts on scholastic achievement of the affected students. So, we try also to explore the impacts in this sample of students.

From the prenatal period to eight years of age children undergo rapid growth, which is highly influenced by their environment **(WHO, 2009)**. The overall prevalence of underweight among children in Colombia was 10.0%. The total prevalence of stunting was 14.1% **(Botero-Garcés *et al.*, 2009)**. In Egypt, 17.6% of children were <5th percentile weight-for-age and 18.7% were <5th percentile height-for-age **(El-Masry *et al.*, 2007)**. Our figures were higher than these figures and this might be due to differences in age, cultural, socioeconomic and associated morbid conditions.

In this study we cleared that low growth status was more prevalent among younger age students. Growth failure in under-five children was estimated; 74% were stunted, 44% were weight deficient and 6% were wasted. But, these prevalence rates were lower among school-age children **(Immink and Payongayong, 1999)**.

Also, we noticed that the girls were heavier and taller than boys. This is expected and accepted as the boys have less protein and calories reserves and are relatively more affected by negative environmental and nutritional stress **(Schumacher and Kretchmer, 1988)**. Moreover, these differences appear to be due to sex differences among prepubertal children **(He *et al.*, 2002)**.

An important risk factor of growth failure is intrauterine growth restriction **(Richard, 2007** and **WHO, 2009)**. Studies continue to provide evidence that very low birth weight (VLBW) infants have significantly lower weight and height, and may have abnormal body composition and bone mineralization, during the first years of life compared to children who were born full-term. Growth impairment in VLBW infants is due largely to prolonged, acute neonatal illnesses and subsequent chronic illnesses. But failure to grow (i.e. weight <3rd and height <10th percentile) in high risk VLBW infants is also strongly associated with neurosensory developmental abnormalities and motor skills that impact the child's feeding ability. Attainment of appropriate growth and nutrition in VLBW infants is an important challenge that requires conscientious attention over the course of months and years after initial discharge from the intensive care unit (ICU) **(Cole *et al.*, 2002)**. Also, abnormal birth history defined by low birth weight, prematurity, or small for gestational age (SGA) at birth is risk factors for poor growth outcomes in children. High prevalence's of low birth weight (17.0%), SGA (14.0%) and prematurity (12.0%) were observed. Further, ICU admission at birth is risk factor for poor growth outcomes in children. A high prevalence (40.0%) of ICU admission after delivery was observed (**Greenbaum *et al.*, 2011)**.

Children living in households with 4 or more children were about three times more likely to be stunted than children living in less crowded households (OR=2.86, 95% CI: 1.17-7.14) **(Sereebutra *et al.*, 2006)**.

As respect students work besides schooling, participation in farm production by school-age children was associated with a higher risk of growth failure in younger siblings **(Immink and Payongayong, 1999)**. On the other hand, there is no evidence that agriculture work impedes the growth of the child in Vietnam as measured by weight-for-age and height growth **(O'Donnell *et al.*, 2005)**.

Consanguineous marriage is defined as a union between couples related as second cousins or closer **(Bittles, 2002)**. Marriage between close biological kin remains preferential in North Africa, the Middle East and much of Central and South Asia, with marriage between first cousins particularly popular. But, consanguineous unions are widely regarded as genetically disadvantageous in contemporary western societies **(Genin & Clerget-Darpouse, 1996** and **Hussain & Bittles, 2000)**. The incidence of consanguineous mating in Egypt was found to be about 29.0%, which could be considered high. The highest incidence was that in the rural areas, 39.1%. First cousin marriages occurred more often than the other types of consanguinity **(Hafez *et al.*, 1983)**. Cultural, social, political and economic factors play roles in favoring consanguineous marriages particularly in rural areas in our communities.

Consanguineous marriages not only have greater risk of producing offspring, which are homozygous for a deleterious recessive gene, but also individuals with increased susceptibility for stillbirths, spontaneous abortions, infant mortality, child deaths, polygenic diseases, as well as congenital malformations **(Bittles *et al.*, 2002** and **Shawky *et al.*, 2002)**. Although the effect of consanguinity on low growth status in the offspring, in some studies, was not found to be significant, it was definitely associated with increased incidence of recessive diseases, congenital malformation and increased rates of morbidity and mortality. But, significant association has been described from other parts of the Muslim world **(Hussain, 1998)**. The malformations that have been found to be common are cardiovascular, central nervous, ophthalmic, urogenital, gastrointestinal, skeletal abnormalities and multiple malformations **(Nabulsi *et al.,* 2001)**. Positive association between consanguinity and childhood morbidity due to the expression of detrimental recessive genes includes deafness, retinal dystrophies, intellectual and developmental disability and complex congenital heart disease **(Bittles, 2001&2003** and **Corry, 2002)**. Increased incidences of thalassaemia and other hematological disorders also are reported in many populations **(Bittles, 2003)**. Environmental effects on the phenotype can act directly or indirectly on the developing organism **(Mousseau and Fox, 1998)**. The offspring might receive signals during its embryonic development that are indicative of the environmental circumstances; it is likely to experience after birth (**Gorman and Nager, 2004**).

This study revealed that positive parental consanguinity was a significant risk factor for the low growth status among students in general. In details, the risk increases if the parents were first cousin. There is no agreement on the effect of consanguineous marriage on the anthropometric measurements and low growth in children. Our study results are in concordance with many studies; **Barrai *et al.* (1964)** observed that Italian military conscripts aged about twenty years showed small but significant effect of consanguinity on weight, height and chest girth. Also, **Krishnan (1975&1986)** in two studies on Delhi Muslims aged 10-19 years and 11-16 years, found that the children of consanguineous marriage were small in all the measurements than controls. Further, **Mukherjee (1982)** and **Mukherjee & Lakshmanadu (1990)** in their studies in India found that the mean values of physical measurements of the offspring of consanguineous marriages were lower than that of controls. Also, our study results were supported by those of **Kulkarni and Kurian (1990); Jaber *et al.* (1997)** and **Mumtaz *et al.* (2006)** who reported a significant decrease in the mean birth weight of infants born to consanguineous parents. In Egypt, **Belal and Omar (2006)** stated that a slight but statistically significant depression has been observed for all investigated anthropometric measurements in the children of consanguineous parents. On the other hand, **Paddaiah (1985)** did not observe significant differences between the inbred and non-inbred, in any of his age groups. Also, **Saedi-wong & Al- Frayh (1989)** and **Al-Abdulkareem & Ballal (1998)** in their Saudi newborn infants found no significant effects of inbreeding either on gestational age or on anthropometric measurements. Further, **Basaran *et al.* (1994)** cleared that the anthropometric values were slightly less, especially in children from first-cousin couples, but the differences were insignificant for all groups. Moreover, **Paddaiah and Madhavi (2001)** illustrated that it cannot be inferred that inbreeding has any effect on the anthropometric measurements of the newborns.

Our findings cleared that low parental stature is risk factor of low growth status among our study sample. This result was in accordance with **Immink and Payongayong (1999)**; they reported that women's low body mass index was risk factor for low growth in their children. Also, our results showed that bad sanitary condition was risk factor for low growth in our study sample. This result agreed with **Immink and Payongayong (1999)**; they stated that bad sanitary and housing conditions were risk factors for low growth in their students.

Women's illiteracy is risk factor of low growth status in children **(Immink and Payongayong, 1999)**. This finding was in agreement with our results, which cleared that parental illiteracy is risk factor of low growth among our study sample. Also, low educational level of the caregivers, illiterate parents/caregivers, represents risk factor for weight- and height-for-age below 25^{th} percentile among children in rural Guatemala (OR=5.0, 95% CI: 1.37-16.67) **(Sereebutra *et al.,* 2006)**. Further, participation by women in farm production was one of the most significant risk factor of growth failure in under-five children. This risk was particularly a risk factor of wasting **(Immink and Payongayong, 1999)**. Collectively, the mean values of the physical measurements of the newborns were lowering with statistically significant differences in the lower socioeconomic class compared to those in higher class **(Mukherjee, 1982** and **Mukherjee & Lakshmanadu, 1990)**. So, improving socio-demographic factors will help prevent future impairment of physical and mental development in children and will assist in alleviating malnutrition and improving their quality of health **(Sereebutra *et al.,* 2006)**.

Although the etiology of growth failure is multi-factorial, malnutrition and repeated infections in children have been documented as causative agents **(De Onis *et al.,* 1993)**. The presence of more than one of these factors leads to an increased risk of impaired growth and malnutrition **(Sereebutra *et al.,* 2006)**.

There is food risk factor of growth failure in children of different age groups. Low per capita food availability, and particularly the absence in the household of self-produced staple foods, was the most significant risk factor of growth failure in under-five children **(Immink and Payongayong,**

1999). Also, malnutrition that is chronic and severe enough to cause growth stunting and iron deficiency anemia are important risk factors affect up to 20.0% of infants and young children in developing countries **(Richard, 2007** and **WHO, 2009)**.

The present findings provide evidence that parasitosis is one of the causal factors of stunting and underweight among the children in this study. Also, it is very probable that several factors were predictors for low growth among children; infection, low nutritional status, together with sanitary and socioeconomic conditions…etc **(Astiazaran-Garcia *et al.*, 2000** and **Ali & Hill, 2003)**. Parasitic infection is a major public health problem in children worldwide, especially in developing societies. It produces nutritional deficiencies, especially among chronically infected children **(El-Shobaki *et al.*, 1990)**. Un-hygienic living conditions give rise to increased prevalence of parasitic infections **(Gamboa *et al.*, 1998** and **El-Masry *et al.*, 2007)**. Further, the prevalence of parasitic infection differ in different communities according to many factors, which include social and environmental characters of the community, health habits of the community personnel and technical methods used in diagnosis of parasites **(El-Gammal *et al.*, 1995)**. In Egypt, 56.0% of children are worryingly suffering from intestinal parasites and 47.0% of children are worryingly suffering from anemia **(UNICEF, 2000)**. Also, in Egypt, 38.5% of children were infected with parasites; 29.2% of them were <5th percentile weight-for-age, 31.6% of them were <5th percentile height-for-age and 52.4% of them were suffering from anemia **(El-Masry *et al.*, 2007)**.

About eleven percent (10.9%) of school children in Riyadh, KSA had intestinal parasites. *Entamoeba coli* was found more frequently (61.9%) among the commensals, while *Giardia lamblia* was the most common (28.57%) pathogenic parasite. But, all urine samples were parasites free. The low infection rate with *Giardia* could be explained by the good physical and nutritional status and better sanitary and living conditions **(Ahmed and El-Hady, 1989)**.

Giardia intestinalis is the most frequently reported intestinal parasite worldwide. It can cause acute or chronic diarrhea, contributing to nutritional deficiency, or remain asymptomatic. Chronic giardiasis in children is generally associated with clinical manifestations of failure to thrive **(Carvalho-Costa *et al.*, 2007)**. So, *G. intestinalis* is a hallmark cause of growth failure in children **(De Onis *et al.*, 1993)**. Poor sanitation, housing and socioeconomic conditions are factors that contribute to the high prevalence of this parasite **(Astiazaran-Garcia *et al.*, 2000** and **Ali & Hill, 2003)**. Further, the association of giardiasis with protein-energy malnutrition, micronutrient deficiency and with iron deficiency anemia has been reported by some researchers **(Awasthi and Pande, 1997; Sackey *et al.*, 2003** and **Carvalho-Costa *et al.*, 2007)**. A study in Brazil noticed that children with symptomatic *G. intestinalis* infection had significantly lower weight-for-age and height-for-age **(Carvalho-Costa *et al.*, 2007)**, and a study in Malaysia observed that children with giardiasis were significantly underweight and wasting compared to those without this parasitoses **(Al-Mekhiafi *et al.*, 2005)**. On the other hand, a cross-sectional study in Guatemala involving children with asymptomatic *Giardia* infection showed that only the literacy status of the primary caregiver and the number of children in the household were related to the prediction of stunting among the children participating in the study **(Sereebutra *et al.*, 2006)**.

The prevalence's of intestinal parasites and multi-parasitism were; 27.6% of the studied children positive for *G. intestinalis* infection, 24.0% positive for *E. histolytica*, 22.9% positive for *Trichuris trichiura*, 1.1% for *S. stercoralis*, 0.8% for *H. nana* and 27.8% for multi-parasitism. But, statistical analysis did not identify giardiasis as a predictor of being underweight or wasting; however, a statistically significant association between this parasitoses and stunting was observed **(Botero-Garcés *et al.*, 2009)**.

Most of the parasitic infections cause acute or chronic diarrhea with mal absorption **(Alberton *et al.*, 1995)**. However, chronic symptoms such as dyspepsia, epigastric pain, nausea and anorexia may be present **(Fayad *et al.*, 1992)**. **Markel *et al.* (1999)** cleared that, through effect on the intestinal flora, children infected with enteric parasites may suffer from colitis that lead to vague, non-specific abdominal symptoms. So, they usually lose their food interest to prevent these symptoms. Hematuria was significant presenting finding among those infected by *S. haematobium* **(El-Khoby *et al.*, 2000)**.

With respect weight-for-age and height-for-age, **El-Masry *et al.* (2007)** reported that 29.2% and 31.6%, respectively of positive parasitic infection students were <5th percentiles compared with 17.6% and 3.0%, respectively of negative parasitic infection students, with statistically significant differences. Also, our findings were in accordance with **WHO/WER (2006)**. Our results were expected, as parasitic infections are thought to contribute to child malnutrition, micronutrient deficiency and protein loss through subtle reduction in digestion and absorption, chronic inflammation and loss of nutrients. Parasites may decrease food intake, loss of appetite, the maintenance of nutrient pools and anemia secondary to blood loss **(Hesham *et al.*, 2004)**. So, impairment of the anthropometric measures and anemia were more prevalent among these children. Further, our results were in accordance with **Khalil (1982)** and **Shalabi (1991)** who cleared that enteric parasitic infections had significant effect on weight and height. Also, **El-Baroudy *et al.* (1993)** observed that *Giardia* infection might lead to impairment in anthropometric measures of the infected children. On the other hand, **Kandeel (1998)** did not find any effect of parasitic infections on children growth, but he attributed this to the recent, light intensity of infection or infection for a short period.

High risk of being ill was one of the most significant risk factors of growth failure in under-five children **(Immink and Payongayong, 1999)**. In Egypt, 32.7% of children were suffering from anemia **(El-Masry *et al.*, 2007)**. Also, poor growth can result from inhaled corticosteroids (ICS); poorly controlled asthma can lead to poor growth in children. In general, low and medium doses of ICS are potentially associated with small, non-progressive but reversible declines in growth of children. As a result, parents and doctors should not only carefully monitor growth, but try to use the lowest possible dose that gets good control of the child's asthma and must weigh the potential benefits of good asthma control with the small but real possible side effect of slowed growth **(Bass, 2009)**. In Egypt, the non appropriate use of oral corticosteroids by the parents to obtain a good asthma control of their children and their dislike of ICS use might explain, partly, this side effect. Also, the results of the Chronic Kidney Disease (CKD) in Children Prospective Cohort study showed that children with CKD are more likely to be born with low birth weight than the general population. This occurs in children who are born with kidney disease and those who acquire kidney disease during childhood **(Greenbaum *et al.*, 2011)**.

Many children in developing countries are exposed to multiple risks, including poverty, malnutrition, poor health, and unstimulating home environments, which detrimentally affect their cognitive, motor and social-emotional development. Also, low growth in children had many morbid conditions risk factors. Further, there are few national statistics on the development of young children in developing countries. Therefore, two factors with available worldwide data were identified; the prevalence of early childhood stunting and the number of people living in absolute poverty, to use as indicators of poor development. Both indicators are closely associated with poor cognitive and educational performance in children and use them to estimate that over 200 million children under 5 years are not fulfilling their developmental potential. Most of these children live in south Asia and sub-Saharan Africa. These disadvantaged children are likely to do poorly in school and subsequently have low incomes, high fertility, and provide poor care for their children, thus contributing to the intergenerational transmission of poverty **(Grantham-McGregor *et al.*, 2007)**.

Conclusion and Recommendations

Low growth is prevalent among school students especially in public schools in Cairo. Most of the risk factors of low growth status can be manipulated. So, this health problem and its negative impacts can be prevented. Multi-sectoral programs need to reduce the impact of various risk factors of low growth in children, and be careful not to introduce new risk factors. Depending on which age group is targeted, such programs should either prioritize improvements in household food availability, or interventions that reduce women's illiteracy and improve sanitary and housing conditions. Also, health education, good antenatal care, health promotion, improving people and environmental hygiene, and regular health screening and treatment of children at all occasions are an important essentiality. Further studies on large numbers of students in different rural and urban areas in Egypt are recommended.

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