Original Report:
Public Health

Awareness Campaign for the Early Detection of Growth Disorders in Public School Children in North Lebanon

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Objectives: To detect and screen growth anomaly among children in North Lebanon, raise awareness on the importance of regular height check, and establish recommendations for the authorities.

Design: 18-month campaign.

Setting: 230 public schools in North Lebanon.

Participants: 41,347 children, aged 5-15 years.

Interventions: Weight was measured using a standardized stadiometer and compared with French curves of height-for-age. Awareness was raised by promoting early detection of growth disorders in Lebanon. The follow-up phase was intended to secure referral and treatment of the detected short stature children.

Main outcome measures: Age, sex, height, societal issues.

Results: 40,023 students were recruited from 228 schools; of these, 63.7% of the screened children were aged 5-10 years. Four percent (1,631 children) of the screened population presented short stature, of whom 50% were aged 5-10 years and 41% were more severely affected and referred to specialists; 59% were first directed to the school physician/pediatrician. The follow-up phase was not achieved because of the patients' low socioeconomic level. We also found that many children were too old for the attended level at school, mainly because of low socioeconomic levels and educational backwardness.

Conclusions: Our screening campaign confirms the need for more awareness on the importance of early detection of growth retardation in Lebanon. It highlights the need for making efforts to reduce poverty and its consequences in North Lebanon. Our future goal is to expand our campaign throughout Lebanon and cooperate with health authorities to lower the cost of work-up on the patient. *Ethn Dis*. 2016;26(3):417-426; doi:10.18865/ed.26.3.417

Keywords: Early Detection; Growth Disorders; Health Educators; Ministry of Education; Screening; Socioeconomic Level.

Introduction

Growth and weight attainment reflect the general well-being of the individual child. Growth disorder is any type of problem in infants, children, or teenagers that prevents normal growth. Apart from genetic factors,[1] environmental factors and the general health status of a child (eg, nutrition and hormone levels) are crucial for the capacity to grow. As such, many children are born with risk factors that predispose them to developmental disorders. Endocrine causes of growth disorders include hypothyroidism, growth hormone deficiency, hypopituitarism, or other hormone disorders. Those, if undetected and untreated, can contribute to early school failure and attendant social and emotional problems. Some children have growth disorders attributable to a specific medical condition for which medical treatments may be indicated.[2] Furthermore, measurement of height is often neglected in the daily routine of pediatric practice and at schools. A consequence of this lack of attention to growth is that pathological causes are often detected late.[3,4]

Thus, a child's growth and development should be followed through a partnership between parents, school health educators and health care professionals. Early identification of developmental disorders is critical to the well-being of children and their families. Besides, identification of a growth disorder and its underlying etiology may also drive a range of treatment planning, from medical treatment of the child to family planning for his/her parents.

Approximately 3,961,820 individuals live in Lebanon with 80,000

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to 85,000 live births per year. Twenty-five percent of the population are below the age of 15.[5] Fifty percent of the pre-pubertal children (aged 5 to 10 years) live in Beirut and Mount Lebanon districts vs 19% in the North district (n=68,836).[6] We should also note that North Lebanon has the highest rate (>40%) of children aged 5 to 10 years in the country.[7]

A cross-sectional study was conducted in 2007 to draw growth curves of 2,547 adolescents in Lebanese public schools. Researchers of this study found lower 3rd and 50th percentiles, and 97th percentiles superior or equal to the height vs age charts of the World Health Organization.[8] Although this study added to the knowledge about trends in child growth,[8] further studies are needed to thoroughly screen growth disorders in Lebanon, a nation struggling with important demographic changes.

In this context, the aim of our study was to detect and screen growth anomaly with age, in a population of school students born in the 2000s and located in North Lebanon, and to compare the measurements with French reference curves of height-for-age established 37 years ago.[9] The screening campaign also aimed to raise awareness of the importance of regular height check as a key health indicator. Other secondary objectives were to: 1) establish a list of recommendations for the authorities with respect to the societal needs of North Lebanon; 2) emphasize the need for general practitioners, pediatricians, parents, educators and lay population to make early diagnosis of growth disorders for better treatment outcomes; 3) screen for, detect and drive referral of children with potentially morbid short stature; 4) create a coalition for better access to treatment through partnership with key ministries, private sector and the medical community; and 5) establish an electronic database of school children with growth disorders. Finally, we aimed to define the growth characteristics of children in Lebanon.

Methods

Study Population

From January 2009 through June 2010, a national screening campaign was conducted; 41,347 children participated in the campaign. Participating children were aged 5 to 15 years and attended kindergarten 1 (KG-1) through elementary 5 in 230 public schools located in the North district of Lebanon according to the Lebanese Ministry of Education records. Children of Lebanese parents and who had no history or current medical illness were included in the study. Those with incomplete, insufficient or conflicting data or presenting a chronic illness or from non-Lebanese origin were excluded from our study.

Study Design

Our campaign included three phases: screening, awareness and follow-up phases. During the screening phase, a steering committee was formed and comprised: four pediatric endocrinologists; the director of the Lebanese Health Education; one school health coordinator from the Ministry of Education; and representatives from the campaign sponsor. Three educational workshops were held in January 2010 during the second phase; the workshops provided information about growth disorders for the health educators in the 230 participating schools; the health educators' team from the Ministry of Education conducted the workshops. Hands-on training on height and weight measurement using standardized Seca stadiometer 213 (Seca, Hamburg, Germany) was also provided. Following the trainings, a total number of 41,347 children were screened during a seven-week period from January - February 2010. Finally, all data were collected and entered on a weekly basis through March 2010; data included name, place and date of birth, date of visit, and anthropometric measurements.

The awareness phase aimed on promoting the early detection of growth disorders through posters and pamphlets that were distributed in public schools and all hospitals of North Lebanon. General public awareness was also raised through press releases, public service announcements, and television interviews.

Finally, the follow-up phase was intended to secure referral and treatment of children determined to be of short stature. For that purpose, a stepwise protocol for the diagnosis of growth disorders was finalized by the end of March 2010 (Figure 1). A continuing medical education symposium for pediatricians and GPs was also conducted in collaboration with the Lebanese Order of Physicians.

As per the stepwise protocol, for patients whose height fell more than two standard deviations below the mean, urinalysis for calcium and phosphorus levels was conducted. Anti-transglutaminase and anti-gliadin antibodies were also evaluated for celiac

screening. A duodenal biopsy was to be performed in patients with positive celiac serology. Insulin-like growth factor I (IGF-1), and bone age were also determined. In case of normal level of IGF-1 and concordant bone age with chronological age, no further steps were done and patients were asked to come back for follow-up in six months. In the opposite cases, children were referred to a specialist who would perform the growth hormone (GH) stimulation test, using the insulin-induced hypoglycemia and the glucagon or glucagon/propranolol tests. Also, for short girls, karyotyping was performed.

Support packages were circulated through public schools with the endorsement of the Ministries of Education and Public Health and the Order of Physicians. The following items were included in a documentation support package: the screening results, the growth evaluation protocol, a letter to the referral physician and explanatory letters to the parents, the list of endocrinologists providing free services and a list of laboratories providing 30% discount.

Statistical Analysis

Sample characteristics were summarized using the mean and the stan-

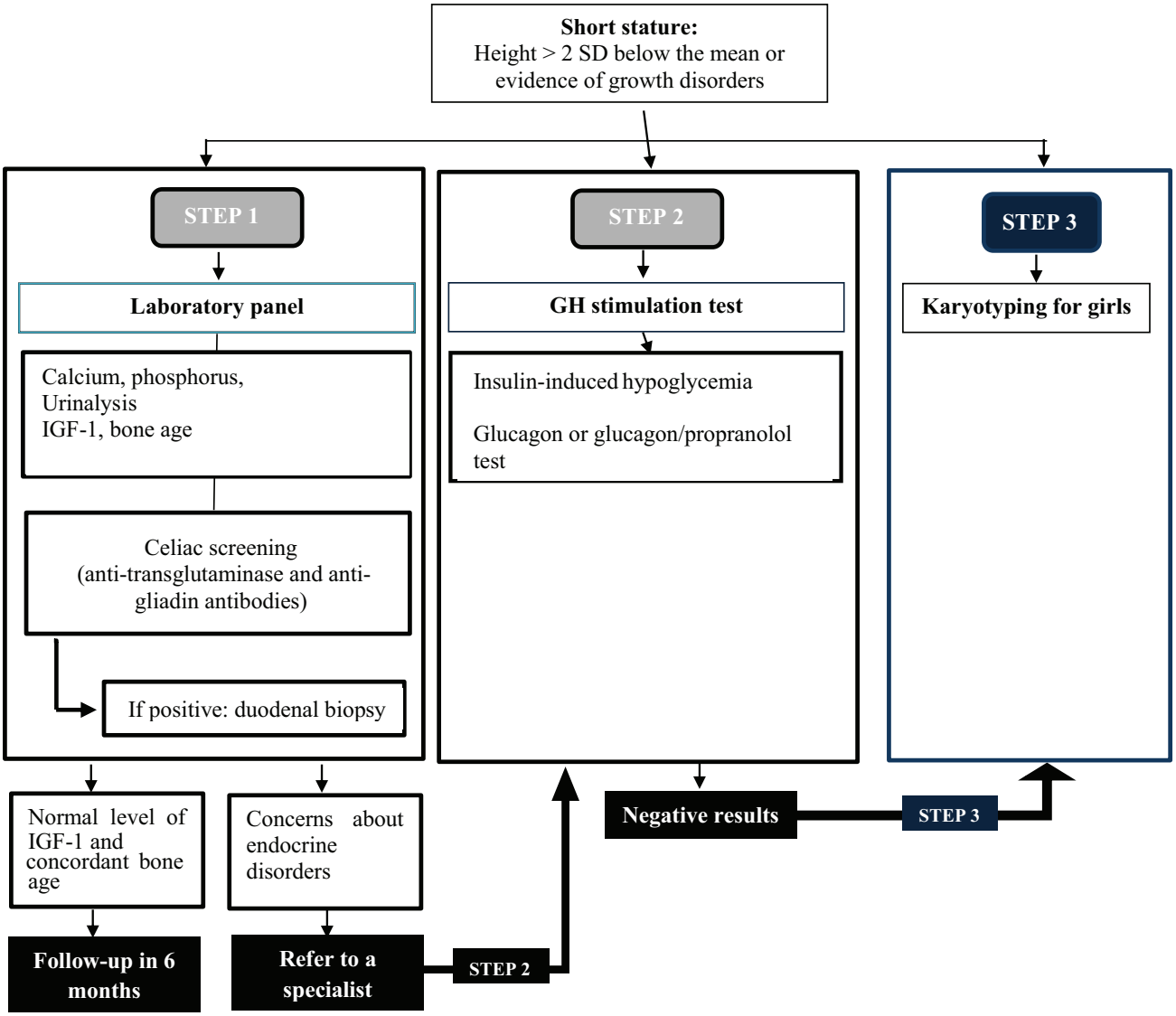

Figure 1. Diagnostic approach to short stature and stepwise protocol for the diagnosis of growth hormone disorders IGF-I, insulin-like growth factor 1.

dard deviation (SD) for continuous variables such as age and height; frequency distributions for categorical variables such as sex were presented. Besides, the French population curve was referenced to identify children whose height fell more than two standard deviations below the mean for referral and for further medical evaluation.[9] A comparison of the sample heights with the reference population was also performed showing the SDs. For that purpose, data were stratified by sex and age groups; age groups were created and the average age of the children and adolescents in each age group along with SD were computed. For example, students aged between 4.25 and 4.749 years were grouped together and their mean age was centered at 4.5 years and those whose ages were between 4.75 and 5.249 years were grouped together and their mean age was centered at 5 years. Mean heights in each age group were compared with those obtained from the French growth charts using one sample t-test, with a two-sided significance level of 5%. The statistical analysis was carried out using SPSS version18.0 (SPSS Inc. Released 2009. PASW Statistics for Windows, Version 18.0. Chicago).

Ethical Considerations

The study was approved by the Ministry of Education and the Ministry of Public Health. The purpose of the study was elucidated to the children's parents through letters addressing the screening program; parents were given a choice to opt-out of having their child participate in the study. Anthropometric measures and all campaign steps were performed with respect of the children's autonomy and anonymity.

Table 1. Distribution of screened school students by sex, age category and Caza, n=40,023

School location (Caza)			
Akkar	15,543 (38.8)		
Tripoli	13,953 (34.9)		
Minieh	7,137 (17.8)		
Zgharta	2,205(5.5)		
Koura	946 (2.4)		
Bcharre	59 (.1)		
Batroun	180 (.5)		
All North	40,023 (100)		
Age categories, years	Boys	Girls	All
5 to <10	12,209 (30.5)	13,295 (33.2)	25,504 (63.7)
>10 to <15	6,541 (16.3)	6,839 (17.1)	13,380 (33.4)
≥ 15	594 (1.5)	545 (1.4)	1,139 (2.9)
All age categories	19,344 (48.3)	20,067 (51.7)	40,023 (100)

Data are n (%).

Results

A total of 40,023 of 41,347 (96.8%) students from 228 schools met criteria for participation. Four schools were excluded from the statistical analysis because the quality of height measurement was doubted. The majority of children attending public schools in North Lebanon belonged to the Governate of Akkar and Caza of Tripoli (39% and 35% respectively), followed by Minieh (18%). Overall, 63.7% of screened children were in the pre-pubertal age group (5-10 years). The distribution of the school students by age, sex and Caza of the North district are displayed in Table 1.

Height (mean) for age is displayed by sex for the study group compared with the French population in Figures 2 through 7 and illustrates how height was significantly lower in the study group compared with the French reference population, for both boys and girls. Data of the height differences are presented in Tables 2 and 3 and Figures 2-7.

In total, 4% (1,631 children) of the 40,023 screened children presented short stature, defined as <2 SDs below the mean for age and sex. Short patients were equally distributed between both sexes (49% boys). Moreover, 50% of children with short stature were in the pre-pubertal age group. Among the 1,631 children with short stature, 41% (661 children) were more severely affected (-2.5 SDs) and consequently referred to specialists, while 59% were directed to the school physician/pediatrician, with follow-up scheduled in 6 months (Table 4).

Of the children with short stature, 52% of those with less severe short stature were aged 5-10 years and 40% of those with more severe stature needing specialist care were aged 5-10 years (Table 5).

Discussion

Of the public school students born in the 2000s who live in North Lebanon, 4% were of short stature.

Compared with the total group of participants, the majority of those with relatively less short stature were in the pre-pubertal age group (aged 5 to 10 years). Although we targeted the relevant school levels (exclusively KG-1 up to elementary 5), only 63.7% of children were in the pre-pubertal age group and can therefore benefit from a better outcome of potential growth problem treatment. Many children were too old for their attended level, mainly because of low socioeconomic status and educational backwardness. Therefore, in the short stature group, the oldest students were the more severely affected. However, since their bone age may be lower than the chronological age, some intervention on growth is still possible for those aged older than 5 and less than 10 years. Additionally, some children may require treatment with GH or other agents even after cessation of growth in case of ongoing severe GH deficiency for potential beneficial effects on bone maturation and body composition. Not surprisingly, previous studies suggest that better growth is associated with younger age at the start of GH treatment, taller height at start of GH therapy, taller parents and a greater response to GH in the first year of treatment.[10,11]

In comparison with French growth curves, our data showed that height-for-age for North Lebanon boys and girls were significantly lower. Also, children screened with short stature were <2 SDs below the average height for their age and sex, and that 40% (661 children) were more severely affected (-2.5 SDs). It is noteworthy that individual Lebanese children do not necessarily grow according to the national French standard curves. There may be quite large deviations between the Lebanese and French populations during childhood and adolescence, depending on factors such as exercise, genetics, socioeconomic status, and nutrition. While the most common cause of growth retardation was reported

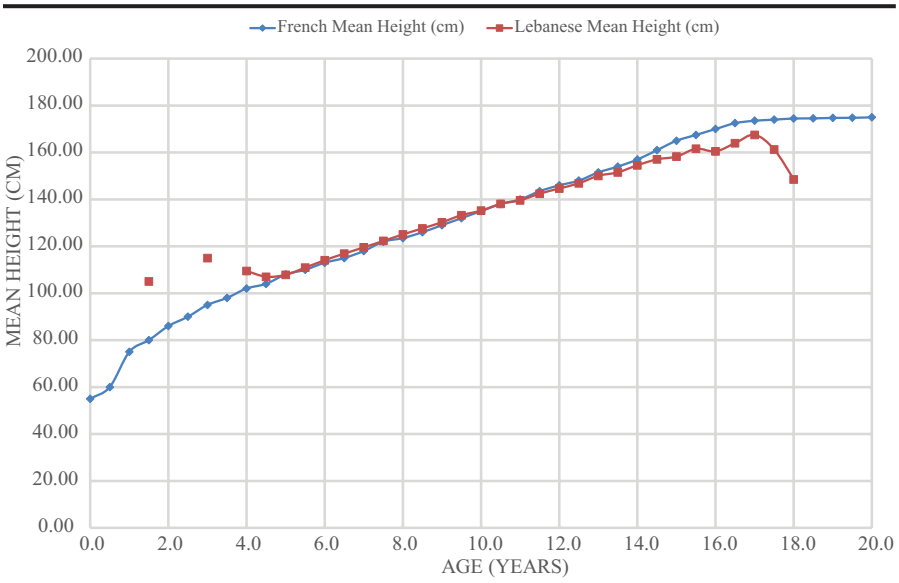

Figure 2. Growth curves for boys in North Lebanon compared with standard French curves[9]
Mean height-for-age for North Lebanon boys and French boys

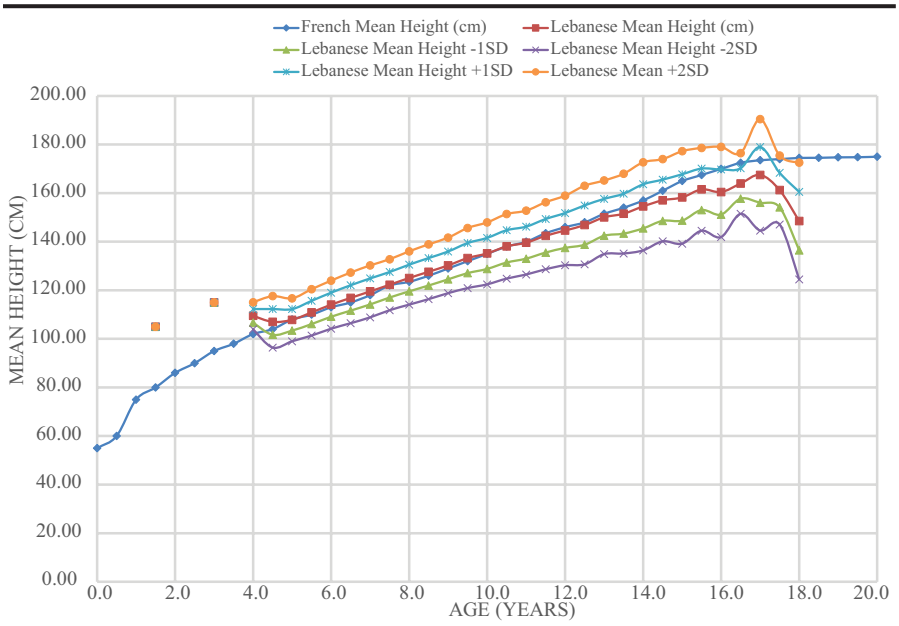

Figure 3. Growth curves for boys in North Lebanon compared with standard French curves[9]
Mean height-for-age for North Lebanon boys and French boys with North Lebanese standard deviations

Table 2. Comparison of mean heights between the study sample and the French reference population by sex (boys) and age (n=19,002)

Age, years	French	Lebanese	Lebanese	Lebanese	Lebanese - French mean, cm	P[b]
	Mean height, cm	Mean height, cm	SD height, cm	n		
0	55	-	-	-	-	[a]
0.5	60	-	-	-	-	[a]
1	75	-	-	-	-	[a]
1.5	80	105	0	1	-	[a]
2	86	-	-	-	-	[a]
2.5	90	-	-	-	-	[a]
3	95	115	0	1		[a]
3.5	98	-	-	-	-	[a]
4	102	109.5	2.78	3	7.5	.043[b]
4.5	104	107	5.29	177	3	.000[b]
5	108	107.83	4.42	832	-0.17	0.282
5.5	110	110.88	4.77	887	0.88	.000[b]
6	113	114.07	4.95	1065	1.07	.000[b]
6.5	115	116.85	5.22	1004	1.85	.000[b]
7	118	119.53	5.35	1179	1.53	.000[b]
7.5	122	122.27	5.25	1164	0.27	0.081
8	123.5	125.05	5.49	1320	1.55	.000[b]
8.5	126	127.62	5.65	1274	1.62	.000[b]
9	129	13.23	5.72	1323	1.23	.000[b]
9.5	132	133.25	6.18	1198	1.25	.000[b]
10	135	135.18	6.38	1360	0.18	0.306
10.5	138	138.08	6.64	1240	0.08	0.688
11	140	139.6	6.58	1033	-.4	.054[b]
11.5	143.5	142.43	6.9	980	-1.07	.000[b]
12	146	144.62	7.17	799	-1.38	.000[b]
12.5	148	146.84	8.09	551	-1.16	.001[b]
13	151.5	150.03	7.58	530	-1.47	.000[b]
13.5	154	151.53	8.21	359	-2.47	.000[b]
14	157	154.54	9.07	315	-2.46	.000[b]
14.5	161	157.05	8.46	144	-3.95	.000[b]
15	165	158.21	9.52	145	-6.79	.000[b]
15.5	167.5	161.56	8.52	52	-5.94	.000[b]
16	170	160.45	9.28	34	-9.55	.000[b]
16.5	172.5	163.96	6.26	14	-8.54	.000[b]
17	173.55	167.5	11.46	12	-6.05	.095
17.5	174	161.25	7.09	4	-12.75	.037[b]
18	174.5	148.5	12.02	2	-26	0.201
18.5	174.55	-	-	-	-	[a]
19	174.75	-	-	-	-	[a]
19.5	174.8	-	-	-	-	[a]
20	175	-	-	-	-	[a]

a. Some points had no P since there is no replication of people (n=1), mainly for those aged <5 years and >15 years.
b. Significance level <.05.
SD, standard deviation.

to be poverty-related malnutrition,[12] North Lebanon suffers from impaired economic situation and poverty. Nonetheless, the rationale for using these curves is that the most of the researchers received their degrees in France and were using it as reference in their practice in the absence of a standard Lebanese growth chart. Importantly, while our study is not representative of the whole Lebanese youth population, it has the merit to pave the way toward establishing the Lebanese growth curves. Also, having a regional growth curve project is an utmost concern. For this purpose, we should include regional countries for an ideal growth chart because of the melting population in the area.

In Lebanon, the majority of public school students in North Lebanon are of low socioeconomic status; the rate of poverty reaches 43.8% in the North.[13] In addition, the overall prevalence of consanguineous marriages is relatively high (35.5%).[14] Yet, these and other factors (eg, nationality, disease status) were not considered in our study. In this context, a study assessing growth deficits in Chilean school children showed that history of malnutrition, lack of health care, unhygienic housing conditions, small length at birth and short period of exclusive breastfeeding were the most important risk factors.[15] Moreover, studies have shown that among children of low socioeconomic status, a short period of breastfeeding is associated with a higher risk of complications and/or early primary undernutrition; both factors determine growth retardation.[16,17]

Study Limitations and Strengths

We acknowledge that our study was hindered by some limitations. First, the study protocol was not developed enough to allow the collection of data with respect to potential

predictors of the growth disorders, such as period of breastfeeding, parental consanguinity, hygiene conditions, nutritional status and socioeconomic status. A second obstacle was the growth work-up affordability by the majority of students' families ($700 USD). Thus, a list of endocrinologists providing free-of-charge care and a list of laboratories providing 30% discount were circulated to secure referral and treatment of the detected short-statured children. Nonetheless, none of the patients and their families were referred to endocrinologists. Socioeconomic status of these public school students in North Lebanon was one of the key factors influencing the achievement of the follow-up phase. Our observation aligns with the findings from Amigo et al where the lack of health insurance was a determinant of short stature and was also characteristic of low socioeconomic groups.[15] For this reason, the follow-up phase could not be achieved in our campaign.

In parallel, our awareness campaign was effective as it reached its goal by covering 96.8% of North Lebanon students. We also found that families of short-statured children reacted quickly to receive growth evaluation from endocrinologists during the post-screening phase. Also, we found an increased interest in growth disorders from endocrinologists and a younger age at referral for growth retardation within the following months. Further, we achieved minimal bias in anthropometric measurements as they were performed with the same standardized tools. Criteria for obtaining data of good quality included using the right equipment to collect the data and employing standard measuring techniques.

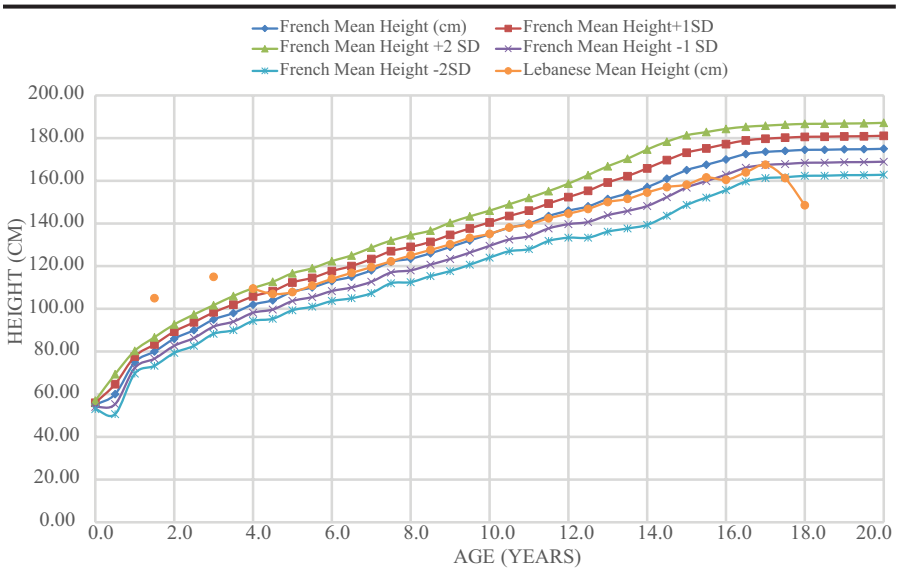

Figure 4. Growth curves for boys in North Lebanon compared with standard French curves[9]

Mean height-for-age for North Lebanon boys and French boys with French standard deviations

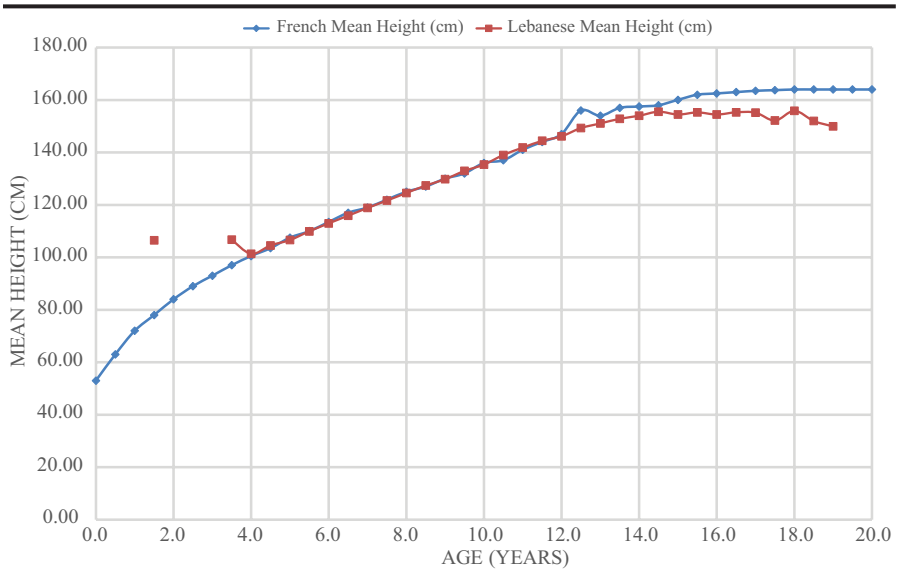

Figure 5. Growth curves for girls in North Lebanon compared with standard French curves[9]

Mean height-for-age for North Lebanon girls and French girls

Lessons Learned

First, early identification of children with growth disorders can lead to treatment of, or intervention for, a problem and lessens its impact on the functioning of the child and family. Hence, our screening campaign confirms the need for more awareness on the importance of early detection

Table 3. Comparison of mean heights between the study sample and the French reference population by sex (girls) and age, n=19,758

Age, years	French	Lebanese	Lebanese	Lebanese	Lebanese - French mean, cm	P[b]
	Mean meight, cm	Mean Height, cm	SD Height, cm	n		
0	53	-	-	-	-	[a]
0.5	63	-	-	-	-	[a]
1	72	-	-	-	-	[a]
1.5	78	106.5	-	1	28.5	[a]
2	84	-	-	-	-	[a]
2.5	89	-	-	-	-	[a]
3	93	-	-	-	-	[a]
3.5	97	106.75	3.18	2	9.75	.144
4	100.5	101.33	8.73	9	.83	.782
4.5	103.5	104.54	4.25	208	1.05	.000[b]
5	107.5	106.6	4.62	890	-.9	.000 [b]
5.5	110	109.93	4.7	977	-.07	.66
6	113.5	112.97	5.02	1067	-.53	.001 [b]
6.5	117	115.88	5.3	1117	-1.12	.000 [b]
7	119	118.84	5.59	1366	-.15	.307
7.5	122	121.66	5.72	1275	-.34	.033 [b]
8	125	124.55	5.93	1360	-.45	.005 [b]
8.5	127	127.4	5.89	1339	.4	.014 [b]
9	130	129.81	6.42	1433	-.19	.265
9.5	132	132.97	6.33	1362	.97	.000 [b]
10	136	135.39	6.47	1512	-.61	.000 [b]
10.5	137	139.04	6.86	1352	2.04	.000 [b]
11	141	141.85	7.39	1015	0.86	.000 [b]
11.5	144	144.43	7.37	819	0.44	.091
12	147	146.1786	7.38	695	-0.82	.003 [b]
12.5	156	149.32	7.6	530	-6.68	.000 [b]
13	154	151.08	6.63	453	-2.92	.000 [b]
13.5	157	152.85	6.54	318	-4.15	.000 [b]
14	157.5	154.01	7.07	254	-3.49	.000 [b]
14.5	158	155.56	5.79	146	-2.44	.000 [b]
15	160.05	154.46	6.71	119	-5.58	.000 [b]
15.5	162	155.3	6.11	50	-6.7	.000 [b]
16	162.5	154.47	8.23	36	-8.03	.000 [b]
16.5	163	155.32	6.53	17	-7.68	.000 [b]
17	163.5	155.2	4.53	15	-8.3	.000 [b]
17.5	163.75	152.17	5.97	9	-11.58	.000 [b]
18	164	155.9	6.46	5	-8.1	.049 [b]
18.5	164	152	12.72	2	-12	.41
19	164	149.94	3.32	5	-14.06	.001 [b]
19.5	164	-	-	-	-	a
20	164	-	-	-	-	a

a. Some points had no P since there is no replication of people (n=1), mainly for those aged <5 years and >15 years.
b. Significance level <.05.
SD, standard deviation.

of growth retardation in Lebanon. As such, ongoing involvement with the family permits the health educators and the pediatricians to respond to parental concerns about the child's development when such concerns exist. When parents are not aware that a growth retardation exists, the pediatrician can guide them toward closer observation of the child and, thus, enable them to recognize the delay. Screening procedures should also be incorporated into the ongoing health care of the child as part of the provision of a medical home.

Second, although only one of three steps of the study protocol was completed and our study does not provide solid national data, it has the merit to be the first effective Lebanese campaign that covers a large spectrum of a pediatric population (40,023 out of 41,347 students), and to raise awareness about growth disorders. In terms of the campaign's adoption, implementation and maintenance, health educators are now more considerate toward anthropometric measurements of the students; they are also recording the relevant data on specific growth charts. Importantly, our campaign highlighted the need of a highly populated but unfortunately neglected region of the country, North Lebanon. This area suffers from demographic and societal burdens, as it historically witnessed the highest poverty incidence in Lebanon. As such, North Lebanon houses 38% of the poor and 46% of the extremely poor, while it has 20.7% of Lebanon's population.[18] In addition, and more recently since Syria's war onset in 2011, the population of refugees is increasing in North Lebanon, exacerbating the conditions of extreme poverty in this governorate, particularly Akkar, Minieh and Dinneyeh, and increasing the marginalization of a large segment of the population that is already living in difficult circumstances. In addition, our study sheds the light

over another serious societal issue, so far ignored by the authorities: access to public schools and preschool education in poor urban and rural areas. Indeed, we found that many students were too old for their attended level.

Thirdly, we plan to conduct an additional screening in the same schools of North Lebanon to check the correct implementation of the initial campaign. Also, further studies will be performed in Lebanon to thoroughly explain the association between growth disorders and its associated factors such as consanguinity, the parent's level of education and their income. We also aim to screen

Of the public school students born in the 2000s who live in North Lebanon, 4% were of short stature.

short stature in other geographic areas and to expand our campaign to private schools throughout Lebanon.

Fourth, we were able to raise the authorities' awareness about North Lebanon's societal caveats. Consequently, efforts should be made to reduce poverty in this area and its consequences so as to reduce the adverse environmental factors that the children face. Thus, we will be able to decrease the prevalence of growth deficit in regions with epidemiological profiles similar to that of public schools in North Lebanon.

Finally, public health professionals have the responsibility to cooperate with the Ministry of Public Health and health industries to lower the cost of patient care. Consequently, health educators, pediatricians and families would be able to refer children with growth disorders in a timely fashion to the appropriate early intervention.

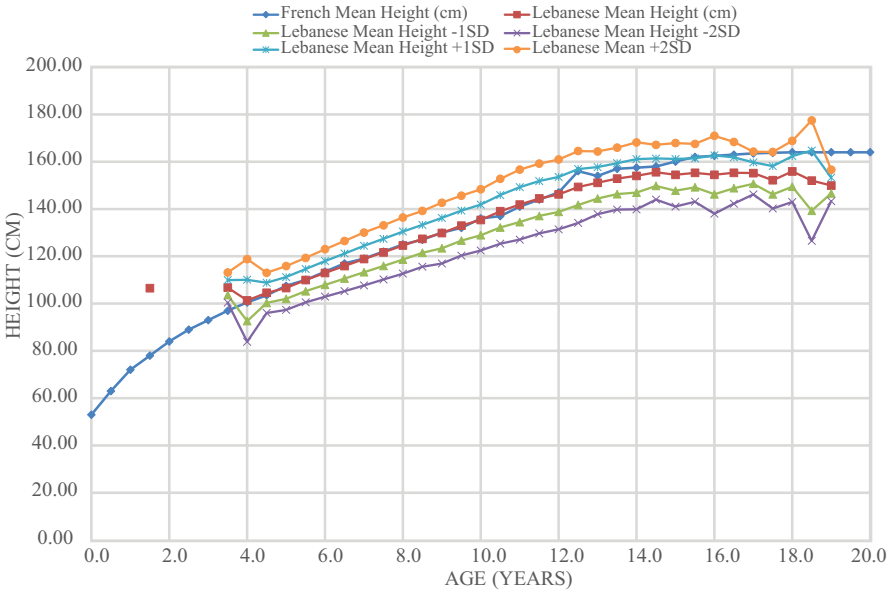

Figure 6. Growth curves for girls in North Lebanon compared with standard French curves[9]
Mean height-for-age for North Lebanon girls and French girls with North Lebanese standard deviations

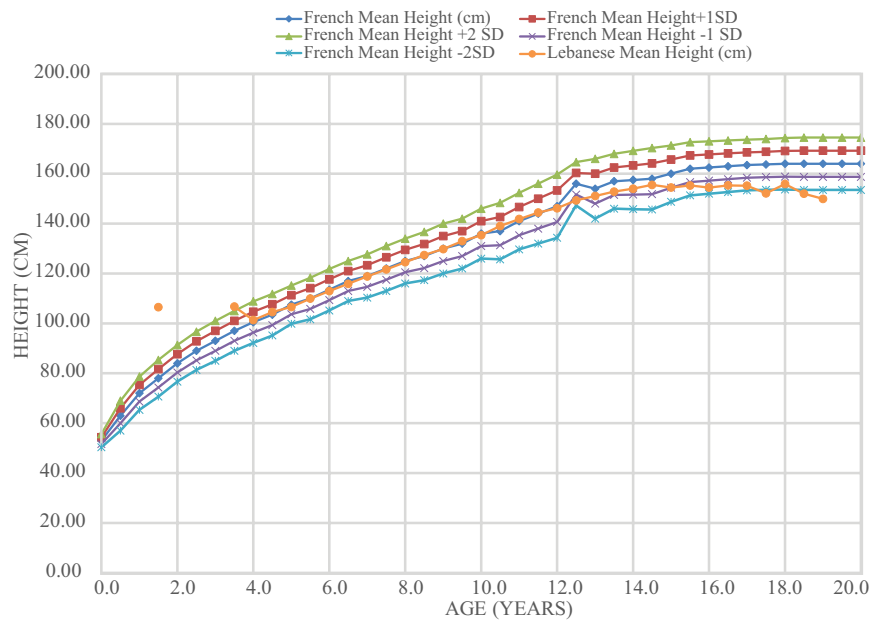

Figure 7. Growth curves for girls in North Lebanon compared with standard French curves[9]
Mean height-for-age for North Lebanon girls and French girls with French standard deviations

Table 4. Description of the short stature group of children, n=1,631

		Boys	Girls	Total
Primary care group[a]	At least -2 SD below the mean but strictly less than -2.5 SD	500 (31)	470 (29)	970 (59)
Endocrinologist group[b]	-2.5 SD or more below the mean	299 (18)	362 (22)	661 (41)
All groups	All short stature	799 (49)	832 (51)	1,631 (100)

Data are n(%).
a. Primary care group: to be first evaluated by a primary care physician and referred to a specialist after 6 months follow-up, if needed.
b. Specialty group: to be directly evaluated by an endocrinologist.
SD, standard deviation

Table 5. Age characteristics by severity of short stature, n=1,631

Age categories, years	Less severe short stature, primary care group	More severe short stature, specialists group
5-10	507 (52)	266 (40)
>10 to <15	427 (44)	338 (51)
≥ 15	36 (4)	57 (9)
Total	970	661

Data are n (%).

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Conflict of Interest

WF was a member of the Advisory Board of Novo Nordisk, Lebanon. No other conflicts of interest to report.

Author Contributions

Research concept and design: Hayek, Berro, Fayad; Acquisition of data: Hayek, Berro, Fayad; Data analysis and interpretation: Hayek, Fayad; Manuscript draft: Hayek, Berro; Supervision: Hayek, Fayad.

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