

Growth pattern of primary schoolchildren in Benghazi, Libya

*Marwan M. Al-Sharbaty¹, Ameer A. Younan², Omar H. Sudani³

نمط النمو عند تلاميذ المدارس الابتدائية في بنغازي

مروان محمد الشربتي، أمير يونان و عمر السوداني

الملخص: الهدف: إيجاد منحنيات النمو في عينة من تلاميذ بنغازي (ليبيا)، و مقارنتها مع منحنيات عالمية و محلية، كخطوة على طريق الحصول على منحنيات وطنية. **الطريقة:** تم عشوائيا اختيار ثلاث مدارس حكومية من ثلاث مناطق مختلفة اجتماعيا و اقتصاديا في مدينة بنغازي. ضمت العينة ٤٠٣ صفوف من كل مرحلة و في كل مدرسة. شملت العينة ٢٠٢٢ طفلا (١١٦٠ تلميذا و ٨٦٢ تلميذة)، في الفترة ٢٥ شباط (فبراير) إلى ٣١ تشرين الأول (أكتوبر) ١٩٩٣. وزع استبيان يتعلق بالأمور الاجتماعية و المدرسية على المدرسين قبل أيام من بداية البحث، وقد أجري قياس أطوال و أوزان التلاميذ. حللت المعلومات بواسطة الحاسب الآلي باستعمال رسومات هارفرد و فورنت بمنحنيات عالمية أخرى. **النتائج:** شابهت أطوال و أوزان تلاميذ بنغازي المنحنيات العالمية في بداية السن المدرسية، مع إنحدار وبالذات فيما بعد في منتصف سني الدراسة الابتدائية. وفي نفس الوقت، تمتاز منحنيات بنغازي بارتفاعها عن مثيلاتها من طرابلس، خاصة بالنسبة للطول. **الخلاصة:** كانت تغذية الأطفال جيدة في بداية المرحلة الدراسية، ويمكن مقارنتها بنمط النمو العالمي، لكن تلك التغذية تدهورت في سنوات الدراسة، ربما لانشغال الأم بتربية الأطفال الأصغر سنا أو لتأثير المدرسة السلبى على شهية الأطفال.

ABSTRACT. Objective: To find the growth trends in a sample of schoolchildren in Benghazi (Libya), and to compare it with international and other local growth charts, as a step for setting the national curves. **Method:** From 25th February to 31st October 1993, a sample of 2,022 pupils (1,160 boys and 862 girls) were randomly selected from three public primary schools in three different socio-economic areas in Benghazi. A questionnaire consisting of social and scholastic items was distributed to teachers a few days before the examination. The height and weight of all the pupils were measured according to the standards of Jelliffe, Gorstein, WHO, and de Onis. Data were analysed and compared with both the reference standard of the United States National Center for Health Statistics (NCHS-USA), and the local standards of Tripoli-1986. **Results:** The boys and girls in the lowest age-group had a pattern similar to that of the reference population for both height/age and weight/age, but it dropped sharply from mid-school years. The Benghazi curves were consistently higher than those of Tripoli, particularly for height/age. **Conclusion:** The nutritional status of these children, which was good before the beginning of schooling, was negatively affected during the school years. This could be attributed either to births in the family and consequent neglect, or to the school's negative effects on the child, such as lack of appetite created by anxiety or other factors. Further studies from different regions of the country are needed to set national growth curves.

Key Words: anthropometric measurements, child, growth, nutrition, Benghazi, Libya, NCHS-USA.

IT HAS BEEN LONG RECOGNIZED that environmental influences – especially nutrition and socio-economic status – are more important than genetics in determining the somatic growth of children, particularly during the early childhood when growth is rapid.¹ This is supported by recent community-based researches on child growth in UK,⁸ Hong Kong,⁹ Argentina,¹⁰ USA¹¹⁻¹⁴ and other countries.¹⁵ Therefore, the growth pattern of children is a good indicator of their nutritional status, health and socio-economic level.

Nutritional anthropometric measurements are useful for measuring such growth patterns. Their simplicity belies their ability to reflect the pattern of physical growth and

development of a population.^{16,17} In spite of the tediousness in the preparation of growth charts,^{1,18} it is advisable to have local charts developed in the community itself, as the charts pertaining to the well-nourished children in developed countries may not be quite valid in developing ones.^{1,3} Charts developed using local data are valuable not only for assessing the current nutritional status but also for detecting future changes, such as improved nutritional awareness, better health status by implementation of health education programmes, prevention and effective treatment of diseases, vaccination programmes etc., or a downslide, as in famine, epidemics or war.

Ideally both cross-sectional and longitudinal serial

¹Department of Behavioural Medicine College of Medicine, Sultan Qaboos University P.O. Box 35, Al-Khod 123, Muscat, Sultanate of Oman. ²Department of Nutrition, College of Public Health Al-Arab Medical University, Benghazi, Libya. ³Dean, College of Public Health, Al-Arab Medical University, Benghazi, Libya.

*To whom correspondence should be addressed. E-mail: marwan@squ.edu.om

measurements are needed for growth assessment of children. However, only cross-sectional measurements were practical for this study, as they were quickly obtained, gave information on the prevailing state of nutrition, and did achieve the general objectives.^{1,3}

Although many countries have charted their growth reference standards,¹⁹⁻²² in Libya, such studies were few. Prior to us, only two studies had been performed: (1) in 1979 in Benghazi on preschoolers,^{23,24} and (2) in 1986 in Tripoli on schoolchildren.⁷ Lack of growth data for children in Benghazi, an important port city in north-eastern Libya and the second biggest city in Libya after Tripoli, obliged us to conduct this study. The study aimed to prepare local growth curves (weight/age and height/age) for a representative sample of Benghazi schoolchildren, till a countrywide study could be performed for a larger, representative sample of both urban and rural pupils, to set the national curves.

METHOD

This cross-sectional study was conducted between 25th February and 31st October 1993 by taking physical measurements of 2,022 pupils (1,160 boys and 862 girls) aged 6–12 years, living in Benghazi. Public primary schools in three areas of the city of different socio-economic levels: Al-Fwehat Al-Sharqiya (high class area), Al-Slawi (middle class area) and Al-Mheshi (lower class area)²⁵ were listed, and one school was randomly selected from each area: School-H from the high class area, School-M from the middle class area, and School-L from the lower class area. We excluded private schools because their children comprised a small fraction of the total population of schoolchildren, and because of the possibility that their inclusion in the sample might create bias.

All the pupils were examined in the School-H and School-M, but systematic sampling was done in School-L due to the large number of classes there. Using this method we examined 3–4 classes in every grade, in every school.

PROCEDURE

The internists who worked under our supervision were fully instructed about the aim and the procedure of the research, and were frequently changed to prevent possible bias.³ The administrations of the schools, teachers and the children were also clearly informed about the nature and objectives of the research.

We distributed a questionnaire (which sought information social variables related to each child, such as the date of birth, parents' education level and occupation, family size, etc.) to teachers a few days before the physical examination of the children. In most cases the schools were able to

obtain this information from the pupils' files; wherever such information was lacking it was obtained from the child's parents by sending a slip of paper with the child, to be returned the next day.

MEASUREMENTS

For each child we measured height to the nearest 0.1cm, and weight to the last 100 g. For measuring height, we fixed a calibrated ruler to the wall. As the child stood barefoot with his/her heel, back and head touching the wall with the head in the Frankfurt plane, a thin wooden plate was placed above the head perpendicular to the ruler and parallel to the ground to measure the height accurately. Weight was measured using a portable weighing machine³ that was standardized regularly, the child being barefoot and wearing light clothes. All the anthropometric measurements were carried out as stipulated by Jelliffe et al,¹ Gorstein et al,² WHO^{3,4} and de Onis et al.⁵ The data were analysed statistically using Harvard Graphics statistical package. The results were compared with the reference NCHS-USA standards and with the local standards of Tripoli (1986).^{6,7}

RESULTS

Table 1 shows the composition of the sample according to age, sex and school. A total of 2,022 pupils (1,160 boys and 862 girls) were examined, among whom 855 pupils were from School-H (473 boys and 382 girls), 524 pupils from School-M (281 boys and 243 girls), and 643 pupils from School-L (406 boys and 237 girls).

Figure 1 shows the Benghazi boys' height percentiles compared with the boys' medians of height (of the same age) for both the reference population of NCHS-USA standards,⁶ and the standards of Tripoli.⁷ The median of height for Benghazi boys starts off at the same level as the reference median during the younger ages. However, by the age of nine, differences start to appear, when the Benghazi median starts deflecting downward. Indeed, at the age of 12, the reference median curve approaches the 75th percentile curve of Benghazi. However, median height of Benghazi boys remains consistently higher than the Tripoli median throughout the school years. In fact, the latter reaches only the 25th percentile of Benghazi boys' height.

Figure 2 shows the weight/age of Benghazi boys compared with the NCHS-USA reference and the Tripoli curves. Here the median weight for Benghazi boys, which, at the age of 6 years remains just below but very close to the reference median, starts declining by the age of 9 and by the end of school age the reference median approaches the 75th percentile. As for Tripoli median, it remains slightly lower than the Benghazi median throughout.

Girls' height percentiles are plotted with the median

Table 1. The composition of the sample of school children examined for growth pattern according to age and sex, Benghazi (1993)

Age (y)	School-H (High class neighbourhood)			School-M (Middle class neighbourhood)			School-L (Lower class neighbourhood)			Grand Total		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
6	74	55	129	45	23	68	50	36	86	169	114	283
7	83	56	139	26	39	65	58	53	111	167	148	315
8	69	68	137	47	29	76	58	39	97	174	136	310
9	89	56	145	39	42	81	76	35	111	204	133	337
10	63	70	133	36	36	72	47	13	60	146	119	265
11	69	66	135	42	50	92	57	19	76	168	135	303
12	17	6	23	23	19	42	36	25	61	76	50	126
13	5	5	10	16	3	19	15	11	26	36	19	55
14+	4		4	7	2	9	9	6	15	20	8	28
Total	473	382	855	281	243	524	406	237	643	1160	862	2022*

*2088 questionnaire sheets were distributed; however, 66 pupils were absent during the physical examination.

The age-groups 13 and 14+ are not considered in the charts because their numbers were very small.

height of both NCHS-USA reference and Tripoli medians in Figure 3. Here also, the difference between Benghazi girls' median height and reference population is minimal during the early years of the school, but it starts to appear at the age of eight years, and the curve goes down sharply at the age of 11. The reference median height actually crosses the 75th percentile of that of Benghazi girls at the highest age. Tripoli median for girls' height remains lower than that of Benghazi, and it corresponds to the 25th percentile during the school years.

Weight/age for Benghazi girls is shown in Figure 4, compared with the medians of both the reference population and Tripoli girls of comparable age. Here also Benghazi girls' median weight simulates that of the reference median of NCHS-USA at the age of six years, but deviates down in mid-school age. The Tripoli girls' median weight, however, is similar with that of Benghazi at the beginning of the school age, but dips down between the ages of 8–11 years, to again rise to the level of Benghazi at 12 years.

DISCUSSION

This study demonstrates that the growth pattern (height/age and weight/age) of the public primary schoolchildren aged six to twelve years in Benghazi in the year 1993 was similar to the international standards at early school years

for both sexes (which is different from other studies)^{21,22} but it dropped down with the advance of the age, (which is in accordance with other studies).^{7,26,27} The picture is clear enough for boys, where the relative decline started from the age of nine, while in girls it began at the age of eight or even earlier. The minimal differences in height and weight between Benghazi schoolchildren and the reference population at the start of the school indicates the satisfactory nutritional status of the former at preschool age. That state of good nutrition has been possibly affected negatively at mid-school period, possibly either by reduced attention from mother as it diverted toward newborns or younger children in the family, or by the pressures of school life affecting health and nutrition. We must also keep in mind the hereditary and environmental factors that affect the growth spurt in both sexes. This may be responsible for the big difference between Benghazi children and the reference population at mid-school age; the Americans possibly started their adolescent growth spurt earlier than the Libyans.

The higher curves of growth seen in our group compared to that of Tripoli for both boys and girls, specially for height, indicates better nutritional status in the first few years of schooling in Benghazi than in Tripoli, as it is well known that the height is a good indicator of nutrition in the past.¹⁷ The difference in weight curves in favour of Benghazi, although less marked than the height, perhaps indicates improved nutrition in 1993 compared to 1986, when

the Tripoli curves were drawn. The improvement of the socio-economic status, earlier diagnosis and treatment of diseases, and better awareness of people regarding nutrition probably achieved this result. This emphasises the impor-

tance of reviewing and updating growth charts periodically, especially in developing countries to assess the efficacy of national health programs.^{21,28,29}

Though our study had limitations, the present charts

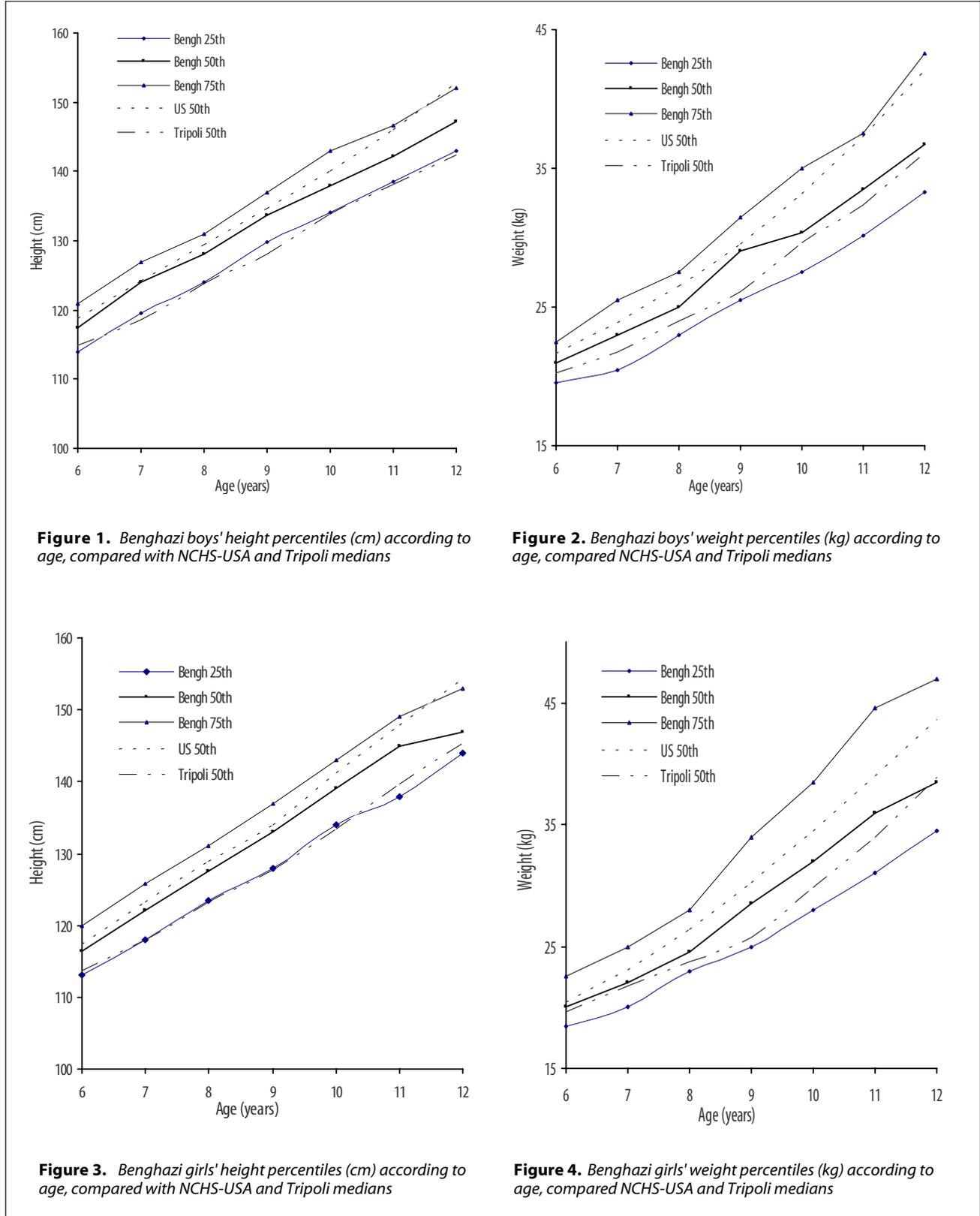


Figure 1. Benghazi boys' height percentiles (cm) according to age, compared with NCHS-USA and Tripoli medians

Figure 2. Benghazi boys' weight percentiles (kg) according to age, compared NCHS-USA and Tripoli medians

Figure 3. Benghazi girls' height percentiles (cm) according to age, compared with NCHS-USA and Tripoli medians

Figure 4. Benghazi girls' weight percentiles (kg) according to age, compared NCHS-USA and Tripoli medians

are more suited for local use, instead of foreign ones. However, further studies on larger samples representing schoolchildren of the whole country (urban and rural) are needed on a nation-wide level, to set up the final national Libyan growth charts.

CONCLUSION

This study has shown that Benghazi public primary schoolchildren had more or less a similar pattern of growth with the reference population at the start of the school, but it dropped below that during the school years. On the other hand, Benghazi children's growth pattern is higher than that of Tripoli children as measured in 1986, especially the height curves, which is probably an indication of better nutritional status of school-children of Benghazi in their preschool period compared to the Tripoli schoolchildren.

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