Growth pattern of primary schoolchildren in Benghazi, Libya

*Marwan M. Al-Sharbati, Ameer A. Younan, Omar H. Sudani

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 Jellife, 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 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 downside, 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.\textsuperscript{13,14}

Although many countries have charted their growth reference standards,\textsuperscript{19–22} in Libya, such studies were few. Prior to us, only two studies had been performed: (1) in 1979 in Benghazi on preschoolers,\textsuperscript{23,24} and (2) in 1986 in Tripoli on schoolchildren.\textsuperscript{7} Lack of growth data for children in Benghazi, an important port city in northeastern 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 Benghazian 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 25\textsuperscript{th} February and 31\textsuperscript{st} 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-Sharqiyah (high class area), Al-Slawi (middle class area) and Al-Mheshi (lower class area)\textsuperscript{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.\textsuperscript{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 machine\textsuperscript{3} that was standardized regularly, the child being barefoot and wearing light clothes. All the anthropometric measurements were carried out as stipulated by Jellife et al,\textsuperscript{1} Gorstein et al,\textsuperscript{2} WHO\textsuperscript{4,4} and de Onis et al.\textsuperscript{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).\textsuperscript{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-M (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,\textsuperscript{4} and the standards of Tripoli.\textsuperscript{7} The median of height for Benghazian 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 Benghazian median starts deflecting downward. Indeed, at the age of 12, the reference median curve approaches the 75\textsuperscript{th} percentile curve of Benghazi. However, median height of Benghazian boys remains consistently higher than the Tripoli median throughout the school years. In fact, the latter reaches only the 25\textsuperscript{th} percentile of Benghazian boys’ height.

Figure 2 shows the weight/age of Benghazian boys compared with the NCHS-USA reference and the Tripoli curves. Here the median weight for Benghazian 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 75\textsuperscript{th} percentile. As for Tripoli median, it remains slightly lower than the Benghazi median throughout.

Girls’ height percentiles are plotted with the median
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) but it dropped down with the advance of the age, (which is in accordance with other studies). 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 dietary 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. 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 importance of reviewing and updating growth charts periodically, especially in developing countries to assess the efficacy of national health programs.\textsuperscript{21,28,29}

Though our study had limitations, the present charts...
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.

ACKNOWLEDGEMENT

We are grateful to the Ministry of Education, Government of Libya for permitting us to do this research. We would like also to express our thanks to the directors, social workers, teachers, parents and pupils who helped us in carrying out this study. We greatly value the efforts of all the internists who showed high motivation and precision while working with us on this study.

REFERENCES

23. Abudejaja A, Sing R, Amanullah Khan M, Gupta BS. Anthropometric measurements in children up to 5 years


