THE EGYPTIAN JOURNAL OF MEDICAL SCIENCES. VOL.13- No 2-DECEMBER 1992 (ISSN:1110-0540)

Egypt. J. Med. Sci. 13 (2) December, 1992: 273 - 283

NUTRITIONAL ANTHROPOMETRY OF CHILDREN FROM BIRTH UP TO TWO YEARS IN SHEBIN EL-KOM COMPARED TO THE INTERNATIONAL NCHS/CDC GROWTH REFERENCE POPULATION

Aida M. El-Asfahani
Dept. of Nutrition and Food Science, Faculty of Home Economics,
Al-Menoufia University.

ABSTRACT

The nutritional status of a sample of infants and children (n=302) aged 0-24 months from Shebin El-Kom, Al-Menoufia governorate, was evaluated by anthropometric indices. Weight-for-height, height-for-age, and weight-for-age were expressed as centiles and standard deviation (SD) scores (z-scores) and the results were compared with those for the NCHS/CDC reference population. The prevalence of stunting (28.5 percent) was higher than that of wasting (7.9 percent). The proportion of those who had both wasting and stunting was (3.64 percent). Stunting and wasting were highest at the age groups 18-24 months and 12-17 months, respectively. More stunted children were observed when mothers' level of education and family room number were lowest. These findings, though based on a small number of cases, reinforce the need of special nutritional and health programs targeted at this group of infants and children in Shebin El-Kom.

5-(571/92)

INTRODUCTION

For more than three decades the 90 percent weight-for-age as the cut-off point for estimating the prevalence of child malnutrition (Gomez, 1956) has been increasingly followed in developing countries for the assessment of malnutrition in the community. Thereafter different cut-off values and classification systems have been proposed and used for estimating malnutrition in population surveys (Jelliffe, 1966; Waterlow, et al., 1977; Keller and Filmore, 1983). However, the reported rates were often not comparable and sometimes questionable (Sykes, 1977; Gueri, et al., 1980; Mora, 1989). The most important drawbacks of the use of percentages to express anthropometric indicators is that a cut-off value at one standard deviation was used to determine the normal range of the reference population. This appears to grossly overestimate the prevalence of malnutrition by including a significant proportion of false positives (16 percent), those whose weights are within the normal range of the reference population (Bengoa, 1970; Bengoa, 1970; Goldsmith,1974).

A proposal was made by the World

Health Organization (WHO) (1983) requiring that anthropometic measurements should be reported in relation to international reference values. For this purpose the deviation from the anthropometric measurement of the reference median was expressed in terms of standard deviation scores (z-scores) rather than the percentage of the median of the reference populoation (Waterlow, 1977). Furthermore, the reference population defined by the US National Center for Health Statistics (NCHS) (US Food and Nutrition Board, 1974) should be used where all anthropometric data on children should be presented for separate age groups and the normal range for any population should be between plus and minus two standard deviations (±2SD) units of the median (Keller, et al., 1976, Waterlow et al., 1977; WHO, 1978; Keller and Filmor 1983; Delgado, 1986). This range would include 95.4 percent of the reference population and yield only 2.3 percent "false positives" (i.e., those whose weights are within the normal range of the reference population distribution).

Besides its statistical justification the WHO cut-off point had been further supported by a significant increase in the risk of death (Kielmann and McCord, 1978; Bairagl, et al., 1985) as well as a decreased immuneresponse (Reddy, et al., 1976) when anthropometric indicators drop below such point.

The present work compares the nutritional status as indicated by height-for-age and weight-for height indices for a selected sample of infants and children below two years of age from Shebin el-Kom, Al Menoufia governorate, Egypt, with that of the NCHS/CDC reference population.

MATERIALS AND METHODS

The study was performed during first of September through end of November (1991), at Shebin- El-Kom, Al-Menoufia Governorate and its surroundings. The study population comprises 302 infants and children (136 females and 166 males) aged 0-24 months and who attended the MCH center with their mothers. All study subjects belonged to low socioeconomic class. The collecting of anthropometric and questionnaire data were performed by the author assisted by two MCH trained nurses. Weight, and height were taken according to standard procedures (US Food and Nutrition Board, 1974). All subjects were weighed with minimum clothes to the nearest 0.1 kg on a spring balance (Pelouze). Height data were measured as recumbent length (Dibley, et al., 1987) with the child lying down using a locally constructed wooden measuring board. Ages were determined to the nearest month from birth certificate if available or by thoroughly questioning the mothers with the aid of a local event calendar to assist recall. Information regarding mothers' eduction level and number of rooms in their homes and/or the household where they live were also obtained by interviewing the mothers.

Analysis of the data: The measurements for weight-for-height, height-for age, weight-for-age were expressed as centiles and standard deviation (SD) scores (z Scores) and the results were compared with those for the NCHS/CDC reference population. Folowing the recommendations made by Waterlow, et al., (1977) and Seoane and Lathem (1971) the height-for-age (as an indicator of stunting, i.e., past undernutrition) and weight-for-height (as an indicator of wasting or present undernutrition) were

analyzed together in a cross-classification scheme using the z scores in order to detect possible trends for past or present undernutrition with age. The NCHS/CDC anthropometric package and the SPSS PC computer plus programs were used) to analyze the data obtained (Jordan, 1986; SPSS-XSPSS Inc. 1984). A 5 percent level of significance was used in the test.

In order to examine the effect of socioeconomic differences on the prevalence of undernutrition the data were also analyzed using an arbitrary cut-off point of 10th centile of weight-for-height and height-for-age of the NCHS/CDC reference population.

RESULTS

Cumulative distribution curves of z scores, the height-for-age and weight-for-height values:

Figure (1) shows that the height-for-age curve is significantly skewed to the left because of the large number of children whose height-for-age lies in the lower centile range. On the other hand the weight-for-height curve is shewed slightly to the right due to the large number of children whose weight-for-height lies in the upper centile range.

The Centile Distribution of Anthropometric Indicators.

Table (1) shows that for weight-for-height 13.6 percent of the subjects were in the upper decile and 11.9 percent in the lower decile compared with 10 percent in each in the reference population. This pattern was shown in females but not males where females were insignificantly heavier, although there was no statistically significant difference either in the overall distribution or in the proportion classified in the upper or the lower centile ranges for both sexes.

The centile distribution of height-for-age was also different from that of the reference groups. Only 7.6 percent of the survey children were in the upper decile while a considerably higher percentage (30.8 percent) was in the lower decile compared with 10 percent in each in the reference population. Nevertheless females seem to be insignificantly shorter than males.

The distribution of weight-for-age, the composite indicator which measures both the skeletal and muscle tissues and therefore does not distinguish between chronic and acute malnutrition, in the survey sample was also different from that of the reference groups with higher percentage of children (26.5 percent) present in the lower centile range of the reference population. Compared to the reference population the weight-for-age deviated midway between that of the weight-for-height and height-for-age.

Prevalence of Wasting and Stunting in the Study subjects

Wasting and stunting were both defined as below. -2 z-scores of the normalized distribution of the reference population. The prevalence of wasting and stunting by age groups are shown in figure (2) and tabe (2). The prevalence of wasting and stunting of the combined age groups were 7.7 and 31.1 percent, respectively. However, there was a peak of wasting (15.1 percent) and stunting (67.6 percent) at the age groups of 12-17 and 18-24 months, respectively. The changes of percentages of wasting and stunting

Table (1) : Centile distributions of weight-for-height, height-for-age and weight-for-age in Shebin El-Kom children aged 1-24 months.

	Weight-for-height			Height-for-age			Weight-for-age		
	Males	Females	Total	Males	Females	Total	Males	Females	Total
0.00 - 2.99	11(6.6)*	5 (3.7)	16 (5.3)	32 (19.3)	31 (22.8)	63 (20.9)	26 (15.7)	15 (11.0)	41 (13.6)
0.00 - 4.99	14 (8.4)	5 (3.7)	19 (6.3)	38 (22.9)	39 (28.7)	77 (25.5)	36 (21.7)	25 (18.4)	61 (20.2)
0.00 - 9.99	25 (15.1)	11 (8.1)	36 (11.9)	44 (26.5)	49 (36.0)	93 (30.8)	45 (27.1)	35 (25.7)	80 (26.5)
10.00 - 19.99	13 (7.8)	12 (8.8)	25 (8.3)	22 (26.5)	12 (36.0)	34 (30.8)	17 (10.2)	16 (11.8)	33 (10.9)
20.00- 29.99	16 (9.6)	12 (8.8)	28 (9.3)	20 (13.3)	11 (8.8)	31 (11.3)	13 (7.8)	9 (6.6)	22 (7.3)
30.00 - 39.99	13 (7.8)	10 (7.4)	23 (7.6)	11 (12.1)	13 (8.1)	24 (10.3)	19 (11.4)	13 (9.6)	32 (10.6)
40.00 - 49.99	21 (12.7)	10 (7.4)	31 (10.3)	18 (6.6)	10 (9.6)	28 (7.9)	9 (5.4)	7 (5.1)	16 (5.3)
50.00 - 59.99	16 (9.6)	17 (12.5)	33 (10.9)	15 (10.8)	14 (7.4)	29 (9.3)	13 (7.8)	10 (7.4)	23 (7.6)
60.00 - 69.99	20 (12.1)	15 (11.0)	35 (11.6)	9 (9.0)	8 (10.3)	17 (9.6)	8 (4.8)	7 (5.1)	15 (4.9)
70.00 - 79.99	14 (8.4)	12 (8.8)	26 (8.6)	8 (4.8)	4 (2.9)	12 (3.9)	15 (9.0)	14 (10.3)	29 (9.6)
80.00 - 89.99	11 (6.6)	13 (9.5)	24 (7.9)	4 (2.4)	7 (5.2)	11 (3.6)	8 (4.8)	9 (6.6)	17 (5.6)
90.00 - 100.00	17 (10.2)	24 (17.7)	41 (13.6)	15 (9.0)	8 (5.8)	23 (7.6)	19 (11.4)	16 (11.8)	35 (11.6)
95.00 - 100.00	6 (3.6)	13 (9.5)	19 (6.3)	10 (6.0)	5 (3.7)	15 (4.9)	11 (6.6)	8 (5.9)	19 (39.4)
97.00 - 100.00	4 (2.4)	11 (8.1)	15 (4.9)	8 (4.8)	4 (2.9)	12 (3.9)	8 (4.8)	6 (4.4)	14 (4.6)

* Figures in parantheses are percentages

with age were statistically significant (P=<0.05).

Table (3) describes the cross tabulation of z-scores of height-for-age by weight-for-height. The prevalence of wasting and stunting were 7.9 percent and 28.5 percent, respectively. The proportion of simultaneous wasting and stundting was 3.6 percent. Furthermore, 90.7 and 69.53 percent of surveyed subjects fall within ±2 SD scores of the mean for weight-for-height and height-for-age of the reference population, respectively. however, 64.57 percent lie within ±2SD scores for both height-for-age and weight-for-height.

Table (4) shows the distribution of surveyed subjects below the 10th centile of the reference population according to selected socioeconomic characteristics of the family. The proportion of wasting and stunting were greater when the eductional level of mothers and family room number were lowest.

Table (2) Distribution of number of children by z-scores for weight-for-height, height-for-age and weight-for age for the sample of Shebin El-Kom infants and children, compared with the NCHS/CDC reference population.

z-score	Age groups (month)				
	0-5	6-11	12-17	18-24	Total*
weight-for-height					
< -2	2 (1.6)	10 (11.2)	8 (15.1)	4 (12.9)	24 (7.7)
-2- -1.0001	22 (17.0)	20 (22.5)	14 (26.4)	10 (32.3)	66 (23.9
-1.0 - 1.0	90 (69.7)	50 (56.2)	29 (54.7)	15 (48.4)	184 (56.7)
1.0001 - 2.0	10 (0.8)	8 (9.0)	1 (1.9)	2 (6.5)	21 (5.4)
2.0001 - 3.0	1 (0.8)	1 (1.1)	1 (1.9)	0 (0.0)	3 (1.1)
> 3	4 (3.1)	0 (0.0)	0 (0.0)	0 (0.0)	4 (1.3)
height-for-age					
< -2	12 (9.3)	29 (32.5)	24 (45.3)	21 (67.7)	86 (31.1)
-2- -1.0001	27 (20.9)	21 (23.6)	19 (35.8)	6 (19.4)	73 (24.2)
-1.0 - 1.0	75 (58.1)	35 (39.3)	10 (18.9)	4 (12.9)	124 (27.3)
1.0001 - 2.0	10 (7.8)	3 (3.4)	0 (0.0)	0 (0.0)	13 (1.4)
2.0001 - 3.0	1 (0.8)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.9)
> 3	4 (3.1)	1 (1.1)	0 (0.0)	0 (0.0)	5 (1.4)
weight-for-age					
< -2	9 (6.9)	27 (30.3)	18 (33.9)	14 (45.2)	68 (23.8)
-2- -1.0001	24 (18.6)	21 (22.5)	14 (26.4)	10 (32.3)	68 (24.4)
-1.0 - 1.0	74 (57.4)	37 (41.6)	20 (37.7)	7 (22.6)	138 (37.8)
1.0001 - 2.0	15 (11.6)	5 (5.6)	1(1.9)	0 (0.0)	21 (3.3)
2.0001 - 3.0	2 (1.6)	0 (0.0)	0 (0.0)	0 (0.0)	2 (1.1)
> 3	5 (3.9)	0 (0.0)	0 (0.0)	0 (0.0)	5 (1.4)

* Calculated by the geometric mean of percentages of individual age groups

Table (3) Cross tabulation of z scores for weight-for-height and height-for-age for the sample of Shebin El-Kom children (0-24 months).

z-score	z-score height-for-age			
weight-for-height	≥ 2.00	- 1.99- 1.99	≤ - 2.00	Total
≥ 2.00	0 (-)	3 (0.99)	3 (0.99)	6 (1.99)
- 1.99- 1.99	5 (1.66)	195 (64.57)	72 (23.84)	272 (90.07)
< - 2.00	1 (0.33)	12 (3.97)	11 (3.64)	24 (7.9)
Total	6 (1.99)	210 (69.53)	86 (28.47)	302 (100.0)

Fig (1): Distribution of height-for-age and weight-for-height among infants and children aged 0 - 24 months in Shebin El-Kom compared with the NCHS/CDC refernce population.

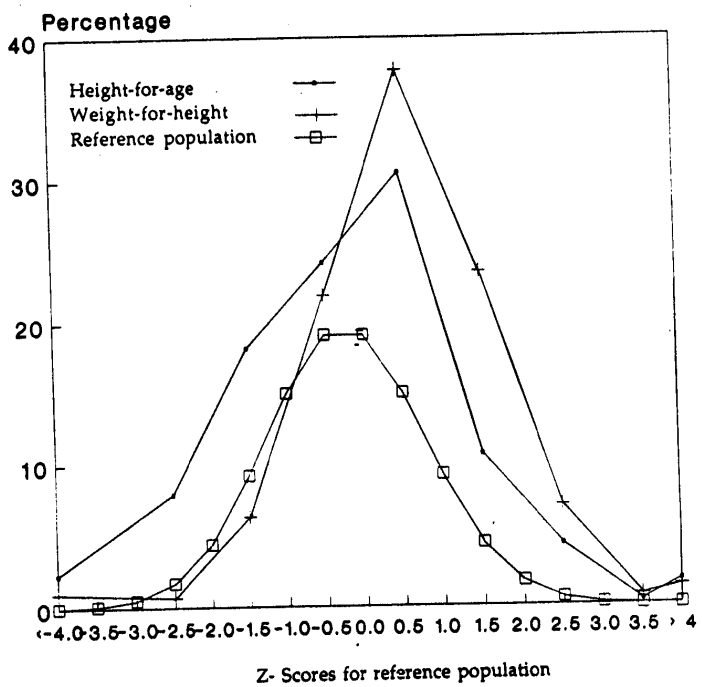
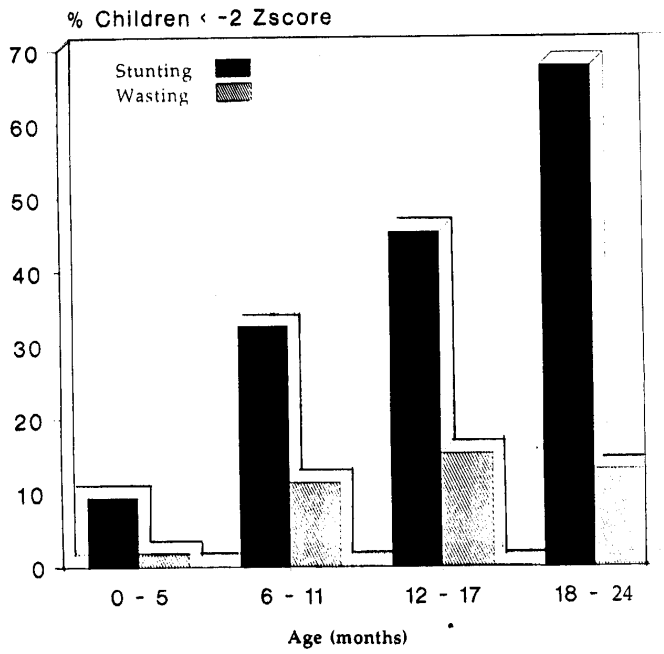


Table (4) Distribution of infants and children below 10th centile of the NCHS/CDC reference population according to selected socioeconomic characteristics of the family.

	Height-for-age	Weight-for-age
Mother's education (yrs)		
≤ 6	74 (79.6)	26 (72.2)
> 6 - < 9	8 (8.6)	3 (8.3)
> 9 - < 12	6 (6.5)	4 (11.1)
4 > 12	5 (5.4)	3 (8.3)
Family room numbers		
1	50 (53.8)	17 (47.2)
2	37 (39. 8)	16 (44.4)
3	6 (6.5)	3 (8.3)

Fig (2): Prevalence of wasting and stunting by age among infant and children aged 0 - 24 months in Shebin El-Kom (defined as those who were below - 2 SD scores of the mean for NCHS/CDC reference population).



DISCUSSION

The present work shows that the distribution of height-for-age and weight-for-height for both boys and girls aged 0-24 months in a sample from Shebin El-Kom governorate were comparable to that of the NCHS/CDC growth reference curves, the distributionof the former index was skewed to the left while the latter was skewed to the right (figure 1). Furthermore, stunting was more prevalent than wasting, 28.5 and 7.9 percent, respectively. These percentages were significantly higher than those (2.3 percent) for the reference population. There was little difference in either stunting or wasting according to sex where there was more girls heavier than boys. Based on data obtained from the Institute of Nutrition in Egypt (1978 and 1986), Allen (1989) reported that the percentage distribution of preschool children (6-72 months) by Waterlow (1972) class revealed that the prevalence of stunting in 1978 in Giza governorate was 26.1 percent and decreased significantly to 19.2 percent in 1986. However, according to data from the Egypt Demographic and Health Survey (EDHS) in 1988 (Sayed, et al., 1989) the percentage of children (aged 3-36 months) who fall 2 or more SD below the reference population for height-for-weight was 31 percent, a result which is comparable to that of the present work.

The 7.5 percent prevalence of wasting was significantly higher than values (0.5 percent and 1.1 percent) reported by other studies from Egypt (Allen, 1989; Sayed, et al., 1989). This higher percentage of wasting might be attributed to that the number of the acutely under-nourished subjects of the present work was greater than that of studies in other parts of Egypt (Allen, 1989; Sayed, et al., 1989).

The prevalences of wasting and stunting increased gradually with age being highest at the age of 12-17 months and 18-24 months, respectively, while it was very low at the age of 0-5 months for both wasting and stunting. Other studies reported wasting was highest at 6-16 months (Briones, 1989), while stunting was highest at 12-17 months (Briones, 1989) and 12-23 months (Sayed, et al., 1989; Allen, 1989). Furthermore, previous studies in countries where undernutrition constitute a major public health problem revealed that the prevalence of stunting rises rapidly until 23-35 months of age and remains stable thereafter, with wasting showing a peak during the post weaning period (12-23 months) and levelling off thereafter (Martorell, 1985).

Due to the fact that the surveyed groups of infants and children showed high percentage of stunting than wasting and due to the relatively low percentage (3.5 percent) of those with both wasting and stunting, it is important to mention that most of the stunted children appear to suffer from hidden undernutrition though they do not look undernourished in terms of their weight-for-height. Similarly, with the group of Egyptian children studied by the EDHS in 1988 (Sayed, et al., 1989) wasting was low (1.1 percent) and stunting was high (31.0 percent) while the proportion of children with both wasting and stunting was very low (less than 1 percent) denoting that 31.0 percent of all children studied by them were stunted but not wasted.

Furthermore, studies are in progress in order to investigate the most common causes of higher rate of stunting among

the group of children examined in Shebin El-Kom. However, reports from other parts of Egypt showed that stunting in preschool children might be due to factors inherent in the environment such as infections, poverty, illiteracy and other aggravating factors. (Gopalan, 1984; Sayed, et al., 1989; El-Asfahani, 1991). The present work also showed that the low socioeconomic status of families is reflected in the prevelance of stunting and wasting in their children (Briones, et al. 1989).

The results of our study show that a significant number of children (28.6 percent) were at risk of under nutrition. This would be of paramount importance for nutritional and health planning in order to develop programs targeted at this group of infants and children in Shebin El-Kom.

ACKNOWLEDGEMENT

The authors acknowledge the help of Professor Dr. Rabie Amer, Institute of Statistical Studies and Research, University of Cairo, Egypt, who supervised the statiscital analysis throughout the study.

REFERENCES

1. **Allen L.F. (1989):** Nutrition. In: The situation of children in upper Egypt. P 38-39. The Central Agency for Public Mobilization and Statistics (CAPMAS), The United Nation Children's Fund (UNICEF).

2. **Bairagl R., et al. (1985):** Alternative anthropometric indicators of mortality. Am. J. Cli. Nutr., **42:** 296-306.

3. **Bengoa J. M. (1970):** The problem of malnutrition. WHO Chronicle, **28**: 3-7.

4. **Bengoa J.M. (1970):** Recent trends in the public health aspects of protein-Calorie malnutrition. WHO Chronicle, **24:** 552-561.

5. **Briones E., Perea E., Ruiz M.P., Torro C., & Gilli M. (1989):** The Andalusian Nutritional Survey: Comparison of the nutritional status of Andalusian children aged 6-60 months with that of the NCHS/CDC reference population.

6. **Delgado H., et al. (1986):** Use and interpretation of anthropometric indicators of nutritional status. Bull. of the World Health Organization, **64(6):** 929-941.

7. **Dibley M. J. et al. (1987):** Interpretation of z-score anthropometric indicators derived from the international growth reference. Am. J. Clin. Nutr., **46:** 749-762.

8. **El-Asfahani A. M. (1991):** The effect of maternal literacy and nutritional knowledge on children's nutritional status. Egypt J. Med. Sci., **12(1):** 43-52.

9. **Goldsmith G.A. (1974):** Current status of malnutrition in the tropica. Am. J. Trop. Med & Hyg., **23:** 753-766.

10. **Gomez F., et al., (1956):** Mortality in second and third degree malnutrition, J. Trop. Ped. & African Child Health, **2:** 77-83.

11. **Gopalan C. (1984):** Classifications of undernutrition- their limitations and fallacies. J. Trop. Ped., **30:** 70-10.

12. Gueri M., et al. (1980): The Gomez classification. Time for a change? bulletin of the World Health Organization, **58:** 733-775.

13. Jelliffe D.B. (1966): The assessment of the nutritional status of the community (with special reference to field surveys in developing regions of the world). Geneva, World Health Organization (WHO Monograph, Series No. 53).

14. Jordan M.D. (1986): The CDC anthropometric software package centers for disease Control, Atlanta, GA.

15. Keller W. & Filmore C.M. (1983): The prevalence of protein-energy malnutrition. World Health Statistics quarterly. **36:** 129-167.

16. Keller W. et al. (1976): Anthropometry in nutritional surveillance: A review based on results of the WHO collaborative study on nutritional anthropometry. Nutr. Abstr. & Rev., **46** L 591-609.

17. Kielmann A.A. & McCord C. (1978): Weight-for-age as an index of risk of death in children. Lancet, **1:** 1247-1250.

18. Martorell R. (1985): Child growth retardation: a discussionof its causes and its relationships to health. In: blaxter K.L. & Waterlow J.C. ed. Nutritional adaptation in Manchester, London, John Libbey.

19. Mora J.O. (1989): A new method for estimating a standardized prevalence of child malnutrition from anthropometric indicators. Bull. World Health organization, **76 (2):** 133-142.

20. Reddy V. et al. (1976): functional significance of growth retardation in malnutrition. Am. J. Clin. Nutr., **29:** 3-7.

21. Sayed H. A., Osman M.I., El-Zanaty F., & Way A.A. (1989): Egypt demographic and Health survey in 1988. Egypt National Population Council, Cairo, Egypt, Institute for Resource Development Macro Systems, Inc., Columbia, Maryland, USA.

22. Seoane N. & Latham M.C. (1971): Nutritional anthropometry in the identification of malnutrition in childhood. J. Trop. Ped. & Africa Child Health.

23. SPSS-X.SPSS Inc. (1984): New York, MacGraw Hill & Co.

24. Sykes P. (1977): Errors arising through using Harvard tables and percentage levels of median weight-for-age is assessing nutritional status, Archives of Disease in Childhood, **52:** 391-395.

25. U.S. Food and Nutrition Board (1974): Comparison of body weights and body heights of groups of children. Atlanta, Ga, U.S.A. Department of Health, Education, and Welfare.

26. Waterlow J.C. (1972): Medical practice. Br. Med., J., **3:** 566-569.

27. Waterlow J.C. et al. (1977): The presentation and use of height and weight data for comparing the nutritional status of groups of children under the age of 10 years. Bull. WHO, **55:** 489-498.

28. World Health Organization (1978): A growth chart for international use in maternal and child health care, Geneva: WHO.

29. World Health Organization (1983): Measuring change in nutritional status. Guidelines for assessing the nutritional impact of supplementary feeding programs for vulnerable groups. Geneva: WHO.

المقاييس الجسمية الخاصة بالحالة الغذائية فى الأطفال من وقت الولادة وحتى عمر سنتين بمدينة شبين الكوم ومقارنتها بالمرجع السكانى العالمى للنمو NCHS / CDC

عايدة محمد على الاصفهانى

(من قسم التغذية وعلوم الاطعمة ، كلية الاقتصاد المنزلى ، جامعة المنوفية)

تم فى هذه الدراسة تقييم الحالة الغذائية باستعمال مؤشرات المقاييس الجسمية للانسان لعدد ٣٠٢ من الأطفال بمدينة شبين الكوم بمحافظة المنوفية تتراوح أعمارهم من وقت الولادة وحتى ٢٤ شهر ، واستخدمت النسبة المئوية وعلامات الانحراف القياسى (علامات – ز) للتعبير عن الوزن للطول ، والطول للعمر ، والوزن للعمر ثم قورنت النتائج بتلك التى فى المرجع السكانى العالمى NCHS / CDC – ولقد لوحظ أن نسبة انتشار القصر فى الطول (٢٨ر٥٪) أعلى من نسبة نقصان الوزن (٣ر٦٤٪) حيث ظهرت أعلى للقصر فى مجموعة العمر ١٨ – ٢٤ شهر ونقصان الوزن فى مجموعة ١٢ – ١٧ شهرا ، كما لوحظ أن نسبة القصر فى الاطفال كانت عالية مع انخفاض مستوى التعليم لامهاتهم وعدد غرف المعيشة لعائلاتهم ، وبالرغم من أن هذه النتائج قد بنيت على عدد صغير نسبيا من الاطفال الا أنها تدعو بقوة إلى عمل برامج خاصة للتغذية والصحة موجهة لهذه الفئة من الاطفال بشبين الكوم . (٩٢/٥٧١)

ه – المجلة المصرية للعلوم الطبية ١٣ (٢) ديسمبر ١٩٩٢ : ٢٧٣ – ٢٨٣

Egypt. J. Med. Sci. 13 (2) 1992