Establishment of Z score reference of growth parameters for Egyptian school children and adolescents aged from 5 to 19 years: a cross sectional study

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Research

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Abstract

Background: Growth charts are an important method for evaluating a child's health, nutrition and development. **Objective:** To establish Lambda – Mu- Sigma (LMS) and Z score references for assessment of growth and nutrition in Egyptian school children and adolescents.

Methods: A total of 31,416 Egyptian school children and adolescents from 5 years to 19 years were enrolled in a cross sectional randomized study from December 2017 to November 2019 to create LMS and Z score references for weight, height and body mass index (BMI) corresponding to ages. They were selected from different districts in Egypt. Apparent Healthy children with good nutritional history and not suffering from any chronic diseases were included in the study.

Results: Egyptian children of both sexes (56.7% boys and 43.3% girls) from 5 years to 19 years old were studied. Then LMS and Z scores for weight for age, height for age, BMI for age of both sexes were represented in detailed tables and graphs. There was no statistically significant difference between the Egyptian Z score charts and the reference values of WHO for weight, height and BMI corresponding to age ($P>0.05$).

Conclusion: This is the first reference for growth and nutritional assessment in Egyptian school children and adolescents, this tool is essential for healthcare and research. In case of absence of these local charts, we recommend to use the WHO references values rather than other local charts. **Key words:** Adolescent - Egyptian Z score -Growth parameters- School children

Background

Impairment in growth is one of universal public health problems,¹ and its early detection and accurate diagnosis is important for early intervention.² Age- and sex-specific growth charts are the important tools used for monitoring children's longitudinal growth.^{3–5}

For investigating a child's growth rate, weight and height are the most common anthropometric measurements used.⁶

Over the past decades, the increasing pattern of childhood obesity worldwide has been identified as an important health problem.^{7–11} Beyond the research setting, the most suitable single indicator of overweight and obesity in children and adolescents is Body Mass Index.^{12 13}

Egypt does not have its own growth reference data based on Lambda – Mu- Sigma (LMS) and Z score parameters that is constructed with a representative national sample of children and adolescents. The recently updated World Health Organization (WHO) international height, weight, and BMI references for children and adolescents aged 5–19 years (WHO 2007)¹⁴ are of interest as potentially useful for the Egyptian population like the reference values from the Centers for Disease Control and Prevention (CDC).¹⁵

Methods And Design

Participants

Egypt consists of 27 governorates. Cairo is the largest governorates in terms of population, accounting for one-third of Egypt's population according to the latest statistics. Therefore this was taken into account and the largest number of participants from Cairo. To conduct the study, the multistage random sampling technique was used. Out of 27 governorates, 3 governorates from Upper Egypt and 5 governorates including Cairo from Lower Egypt were chosen in this study. We chose 18 districts from previously chosen governorates randomly. Then facilities including basic education schools and secondary training schools were counted, and 140 facilities in the selected 8 governorates were randomly chosen.

Out of the week, the study was conducted in three crowded days to gather more information. They were selected from Primary health centers, Primary school and secondary school as representative of children in Egypt. Between the educational courses and during break time, children were screened in the school that was selected randomly from the list of schools.

A total of 31,416 Egyptian children from 5 years to 19 years were studied in a cross sectional randomized study from December 2017 to November 2019. Firstly, we took 32,042 who were eligible for the study, then 31,416 children and adolescents were selected as a final total sample after exclusion of 626 children on applying the inclusion and exclusion criteria.

Verbal consents were obtained from parents who were informed about the objective of the study, its benefits and the absence of any risk associated with the participation of their children.

Inclusion And Exclusion Criteria

All apparent healthy children with good developmental and nutritional history were included in this study. We excluded any child suffering from any chronic disease (cardiac, hematological, renal, endocrinal and hepatic diseases), fever or documented underlying disease at the time of examination.

Measurements And Data Collection

We measured weight for age, height for age, BMI for age for both sexes. All measured were collected by trained medical staff. All children were examined by identical measuring equipment. Instruments needed to be highly accurate. Weight and height were measured by a digital balanced scale (Beurer model GS 11, Germany). Device was calibrated daily. BMI was calculated using the formula: $BMI = \text{weight (Kg)} / (\text{height (m)})^2$.

Patient And Public Involvement

Seeking relevance, identifying the important research priorities of patients, caregivers and healthcare providers (paediatricians, nurses and dieticians) were identified by the authors. A paper-based survey asked patients, caregivers and care providers to submit their unanswered questions on anthropometric measurements. The final top 4 research priorities were identified during a personal meeting. There were 180 respondents, including children (n = 90) of different age and sex who were subjected to anthropometric measurement by observers to assess the degree of response to training and quality of measurement, also participated in setting the priorities of the research either on their own or by their caregiver, submitted 120 questions after exclusions. Of the respondents, 55% were patients or caregivers, 40% lived in urban areas, the caregivers were aged 21–45 years, and 92% were women. The top 4 unique research questions out of the 120 questions were prioritized included charts that can easily determine normal and abnormal levels of anthropometric measurements, education tools and technologies to improve patient motivation and health behaviors.

Statistical analysis

The LMS parameters were used to determine the standard deviation (– 3 to + 3) of weight, height and BMI for both sexes. The LMS parameters are the median (M), the generalized coefficient of variation (S), and the power in the Box–Cox transformation (L). The Box–Cox transformation is used to convert the distribution of anthropometric data to a normal distribution. The method models the data taking into consideration the degree of skewness (L), central tendency (M), and dispersion (S). The L, M, and S parameters are calculated and smoothed according to the method of maximum penalized likelihood.¹⁶¹⁷ Z score and was calculated by using the Statistical package SPSS, version 20, for windows (SPSS Inc., Chicago, Illinois, USA) and Excel according to the following formula:

$$P = M [1 + LSZ]^{1/L}, L \neq 0$$

For the present analysis, Z scores were statistically analyzed using the SPSS V 15 and Excel. We calculated the z-score values of – 3, –2, – 1, 0, + 1, +2, and + 3 for weight, height and BMI for age. The goodness of fit of all L, M, and S models was assessed using Q-test.¹⁸

Student t-test for one sample was used to compare the means values of each group variable with the Egyptian and WHO reference values. For all analyses, the significance level was set at 5%.

Results

A total of 31,416 Egyptian children (56.7% boys and 43.3% girls), from 5 to 19 years of age were examined in this study for weight for age (table 1–2), height for age (table 3–4), and BMI for age (table 5–6). Egyptian z-score weight for age Figs. 1–2, height for age Figs. 3–4, BMI for age for both sexes according to age are shown in Figs. 5–6. There was no statistically significant difference between the Egyptian Z score charts and the reference values of WHO (table 7) Figs. 7–10.

Discussion

To assess the growth and nutritional status of a child, percentiles, percent of median, and Z-scores (standard deviation scores) are the available three methods. The Z-score indicates how many standard deviations any value is from the mean.¹⁹

Variation in the environmental conditions and the ethnicity factor developed the necessity for the development of tailored charts from representative samples,^{20 21} that was and still conducted by many developed,²²⁻²⁴ and developing countries.²⁵⁻²⁷ In Egypt, this is the first national Z score growth charts for school children and adolescents that was developed in spite of using other charts.

Weight for age was not calculated beyond 10 years of age as during the pubertal growth spurt, the height increases rapidly more than weight making it not an accurate measure of nutritional status beyond 10 years. ¹⁴

After comparison of weight, height and BMI for age values of both sexes of the children who participated in the present study with the WHO values, ¹⁴ there was no statistically significant difference between the Egyptian Z score charts and the reference values of WHO. The P values of weight for age in boys and girls were 0.142 and 0.229 ($P > 0.05$) respectively. The P values of height for age in boys and girls were 0.469 and 0.361 ($P > 0.05$). The P values of BMI for age in boys and girls were 0.492 and 0.316 ($P > 0.05$) respectively. This mean that he WHO growth charts may be appropriate for monitoring growth and nutritional status on Egyptian children as the growth pattern in our large population were closer to growth charts of WHO.

WHO Multicentre Growth Reference Study was conducted to provide a single international standard representative for the physiological growth for all children everywhere, regardless of ethnicity, socio-economic status and type of feeding, and our study supports this hypothesis.

Conclusion

The L, M, and S parameters and Z-scores for Egyptian school children and adolescents presented in this report provide nationally representative reference that will facilitate more accurate assessment of nutritional status of Egyptian children and comparison with other populations under different clinical conditions. In absence of these local charts, we recommend using WHO growth charts.

Declarations

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No conflict of interest

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Ethics approval: Institutional Review Boards (IRB) of the Menoufia faculty of medicine had approved the study. Research work had been performed in accordance with the [Declaration of Helsinki](#). Consents was taken from parents or guardians after explain the objective of the study, absence of any risk in participation.

All procedures performed in the study were approved and were in accordance with the ethical standards of Menoufia University institutional research committee.

Data sharing statement: Data are available to be shared on request by e. mailing ahmed.n.elbazzar@gmail.com

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Tables

Table (1): shows Egyptian LMS and z scores weight for age for boys from 5 years to 10 years.

Weight-for-age BOYS
Egyptian Z-score 5 Years to 10 Years

Y:M	M	Mean	S	L	-3SD	-2SD	-1SD	Median	1SD	2SD	3SD
05:01	61	18.6985	0.13625	-0.1455	12.7	14.5	16.4	18.8	22	25.2	28.9
05:02	62	18.9586	0.13789	-0.1489	12.8	14.6	16.6	19	22.2	25.5	29.1
05:03	63	19.1258	0.13814	-0.1499	12.9	14.7	16.7	19.2	22.4	25.7	29.4
05:04	64	19.3528	0.13951	-0.1502	13.1	14.9	16.9	19.4	22.6	26	29.8
05:05	65	19.5283	0.13989	-0.1555	13.2	15	17.1	19.6	22.8	26.3	30.1
05:06	66	19.7625	0.14008	-0.1589	13.4	15.1	17.3	19.8	23.1	26.6	30.4
05:07	67	19.8222	0.14045	-0.1599	13.5	15.3	17.5	19.9	23.3	26.8	30.8
05:08	68	20.0258	0.14125	-0.1614	13.7	15.4	17.7	20.1	23.5	27.1	31.2
05:09	69	20.2158	0.14201	-0.1635	13.8	15.6	17.8	20.3	23.7	27.4	31.5
05:10	70	20.452	0.14268	-0.1665	14	15.7	18	20.5	23.9	27.7	31.9
05:11	71	20.6586	0.14314	-0.1687	14.1	15.8	18.2	20.7	24.1	28	32.2
06:00	72	20.8562	0.14365	-0.1711	14.2	16	18.3	20.9	24.3	28.3	32.6
06:01	73	21.0369	0.14478	-0.1736	14.3	16.1	18.5	21.1	24.5	28.6	32.9
06:02	74	21.1258	0.14514	-0.1745	14.5	16.2	18.7	21.2	24.7	28.9	33.1
06:03	75	21.3587	0.14695	-0.1799	14.6	16.3	18.9	21.4	24.9	29.2	33.4
06:04	76	21.5247	0.14798	-0.1801	14.7	16.4	19	21.6	25.2	29.5	33.8
06:05	77	21.7952	0.14891	-0.1999	14.8	16.5	19.2	21.8	25.4	29.8	34
06:06	78	22.0368	0.14999	-0.2006	15	16.6	19.4	22	25.6	30.1	34.5
06:07	79	22.102	0.15002	-0.2099	15.1	16.8	19.5	22.2	25.9	30.4	34.8
06:08	80	22.2037	0.15098	-0.2125	15.2	16.9	19.7	22.3	26.1	30.7	35.2
06:09	81	22.4586	0.15125	-0.2265	15.4	17	19.9	22.5	26.4	31	35.8
06:10	82	22.6259	0.15256	-0.2369	15.5	17.2	20	22.7	26.6	31.3	36
06:11	83	22.8745	0.15365	-0.2456	15.6	17.3	20.2	22.9	26.9	31.7	36.4
07:00	84	23.0255	0.15458	-0.2569	15.7	17.4	20.4	23.1	27.1	32	36.8
07:01	85	23.2158	0.15584	-0.2695	15.8	17.6	20.6	23.3	27.4	32.3	37.3
07:02	86	23.3257	0.15695	-0.2789	16	17.7	20.7	23.4	27.7	32.6	37.7
07:03	87	23.5471	0.15789	-0.2896	16.1	17.8	20.9	23.6	27.9	33	38.1
07:04	88	23.7896	0.15874	-0.2987	16.3	18	21	23.8	28.2	33.3	38.6
07:05	89	23.9875	0.15987	-0.3009	16.4	18.1	21.2	24	28.4	33.7	39
07:06	90	24.1258	0.16005	-0.3125	16.5	18.2	21.4	24.2	28.7	34.1	39.5
07:07	91	24.3668	0.16089	-0.3255	16.6	18.4	21.6	24.4	29	34.5	40
07:08	92	24.4565	0.16125	-0.3369	16.8	18.5	21.8	24.5	29.2	34.8	40.5
07:09	93	24.63	0.16258	-0.3456	16.9	18.7	22	24.7	30.1	35.2	41
07:10	94	24.9026	0.16314	-0.3587	17.1	18.8	22.1	24.9	30.3	35.6	41.5
07:11	95	25.0259	0.16458	-0.3625	17.3	18.9	22.3	25.1	30.6	35.9	42
08:00	96	25.2015	0.16589	-0.3789	17.4	19.1	22.5	25.3	30.9	36.3	42.5
08:01	97	25.4632	0.16678	-0.3899	17.5	19.3	22.7	25.5	31.2	36.7	43.1
08:02	98	25.6521	0.16714	-0.3999	17.6	19.5	22.9	25.7	31.5	37.1	43.6
08:03	99	25.8741	0.16825	-0.4128	17.8	19.6	23.1	25.9	31.8	37.5	44.1
08:04	100	26.0215	0.16899	-0.4258	17.9	19.7	23.2	26.1	32	37.9	44.7
08:05	101	26.2015	0.16912	-0.4314	18.1	19.9	23.4	26.3	32.3	38.3	45.2
08:06	102	26.4321	0.16935	-0.4478	18.2	20.1	23.6	26.5	32.5	38.7	45.9
08:07	103	26.6012	0.16978	-0.4547	18.3	20.2	23.8	26.7	32.8	39.1	46.4
08:08	104	26.8745	0.17008	-0.4614	18.5	20.4	24	26.9	33	39.5	47
08:09	105	27.0956	0.17045	-0.4874	18.6	20.6	24.1	27.1	33.3	40	47.6
08:10	106	27.2145	0.17147	-0.4987	18.7	20.8	24.3	27.3	33.6	40.4	48.2
08:11	107	27.4688	0.17199	-0.5265	18.8	20.9	24.5	27.5	33.9	40.8	48.9
09:00	108	27.6653	0.17205	-0.5654	18.9	21	24.7	27.7	34.2	41.3	49.6
09:01	109	27.9028	0.17236	-0.5987	19	21.2	24.9	28	34.5	41.8	50.2

09:02	110	28.1268	0.17258	-0.6147	19.2	21.3	25	28.3	34.8	42.2	50.9
09:03	111	28.4069	0.17301	-0.6357	19.3	21.4	25.1	28.5	35.2	42.7	51.6
09:04	112	28.734	0.17355	-0.6478	19.5	21.6	25.3	28.8	35.5	43.2	52.3
09:05	113	28.8032	0.17366	-0.6531	19.6	21.8	25.5	29	35.9	43.6	53.6
09:06	114	29.125	0.17401	-0.6698	19.7	22	25.7	29.3	36.2	44.1	54.2
09:07	115	29.4563	0.17455	-0.6741	19.9	22.2	25.9	29.6	36.7	44.6	55.1
09:08	116	29.7533	0.17555	-0.6814	20	22.4	26.1	29.9	37	45.1	55.8
09:09	117	30.1255	0.17565	-0.6999	20.2	22.6	26.3	30.2	37.3	45.6	56.5
09:10	118	30.4523	0.17601	-0.7111	20.3	22.8	26.5	30.5	37.6	46.1	57.1
09:11	119	30.8514	0.17655	-0.7222	20.4	23	26.7	30.9	37.9	46.6	57.8
10:00	120	31.1254	0.17788	-0.7325	20.6	23.2	26.9	31.2	38	47.1	58.3

Table (2): shows Egyptian LMS and z scores weight for age for girls from 5 years to 10 years

Weight-for-age GIRLS											
Egyptian Z-score 5 Years to 10 Years											
Y:MM	Mean	S	L	-3SD	-2SD	-1SD	Median	1SD	2SD	3SD	
05:01	118.8563	1.1412	0.3345	12.4	14.2	16.5	18.9	22.1	26.2	30.3	
05:02	128.9632	1.1425	0.3355	12.5	14.3	16.6	19	22.2	26.4	30.6	
05:03	139.1526	1.1435	0.3365	12.7	14.4	16.7	19.2	22.4	26.7	30.9	
05:04	149.3566	1.1445	0.3379	12.8	14.5	16.8	19.4	22.6	26.9	31.3	
05:05	159.4586	1.1454	0.3387	12.9	14.6	17	19.5	22.8	27.1	31.6	
05:06	169.5035	1.1465	0.3399	13	14.7	17.1	19.6	23	27.3	31.9	
05:07	179.7852	1.1478	0.4002	13.1	14.8	17.3	19.8	23.2	27.5	32.2	
05:08	189.8563	1.1485	0.4025	13.2	14.9	17.4	19.9	23.4	27.7	32.5	
05:09	190.0252	1.1495	0.4099	13.3	15	17.5	20.1	23.6	27.9	32.9	
05:10	200.2325	1.1509	0.4111	13.4	15.2	17.7	20.3	23.9	28.2	33.2	
05:11	210.4632	1.1514	0.4125	13.5	15.3	17.9	20.5	24.1	28.5	33.6	
06:00	220.5963	1.1525	0.4149	13.6	15.4	18.1	20.7	24.3	28.7	33.9	
06:01	230.7522	1.1536	0.4159	13.7	15.5	18.3	20.8	24.4	28.9	34.2	
06:02	240.9863	1.1547	0.4201	13.8	15.6	18.4	21	24.6	29.1	34.7	
06:03	251.1525	1.1552	0.4255	13.9	15.7	18.5	21.2	24.8	29.3	35	
06:04	261.2635	1.1565	0.4265	14	15.8	18.6	21.3	25	29.5	35.4	
06:05	271.4586	1.1578	0.4288	14.2	15.9	18.8	21.5	25.3	29.8	35.8	
06:06	281.6589	1.1582	0.4299	14.3	16.1	19	21.7	25.4	30	36.1	
06:07	291.8896	1.1593	0.4301	14.4	16.2	19.1	21.9	25.7	30.2	36.5	
06:08	302.0258	1.1599	0.4322	14.5	16.3	19.3	22.1	26	30.5	37	
06:09	312.2035	1.1608	0.4365	14.6	16.5	19.5	22.3	26.3	30.8	37.4	
06:10	322.3258	1.1610	0.4375	14.7	16.6	19.6	22.4	26.5	31.1	37.9	
06:11	332.5688	1.1612	0.4401	14.8	16.7	19.8	22.6	26.7	31.5	38.2	
07:00	342.7663	1.1614	0.4422	14.9	16.9	19.9	22.8	26.9	31.8	38.6	
07:01	352.8523	1.1618	0.4435	15	17.1	20	22.9	27	32.1	39	
07:02	362.9686	1.1620	0.4455	15.1	17.2	20.1	23	27.2	32.5	39.4	
07:03	373.2585	1.1626	0.4499	15.3	17.3	20.3	23.3	27.5	32.8	39.8	
07:04	383.4585	1.1635	0.4502	15.4	17.4	20.4	23.5	27.9	33.1	40.3	
07:05	393.6582	1.1639	0.4555	15.6	17.5	20.6	23.7	28.2	33.3	41	
07:06	403.8622	1.1642	0.4565	15.6	17.6	20.7	23.9	28.5	33.7	41.6	
07:07	414.0586	1.1689	0.4575	15.8	17.7	20.8	24.1	28.8	34	42.1	
07:08	424.2586	1.1692	0.4581	15.9	17.9	21	24.3	29.1	34.4	42.7	
07:09	434.4652	1.1695	0.4599	16	18.1	21.2	24.5	29.4	34.8	43.1	
07:10	444.5632	1.1697	0.4602	16.2	18.3	21.4	24.6	29.7	35.2	43.6	
07:11	454.7556	1.1699	0.4621	16.4	18.5	21.6	24.8	29.9	35.6	44.1	
08:00	465.0255	1.1712	0.4633	16.5	18.7	21.8	25.1	30.2	36	44.7	
08:01	475.3256	1.1716	0.4645	16.8	18.9	22	25.4	30.6	36.4	45.3	
08:02	485.6982	1.1719	0.4675	17	19	22.2	25.7	30.9	36.8	45.8	
08:03	495.7896	1.1720	0.4701	17.2	19.1	22.4	25.9	31.2	39.2	46.2	
08:04	500.6125	1.1722	0.4745	17.3	19.3	22.7	26.2	31.5	39.5	46.7	
08:05	502.4525	1.1729	0.4755	17.5	19.5	23	26.5	31.8	39.9	47.1	
08:06	502.6758	1.1731	0.4801	17.6	19.7	23.3	26.8	32.1	40.4	47.8	
08:07	502.7032	1.1733	0.4825	17.8	19.9	23.5	27.1	32.4	40.9	48.4	
08:08	502.7366	1.1738	0.4845	18	20.1	23.7	27.4	32.7	41.1	48.9	

08:00	0257.6225	5.1739	9.4855	18.1	20.2	23.9	27.7	33	41.8	49.5
08:10	0257.9533	5.1742	9.4865	18.2	20.3	24.2	28	33.3	42.4	50
08:11	0258.3503	5.1744	9.4912	18.3	20.5	24.4	28.4	33.7	42.9	50.4
09:00	0258.6333	5.1745	9.4922	18.5	20.7	24.6	28.7	34	43.3	50.9
09:01	0258.9563	5.1755	9.4933	18.6	20.9	24.9	29	34.3	43.8	51.7
09:02	0259.2325	5.1769	9.4944	18.7	21.2	25.1	29.3	34.6	44.3	52.4
09:03	0259.5235	5.1769	9.4955	18.9	21.4	25.3	29.6	34.9	44.8	53.3
09:04	0259.8663	5.1772	9.4999	19.1	21.6	25.5	29.9	35.2	45.2	54.1
09:05	0260.1251	5.1775	9.5001	19.2	21.8	25.7	30.2	35.4	45.8	54.8
09:06	0260.4524	5.1776	9.5025	19.4	22	25.9	30.5	35.8	46.4	56.5
09:07	0260.7758	5.1777	9.5075	19.6	22.3	26.2	30.8	36.2	46.9	57.2
09:08	0261.0258	5.1778	9.5099	19.8	22.5	26.4	31.1	36.8	47.4	57.9
09:09	0261.3323	5.1779	9.5111	19.9	22.7	26.6	31.4	37.2	47.9	58.3
09:10	0261.6325	5.1780	9.5125	20	22.9	26.9	31.7	37.7	48.3	59
09:11	0261.9393	5.1789	9.5133	20.2	23.1	27.1	32	38.1	48.8	59.6
10:00	0262.2375	5.1792	9.5145	20.4	23.4	27.3	32.3	38.4	49.1	60.4

Table (3): shows Egyptian LMS and z scores height for age for boys from 5 years to 19 years

Height-for-age BOYS

Egyptian Z-score 5 Years to 19 Years

Y:M	M	S									
		Mean		L	-3SD	-2SD	-1SD	Median	1SD	2SD	3SD
05:00	60	109.3	4.88159	1	95.3	100	104.6	109.4	114	118.6	123.5
05:01	61	109.8	5.05613	1	95.8	100.4	105	109.8	114.4	119	123.7
05:02	62	110	4.79432	1	96	100.8	105.5	110.1	115	119.5	124.1
05:03	63	110.6	4.53252	1	96.6	101.2	106	110.7	115.4	120	124.9
05:04	64	111.1	4.58836	1	97	101.6	106.4	111.2	116	120.8	125.5
05:05	65	111.8	4.6442	1	97.4	102.3	107	111.9	116.5	121.3	126
05:06	66	112.1	4.64402	1	98	102.6	107.4	112.2	117.1	122	126.6
05:07	67	112.8	4.89975	1	98.4	103	108	112.9	117.7	122.5	127.2
05:08	68	113.5	5.02762	1	98.8	103.6	108.2	113.6	118.2	123	128
05:09	69	113.9	5.15549	1	99	104	108.9	114	118.8	123.7	128.5
05:10	70	114.4	5.2495	1	99.8	104.3	109.2	114.5	119.5	124.2	129
05:11	71	114.9	5.10849	1	100	105	109.8	115	120	124.8	129.5
06:00	72	115.4	4.96748	1	100.5	105.3	110.2	115.5	120.5	125.4	130.1
06:01	73	115.7	4.96855	1	101	105.6	110.6	115.8	121	126	130.9
06:02	74	116.1	4.96999	1	101.2	106.3	111	116.2	121.5	126.4	131.5
06:03	75	116.7	4.97305	1	101.7	106.6	111.5	116.8	122	127	132
06:04	76	117.2	4.98305	1	102	107	112	117.3	122.6	127.5	132.6
06:05	77	117.8	4.99306	1	102.6	107.5	112.5	117.9	123	128	133
06:06	78	118.3	5.13289	1	103	108	113	118.4	123.5	128.5	133.8
06:07	79	118.7	5.18289	1	103.3	108.3	113.4	118.8	124.1	129	134.4
06:08	80	119	5.20558	1	103.6	108.6	114	119.1	124.5	129.6	134.9
06:09	81	119.6	5.28775	1	104	109	114.3	119.7	125	130.1	135.5
06:10	82	120	5.30669	1	104.2	109.5	114.8	120.1	125.5	130.6	136
06:11	83	120.6	5.32556	1	104.9	110	115.2	120.7	126	131.3	136.5
07:00	84	120.9	5.34945	1	105	110.3	115.6	121	126.6	131.9	137
07:01	85	121.6	5.32445	1	105.6	110.8	116	121.7	127	132.5	137.7
07:02	86	121.9	5.32669	1	105.9	111.3	116.5	122	127.6	133	138.1
07:03	87	122.5	5.31189	1	106.2	111.6	117	122.6	128	133.4	138.8
07:04	88	122.9	5.32669	1	106.4	112	117.4	123	128.6	134	139.3
07:05	89	123.4	5.3807	1	107	112.4	117.8	123.5	129	134.5	140
07:06	90	123.9	5.4107	1	107.2	112.9	118.3	124	129.5	135	140.3
07:07	91	124.4	5.45898	1	107.6	113.3	118.6	124.5	130	135.5	141
07:08	92	124.9	5.50749	1	108	113.6	119	125	130.6	136	141.5
07:09	93	125.2	5.60748	1	108.6	114	119.5	125.3	131	136.6	142
07:10	94	125.7	5.70555	1	108.9	114.3	120	125.8	131.4	137	142.5
07:11	95	126	5.80693	1	109.2	114.7	120.3	126.1	132	137.6	143.1
08:00	96	126.7	5.86112	1	109.6	115.2	120.8	126.8	132.5	138	143.6
08:01	97	126.9	5.63987	1	110	115.7	121.2	127	133	138.5	144.2
08:02	98	127.4	5.25846	1	110.3	115.9	121.6	127.5	133.4	139	144.9
08:03	99	127.9	5.78527	1	110.6	116.2	122	128	133.9	139.5	145.3
08:04	100	128.2	5.79365	1	111	116.5	122.5	128.3	134.3	140	146
08:05	101	128.9	5.80245	1	111.3	117	123	129	134.8	140.6	146.5
08:06	102	129.2	5.81614	1	111.6	117.5	123.4	129.3	135.3	141	147
08:07	103	129.8	5.85963	1	112	118	123.6	129.9	135.6	141.5	147.5

08:08	104	130	5.88471	1	112.3	118.3	124	130.1	136.2	142	148
08:09	105	130.6	5.89586	1	112.7	118.6	124.5	130.7	136.7	142.7	148.5
08:10	106	130.9	5.91258	1	113	119	125	131	137	143	149
08:11	107	131.4	5.93654	1	113.4	119.3	125.4	131.5	137.5	143.5	149.5
09:00	108	131.9	5.94979	1	113.7	119.6	125.9	132	138	144.2	150
09:01	109	132.4	5.20369	1	114	120	126.2	132.5	138.5	144.7	150.5
09:02	110	132.7	5.30254	1	114.3	120.5	126.4	132.8	139	145	151.1
09:03	111	133.1	6.32289	1	114.9	121	127	133.2	139.4	145.5	151.5
09:04	112	133.7	6.32289	1	115	121.3	127.4	133.8	139.8	146	152.2
09:05	113	133.9	6.34874	1	115.6	121.6	127.8	134	140.2	146.5	152.5
09:06	114	134.5	6.35916	1	115.8	122	128.2	134.6	140.9	147	153.2
09:07	115	134.9	6.47681	1	116	122.4	128.5	135	141.2	147.6	153.9
09:08	116	135.4	6.45874	1	116.6	122.7	129	135.5	141.8	148	154.2
09:09	117	135.9	6.46296	1	116.8	123	129.3	136	142.4	148.6	154.9
09:10	118	136.1	6.24934	1	117.2	123.5	129.9	136.2	142.8	149	155.5
09:11	119	136.4	6.25698	1	117.5	124	130.2	136.5	143	149.5	156
10:00	120	137	6.28541	1	118	124.3	130.6	137.1	143.2	150.1	156.5
10:01	121	137.4	6.29665	1	118.3	124.7	131	137.5	144	150.6	157
10:02	122	137.9	6.40236	1	118.6	125	131.5	138	144.6	151	157.5
10:03	123	138.5	6.42356	1	119	125.5	131.7	138.6	145	151.5	158
10:04	124	138.9	6.45255	1	119.3	125.8	132.3	139	145.5	152	158.5
10:05	125	139.4	6.25845	1	119.7	126	132.6	139.5	146	152.5	159
10:06	126	139.7	6.45901	1	120	126.6	133	139.8	146.2	153	159.6
10:07	127	140	6.46987	1	120.4	127	133.5	140.1	146.9	153.5	160
10:08	128	140.7	6.49654	1	120.7	127.4	134	140.8	147.2	154	160.7
10:09	129	140.9	6.50756	1	121	127.8	134.3	141	147.9	154.5	161.3
10:10	130	141.4	6.78526	1	121.3	128	134.7	141.5	148.3	155.1	161.8
10:11	131	141.9	6.2584	1	121.8	128.3	135	142	148.9	155.5	162.5
11:00	132	142.4	6.93484	1	122	129	135.6	142.5	149.3	156.2	162.9
11:01	133	142.9	6.82548	1	122.4	129.3	136	143	149.6	156.7	163.5
11:02	134	143.4	6.32548	1	123	129.7	136.6	143.5	150.3	157.2	164
11:03	135	143.9	6.70349	1	123.4	130	137	144	150.8	157.8	164.5
11:04	136	144.3	6.85239	1	123.7	130.6	137.5	144.4	151.2	158.1	165
11:05	137	144.9	6.99658	1	124	131	137.9	145	151.8	158.9	165.5
11:06	138	145.4	7.06473	1	124.6	131.5	138.3	145.5	152.4	159.4	166.1
11:07	139	145.9	7.06584	1	125	131.9	138.8	146	152.9	160	166.9
11:08	140	146.3	7.07223	1	125.3	132.2	139.2	146.4	153.5	160.4	167.5
11:09	141	146.9	7.11258	1	125.7	132.6	139.6	147	154	161	168
11:10	142	147.4	7.11256	1	126	133.2	140.3	147.5	154.5	161.6	168.5
11:11	143	147.9	7.1528	1	126.7	133.6	140.7	148	155	162.2	169.1
12:00	144	148.3	7.11197	1	127	134	141.3	148.4	155.7	162.9	169.8
12:01	145	148.9	7.12369	1	127.5	134.5	141.6	149	156	163.4	170.5
12:02	146	149.4	7.13548	1	128	135	142.2	149.5	156.7	164	171
12:03	147	149.9	7.19038	1	128.6	135.5	142.8	150	157.2	164.5	171.6
12:04	148	150.6	7.17258	1	129	136	143.2	150.7	158	165.1	172.6
12:05	149	151.1	7.18936	1	129.5	136.6	143.7	151.2	158.5	165.9	173
12:06	150	151.7	7.15953	1	130	137	144.5	151.8	159	166.5	173.8
12:07	151	152.4	7.25896	1	130.5	137.6	145	152.5	159.7	167	174.5

12:08	152	152.9	7.24852	1	131	138.2	145.5	153	160.2	167.7	175
12:09	153	153.4	7.48601	1	131.7	138.7	146	153.5	161	168.5	175.8
12:10	154	154	7.25895	1	132	139.3	146.8	154.1	161.5	169	176.5
12:11	155	154.8	7.4191	1	132.5	139.9	147.2	154.9	162.1	169.8	177
13:00	156	155.3	7.4391	1	133	140.3	147.7	155.4	163	170.2	177.8
13:01	157	155.9	7.49369	1	133.4	141	148.4	156	163.5	171	178.5
13:02	158	156.6	7.51582	1	134	141.5	149	156.7	164.2	171.8	179.1
13:03	159	157.1	7.55768	1	134.5	142	149.5	157.2	164.9	172.5	180
13:04	160	157.9	7.56936	1	135	142.6	150.2	158	165.5	173	180.5
13:05	161	158.3	7.57237	1	135.6	143.2	150.7	158.4	166	173.8	181.3
13:06	162	158.9	7.58317	1	136.2	143.6	151.4	159	166.7	174.4	182
13:07	163	159.6	7.54852	1	136.7	144.2	152	159.7	167.2	175	182.5
13:08	164	160.1	7.56958	1	137.2	145	152.5	160.2	168	175.5	183.3
13:09	165	160.9	7.5476	1	137.9	145.3	153	161	168.5	176.2	184
13:10	166	161.4	7.61258	1	138.3	146	153.6	161.5	169	177	184.6
13:11	167	161.9	7.64365	1	138.9	146.5	154	162	169.7	177.5	185
14:00	168	162.4	7.62587	1	139.3	147	154.7	162.5	170.2	178	185.9
14:01	169	162.9	7.69325	1	139.7	147.6	155.3	163	170.8	178.5	186.5
14:02	170	163.4	7.2646	1	140.2	148	155.6	163.5	171.5	179.1	187
14:03	171	164.1	7.51323	1	140.8	148.5	156.2	164.2	172	179.7	187.5
14:04	172	164.4	7.65285	1	141.3	149	156.8	164.5	172.5	180.3	188
14:05	173	165	7.70958	1	141.7	149.6	157.3	165.1	173	180.8	188.5
14:06	174	165.4	7.74984	1	142.3	150	157.7	165.5	173.7	181.3	189
14:07	175	166	7.65985	1	142.7	150.4	158.2	166.1	174	181.9	189.5
14:08	176	166.4	7.58325	1	143	151	158.6	166.5	174.5	182.5	190
14:09	177	166.9	7.60563	1	143.6	151.2	159	167	175.1	182.9	190.5
14:10	178	167.3	7.61258	1	144	151.6	159.6	167.4	175.5	183.1	191
14:11	179	167.9	7.63258	1	144.3	152	160	168	175.9	183.7	191.5
15:00	180	168.4	7.64829	1	144.7	152.6	160.5	168.5	176.4	184	192
15:01	181	168.7	7.62585	1	145	153	160.7	168.8	176.8	184.5	192.3
15:02	182	168.9	7.69584	1	145.5	153.3	161	169	177.1	185	192.8
15:03	183	169.4	7.68082	1	146	153.7	161.5	169.5	177.4	185.2	193
15:04	184	169.9	7.68082	1	146.3	154	162	170	177.9	185.5	193.5
15:05	185	170	7.6582	1	146.6	154.5	162.3	170.1	178.1	186	193.8
15:06	186	170.4	7.69607	1	147	154.8	162.6	170.5	178.4	186.2	194
15:07	187	170.9	7.70542	1	147.4	155	163	171	178.9	186.7	194.3
15:08	188	171.1	7.74126	1	147.7	155.4	163.2	171.2	179.2	187	194.8
15:09	189	171.4	7.74219	1	148	155.7	163.5	171.5	179.5	187.3	195
15:10	190	171.6	7.63259	1	148.3	156	163.7	171.7	179.7	187.5	195.2
15:11	191	171.9	7.65294	1	148.6	156.2	164	172	180	187.8	195.5
16:00	192	172.1	7.51079	1	148.9	156.6	164.2	172.2	180.2	188	195.7
16:01	193	172.3	7.88363	1	149	156.8	164.6	172.4	180.4	188.2	195.7
16:02	194	172.6	7.99258	1	149.4	157	164.8	172.7	180.6	188.5	195.7
16:03	195	172.9	8.18876	1	149.6	157.3	165	173	181	188.7	195.7
16:04	196	173.1	9.02584	1	149.9	157.6	165.2	173.2	181.1	188.9	195.7
16:05	197	173.3	7.44582	1	150	157.8	165.5	173.4	181.3	189	195.7
16:06	198	173.5	7.77163	1	150.3	158	165.7	173.6	181.4	189.1	195.7
16:07	199	173.7	7.25841	1	150.6	158.2	166	173.8	181.6	189.2	195.7

16:08	200	173.9	7.36952	1	150.8	158.4	166.2	174	181.9	189.5	195.7
16:09	201	174	7.73217	1	151	158.6	166.4	174.1	182	189.6	195.7
16:10	202	174.2	7.65285	1	151.2	158.8	166.5	174.3	182.1	189.7	195.7
16:11	203	174.3	7.60258	1	151.4	159	166.6	174.4	182.2	189.8	195.7
17:00	204	174.6	7.63469	1	151.6	159.1	166.7	174.7	182.4	189.9	195.7
17:01	205	174.7	7.47528	1	151.8	159.2	166.9	174.8	182.5	190	195.7
17:02	206	174.8	7.41583	1	151.9	159.3	167	174.9	182.6	190	195.7
17:03	207	174.9	7.51005	1	152	159.4	167.1	175	182.7	190.2	195.7
17:04	208	175	8.01253	1	152.1	159.6	167.2	175.1	182.7	190.2	195.7
17:05	209	175.1	8.12582	1	152.2	159.7	167.3	175.2	182.8	190.2	195.7
17:06	210	175.2	8.21785	1	152.3	159.8	167.4	175.3	182.8	190.3	195.7
17:07	211	175.2	7.56932	1	152.4	160	167.5	175.3	182.9	190.3	195.7
17:08	212	175.3	7.25899	1	152.5	160.1	167.6	175.4	183	190.4	195.7
17:09	213	175.3	7.36147	1	152.6	160.2	167.7	175.4	183	190.4	195.7
17:10	214	175.3	7.25814	1	152.6	160.3	167.8	175.4	183	190.5	195.7
17:11	215	175.4	7.26149	1	152.7	160.3	167.9	175.5	183.1	190.5	195.7
18:00	216	175.4	7.31851	1	152.8	160.4	168	175.5	183.1	190.5	195.7
18:01	217	175.5	8.12584	1	152.9	160.5	168.1	175.6	183.1	190.5	195.7
18:02	218	175.6	8.13693	1	152.9	160.6	168.2	175.7	183.2	190.5	195.7
18:03	219	175.6	8.29768	1	153	160.6	168.2	175.7	183.2	190.5	195.7
18:04	220	175.7	8.12548	1	153.1	160.7	168.3	175.8	183.2	190.5	195.7
18:05	212	175.7	8.36254	1	153.2	160.8	168.3	175.8	183.3	190.6	195.7
18:06	222	175.7	7.19216	1	153.3	160.8	168.3	175.8	183.3	190.6	195.7
18:07	223	175.8	7.12584	1	153.4	160.8	168.3	175.8	183.3	190.6	195.7
18:08	224	175.8	7.36258	1	153.5	160.9	168.4	175.9	183.3	190.7	195.7
18:09	225	175.8	7.25757	1	153.6	160.9	168.4	175.9	183.3	190.7	195.7
18:10	226	175.8	7.23695	1	153.8	161	168.5	175.9	183.3	190.7	195.7
18:11	227	175.8	7.23584	1	153.8	161	168.5	175.9	183.3	190.7	195.7
19:00	228	175.8	7.24369	1	153.8	161	168.5	175.9	183.3	190.7	195.7

Table (4): shows Egyptian LMS and z scores height for age for girls from 5 years to 19 years

Height-for-age GIRLS
Egyptian Z-score 5Years to 19 Years

Y:M	M	Mean	S	L	-3SD	-2SD	-1SD	Median	1SD	2SD	3SD
05:01	61	109	5.01271	1	94.4	99.2	104.1	109	114	118.7	123.5
05:02	62	109.2	5.01258	1	95	99.7	104.5	109.3	114.3	119.1	124
05:03	63	109.8	5.01281	1	95.3	100.2	105	109.9	115	119.9	124.8
05:04	64	110.5	5.32658	1	95.6	100.6	105.5	110.5	115.5	120.2	125.3
05:05	65	111	5.32587	1	96.2	101	106	111	116	121	126
05:06	66	111.5	5.33867	1	96.6	101.5	106.3	111.5	116.7	121.6	126.5
05:07	67	111.9	5.02587	1	97	102	107	112	117	122	127
05:08	68	112.5	5.02658	1	97.4	102.4	107.3	112.6	117.8	122.8	127.6
05:09	69	112.9	5.02021	1	97.7	102.8	107.9	113	118.2	123.1	128.2
05:10	70	113.5	5.32147	1	98.1	103.1	108.2	113.6	118.8	123.6	128.9
05:11	71	113.9	5.25874	1	98.6	103.6	108.9	114	119.1	124.2	129.4
06:00	72	114.4	5.31711	1	99	104	109.1	114.5	119.8	125	130
06:01	73	115	5.26584	1	99.3	104.5	109.7	115	120.4	125.5	130.7
06:02	74	115.5	5.21478	1	99.6	105	110	115.5	120.8	126	131
06:03	75	115.9	5.08827	1	100	105.3	110.4	116	121.2	126.5	131.7
06:04	76	116.1	5.02587	1	100.5	105.9	111	116.2	121.9	127	132.5
06:05	77	116.7	5.14847	1	101	106.2	111.5	116.8	122.3	127.5	132.9
06:06	78	117.2	5.45681	1	101.2	106.6	112	117.3	122.8	128	133.5
06:07	79	117.6	5.22654	1	101.6	107	112.3	117.7	123.2	128.5	134
06:08	80	118	5.22963	1	102	107.5	112.9	118	123.6	129	134.5
06:09	81	118.5	5.22416	1	102.4	107.7	113.2	118.6	124.2	129.8	135
06:10	82	119	5.22874	1	102.8	108.1	113.7	119.1	124.8	130.1	135.5
06:11	83	119.6	5.22985	1	103.1	108.7	114	119.7	125.4	130.7	136.1
07:00	84	120	5.39606	1	103.6	109	114.5	120	125.9	131.2	136.8
07:01	85	120.6	5.39654	1	104	109.5	115	120.7	126.2	131.9	137.4
07:02	86	121	5.60258	1	104.3	110	115.4	121	126.8	132.3	137.9
07:03	87	121.4	5.60727	1	104.7	110.3	116	121.5	127.4	132.9	138.5
07:04	88	122	5.45789	1	105.2	110.9	116.3	122	127.9	133.5	139
07:05	89	122.4	5.25632	1	105.6	111.1	116.7	122.5	128.3	134	139.5
07:06	90	122.9	5.76285	1	106	111.6	117.2	123	128.9	134.4	140
07:07	91	123.4	5.21487	1	106.5	112	117.7	123.5	129.5	135	140.7
07:08	92	124	5.28514	1	106.8	112.3	118	124	129.9	135.5	141.1
07:09	93	124.3	5.56728	1	107.1	113	118.5	124.4	130.4	136	141.7
07:10	94	124.9	5.24854	1	107.6	113.3	119	125	130.7	136.5	142.3
07:11	95	125.4	5.65987	1	108	113.6	119.5	125.4	131.3	137	143
08:00	96	125.9	5.7613	1	108.3	114.1	120	126	132	137.5	143.3
08:01	97	126.1	6.21525	1	108.7	114.6	120.5	126.2	132.5	138.1	144
08:02	98	126.6	6.23584	1	109.1	115	121	126.7	133	138.7	144.5
08:03	99	127.2	6.21232	1	109.6	115.5	121.3	127.3	133.4	139.3	145.2
08:04	100	127.7	6.06325	1	110	116	121.8	127.8	134	139.9	145.8
08:05	101	128.2	6.02582	1	110.4	116.3	122.2	128.3	134.3	140.4	146.3
08:06	102	128.6	6.06359	1	110.8	116.7	122.6	128.7	135	141	147
08:07	103	129.1	6.35924	1	111.2	117.1	123.3	129.2	135.6	141.5	147.5
08:08	104	129.6	6.32584	1	111.7	117.6	123.8	129.7	136	142	148

08:09	105	130.2	6.38924	1	112	118	124.2	130.3	136.6	142.6	148.7
08:10	106	130.7	6.02584	1	112.4	118.5	124.6	130.8	137	143	149.1
08:11	107	131.1	6.02359	1	113	119	125	131.2	137.6	143.8	149.8
09:00	108	131.7	6.03576	1	113.3	119.5	125.6	131.8	138	144.3	150.3
09:01	109	132.1	6.32587	1	113.8	120	126	132.2	138.7	144.7	151
09:02	110	132.7	6.25478	1	114.2	120.4	126.5	132.8	139.1	145.2	151.5
09:03	111	133.2	6.29722	1	114.6	120.9	127	133.3	139.7	146	152
09:04	112	133.7	6.25584	1	115	121.2	127.4	133.8	140.3	146.5	152.5
09:05	113	134.1	6.32547	1	115.5	121.7	128	134.2	140.9	147	153.2
09:06	114	134.8	6.86152	1	116	122.2	128.5	134.9	141.3	147.7	153.9
09:07	115	135.4	6.25874	1	116.5	122.6	129	135.5	141.8	148	154.4
09:08	116	136	6.36985	1	117	123.2	129.5	136	142.4	148.8	155
09:09	117	136.4	6.64078	1	117.3	123.6	130	136.5	143	149.2	155.7
09:10	118	137	6.32145	1	117.7	124	130.5	137	143.5	149.9	156.1
09:11	119	137.2	6.32652	1	118.1	124.6	131	137.3	144	150.2	156.7
10:00	120	137.9	6.26325	1	118.6	125	131.5	138	144.5	151	157.3
10:01	121	138.4	6.23568	1	119	125.4	132	138.5	145	151.5	158
10:02	122	139	6.25874	1	119.5	126	132.5	139	145.5	152	158.6
10:03	123	139.4	6.76651	1	120	126.4	133	139.5	146.2	152.5	159
10:04	124	139.9	6.25142	1	120.5	127	133.4	140	146.7	153.2	159.8
10:05	125	140.4	6.25143	1	121	127.4	134	140.5	147.2	153.9	160.4
10:06	126	140.9	6.94455	1	121.3	128	134.4	141	147.7	154.4	161
10:07	127	141.4	6.32145	1	122	128.4	135	141.5	148.5	155	161.5
10:08	128	142	6.31542	1	122.3	129	135.5	142	149	155.5	162
10:09	129	142.5	6.82988	1	122.8	129.4	136	142.6	149.5	156	162.5
10:10	130	143	7.25874	1	123.2	130	136.5	143	150	156.5	163.2
10:11	131	143.7	7.25147	1	123.7	130.3	137	143.8	150.5	157.2	163.9
11:00	132	144.3	7.2237	1	124.3	131	137.4	144.4	151	157.9	164.5
11:01	133	144.8	7.22584	1	124.7	131.3	138	144.9	151.6	158.5	165
11:02	134	145.2	7.33698	1	125.1	132	138.6	145.3	152.1	159	165.5
11:03	135	146	6.79107	1	125.7	132.3	139	146	152.8	159.5	166.2
11:04	136	146.5	7.04235	1	126.1	133	139.6	146.5	153.4	160	166.8
11:05	137	147	7.04524	1	126.5	133.3	140	147	154	160.6	167.5
11:06	138	147.4	7.04072	1	127	134	140.6	147.5	154.4	161.2	168
11:07	139	147.9	7.02587	1	127.5	134.4	141	148	155	161.8	168.5
11:08	140	148.3	7.36985	1	128	135	141.6	148.4	155.4	162.5	169
11:09	141	148.9	7.3796	1	128.5	135.3	142	149	156	162.9	169.5
11:10	142	149.5	7.25874	1	129	135.8	142.7	149.5	156.7	163.5	170.1
11:11	143	149.9	7.32654	1	129.4	136.3	143	150	157	164	170.7
12:00	144	150.5	6.91346	1	130	136.8	143.5	150.6	157.5	164.5	171.3
12:01	145	150.9	6.99874	1	130.3	137.1	144	151	158	165	171.8
12:02	146	151.3	6.22584	1	130.8	137.7	144.5	151.4	158.5	165.4	172.3
12:03	147	151.9	6.99624	1	131.1	138	145	152	159	166	172.9
12:04	148	152.4	6.25147	1	131.6	138.5	145.4	152.5	159.5	166.5	173.2
12:05	149	153	6.25148	1	132	139	146	153	160	167	173.6
12:06	150	153.2	7.69385	1	132.5	139.5	146.3	153.3	160.5	167.5	174.2
12:07	151	153.5	7.06584	1	133	139.7	146.8	153.6	160.8	167.7	174.8
12:08	152	154	7.25147	1	133.3	140.2	147	154	161.3	168.2	175

12:09	153	154.4	7.06555	1	133.6	140.6	147.5	154.5	161.8	168.5	175.5
12:10	154	155	7.04258	1	134	141	148	155	162	169	176
12:11	155	155.1	7.04528	1	134.3	141.3	148.4	155.2	162.5	169.4	176.3
13:00	156	155.5	7.04015	1	134.7	141.6	148.7	155.6	162.9	169.9	176.7
13:01	157	156	6.32145	1	135	142	149	156	163.1	170	177
13:02	158	156.3	6.93258	1	135.4	142.4	149.3	156.4	163.5	170.5	177.5
13:03	159	156.6	6.93707	1	135.7	142.7	149.6	156.7	163.9	170.8	177.8
13:04	160	156.9	7.02548	1	136	143	150	157	164.2	171	177.9
13:05	161	157.1	7.02584	1	136.4	143.2	150.3	157.2	164.5	171.5	178
13:06	162	157.4	7.05622	1	136.6	143.6	150.6	157.5	164.8	171.8	178.1
13:07	163	157.9	7.02587	1	137	144	150.9	158	165	172	178.1
13:08	164	158.1	7.02591	1	137.1	144.1	151	158.2	165.4	172.1	178.1
13:09	165	158.3	7.21633	1	137.3	144.3	151.2	158.4	165.6	172.5	178.1
13:10	166	158.5	6.96325	1	137.4	144.5	151.6	158.6	165.9	172.8	178.1
13:11	167	158.7	6.39587	1	137.8	145	151.8	158.8	166	173	178.2
14:00	168	158.9	6.9325	1	138.1	145.1	152	159	166.1	173.1	178.2
14:01	169	159.1	6.66547	1	138.3	145.2	152.2	159.2	166.2	173.5	178.3
14:02	170	159.4	6.56441	1	138.5	145.4	152.5	159.5	166.5	173.6	178.3
14:03	171	159.6	6.78079	1	138.7	145.6	152.7	159.7	166.8	173.6	178.4
14:04	172	159.8	6.45871	1	139	145.8	152.8	159.9	167	173.7	178.4
14:05	173	159.9	6.25147	1	139.3	146	153	160	167.2	173.7	178.5
14:06	174	160	6.72809	1	139.4	146.2	153.2	160.1	167.3	173.7	178.5
14:07	175	160.1	6.25147	1	139.6	146.4	153.4	160.2	167.5	173.8	178.6
14:08	176	160.3	6.25874	1	139.7	146.6	153.6	160.4	167.7	173.8	178.6
14:09	177	160.5	6.6758	1	139.8	146.8	153.7	160.6	167.8	173.8	178.7
14:10	178	160.7	6.25145	1	140	147	153.8	160.8	167.9	173.9	178.7
14:11	179	160.8	6.25147	1	140.1	147.1	153.9	160.9	168	173.9	178.8
15:00	180	160.9	6.82588	1	140.2	147.2	154	161	168	173.9	178.8
15:01	181	161	6.25847	1	140.3	147.3	154.1	161.1	168.1	174	178.9
15:02	182	161.1	6.25841	1	140.4	147.4	154.2	161.2	168.2	174	178.9
15:03	183	161.2	6.63765	1	140.5	147.5	154.3	161.2	168.3	174	179
15:04	184	161.2	6.25847	1	140.7	147.5	154.4	161.3	168.4	174	179.1
15:05	185	161.2	6.23154	1	140.7	147.5	154.5	161.3	168.5	174	179.1
15:06	186	161.3	6.64982	1	141	147.6	154.6	161.4	168.5	174	179.2
15:07	187	161.3	6.62587	1	141.1	147.8	154.6	161.4	168.6	174.1	179.2
15:08	188	161.3	6.62852	1	141.2	147.9	154.7	161.4	168.6	174.1	179.2
15:09	189	161.4	6.62815	1	141.3	148	154.7	161.5	168.6	174.1	179.3
15:10	190	161.4	6.52698	1	141.4	148.1	154.8	161.5	168.7	174.2	179.3
15:11	191	161.4	6.52369	1	141.5	148.2	154.8	161.5	168.7	174.2	179.4
16:00	192	161.5	6.5274	1	141.6	148.3	154.8	161.6	168.7	174.2	179.4
16:01	193	161.5	6.41789	1	141.7	148.4	155	161.6	168.8	174.2	179.5
16:02	194	161.6	6.41654	1	141.8	148.5	155	161.7	168.8	174.2	179.5
16:03	195	161.6	6.41905	1	141.9	148.6	155	161.7	168.8	174.2	179.6
16:04	196	161.7	6.42654	1	142	148.6	155.1	161.8	168.8	174.2	179.6
16:05	197	161.7	6.42587	1	142.1	148.7	155.1	161.8	168.8	174.2	179.7
16:06	198	161.7	6.42287	1	142.2	148.7	155.2	161.8	168.9	174.2	179.7
16:07	199	161.8	6.50258	1	142.3	148.8	155.2	161.9	168.9	174.2	179.8
16:08	200	161.8	6.32548	1	142.4	148.8	155.2	161.9	168.9	174.2	179.8

16:09	201	161.8	6.50674	1	142.4	148.9	155.3	161.9	168.9	174.2	179.9
16:10	202	162	6.39584	1	142.5	148.9	155.3	162	168.9	174.2	179.9
16:11	203	162	6.39654	1	142.5	149	155.3	162	168.9	174.2	180
17:00	204	162	6.39211	1	142.5	149	155.4	162	168.9	174.2	180
17:01	205	162	6.47456	1	142.6	149.1	155.4	162.1	169	174.2	180
17:02	206	162	6.47582	1	142.6	149.1	155.4	162.1	169	174.2	180
17:03	207	162	6.47963	1	142.6	149.2	155.4	162.1	169	174.2	180
17:04	208	162	6.17546	1	142.6	149.2	155.5	162.1	169	174.2	180
17:05	209	162	6.17951	1	142.6	149.3	155.5	162.1	169.1	174.2	180
17:06	210	162	6.17637	1	142.6	149.3	155.5	162.1	169.1	174.2	180
17:07	211	162	6.16524	1	142.7	149.3	155.6	162.1	169.1	174.2	180
17:08	212	162	6.16258	1	142.7	149.4	155.6	162.1	169.1	174.2	180
17:09	213	162	6.16214	1	142.7	149.4	155.6	162.1	169.1	174.2	180
17:10	214	162	6.16258	1	142.7	149.4	155.6	162.1	169.1	174.2	180
17:11	215	162	6.15978	1	142.7	149.4	155.6	162.1	169.1	174.2	180
18:00	216	162	6.15977	1	142.7	149.4	155.7	162.1	169.1	174.2	180
18:01	217	162.1	6.18528	1	142.7	149.4	155.7	162.2	169.1	174.2	180
18:02	218	162.1	6.18254	1	142.7	149.5	155.7	162.2	169.1	174.2	180
18:03	219	162.1	6.18673	1	142.8	149.5	155.7	162.2	169.1	174.2	180
18:04	220	162.1	6.19321	1	142.8	149.5	155.7	162.2	169.1	174.2	180
18:05	221	162.1	6.19632	1	142.8	149.5	155.8	162.2	169.2	174.2	180
18:06	222	162.1	6.19187	1	142.8	149.5	155.8	162.2	169.2	174.2	180
18:07	223	162.1	6.19187	1	142.8	149.5	155.8	162.2	169.2	174.2	180
18:08	224	162.1	6.19487	1	142.8	149.5	155.8	162.2	169.2	174.2	180
18:09	225	162.1	6.19187	1	142.8	149.5	155.8	162.2	169.2	174.2	180
18:10	226	162.1	6.19187	1	142.8	149.5	155.8	162.2	169.2	174.2	180
18:11	227	162.1	6.47949	1	142.8	149.5	155.8	162.2	169.2	174.2	180
19:00	228	162.1	6.47949	1	142.8	149.5	155.8	162.2	169.2	174.2	180

Table (5): shows Egyptian LMS and z scores BMI for age for boys from 5 years to 19 years

BMI-for-age BOYS

Egyptian Z-score 5Years to 19 Years

Y:M	M	Mean	S	L	-3SD	-2SD	-1SD	Median	1SD	2SD	3SD
05:01	61	15.7062	0.08502	-0.3611	12.5	13.3	14.5	15.7	17.1	19.8	21.3
05:02	62	15.7359	0.08525	-0.3633	12.5	13.3	14.5	15.7	17.2	19.8	21.3
05:03	63	15.7456	0.08539	-0.3655	12.5	13.3	14.5	15.7	17.2	19.8	21.4
05:04	64	15.7586	0.08555	-0.3699	12.5	13.3	14.5	15.7	17.2	19.8	21.4
05:05	65	15.7685	0.08599	-0.3744	12.5	13.3	14.5	15.7	17.2	19.8	21.5
05:06	66	15.7758	0.08602	-0.3777	12.5	13.3	14.5	15.7	17.2	19.9	21.5
05:07	67	15.7862	0.08609	-0.3788	12.5	13.3	14.5	15.7	17.2	19.9	21.6
05:08	68	15.7895	0.08623	-0.3799	12.5	13.3	14.5	15.7	17.2	19.9	21.6
05:09	69	15.7935	0.08665	-0.3801	12.5	13.3	14.5	15.7	17.2	19.9	21.6
05:10	70	15.8052	0.08688	-0.3822	12.5	13.3	14.5	15.8	17.2	19.9	21.7
05:11	71	15.8125	0.08711	-0.3844	12.5	13.3	14.5	15.8	17.2	20	21.7
06:00	72	15.8687	0.08755	-0.3855	12.5	13.3	14.5	15.8	17.3	20	21.7
06:01	73	15.8789	0.08745	-0.3865	12.5	13.3	14.5	15.8	17.3	20	21.7
06:02	74	15.8896	0.08765	-0.3875	12.6	13.3	14.5	15.8	17.3	20	21.8
06:03	75	15.8938	0.08799	-0.3885	12.6	13.3	14.5	15.8	17.3	20.1	21.8
06:04	76	15.9085	0.08803	-0.3895	12.6	13.3	14.5	15.9	17.3	20.1	21.9
06:05	77	15.9093	0.08833	-0.3899	12.6	13.3	14.5	15.9	17.3	20.1	21.9
06:06	78	15.9185	0.08845	-0.3901	12.6	13.3	14.6	15.9	17.4	20.2	21.9
06:07	79	15.9356	0.08861	-0.3922	12.6	13.3	14.6	15.9	17.4	20.2	22
06:08	80	15.9756	0.08877	-0.3935	12.6	13.3	14.6	15.9	17.4	20.2	22.1
06:09	81	15.9985	0.08888	-0.3945	12.6	13.3	14.6	15.9	17.4	20.3	22.2
06:10	82	16.0159	0.08901	-0.3956	12.6	13.3	14.6	16	17.4	20.3	22.3
06:11	83	16.0358	0.08945	-0.3966	12.6	13.3	14.6	16	17.4	20.4	22.4
07:00	84	16.0458	0.08955	-0.3978	12.7	13.3	14.6	16	17.5	20.4	22.5
07:01	85	16.0689	0.08999	-0.3999	12.7	13.3	14.6	16	17.6	20.5	22.6
07:02	86	16.0786	0.09001	-0.4009	12.7	13.3	14.7	16	17.6	20.5	22.7
07:03	87	16.1158	0.09039	-0.4022	12.7	13.3	14.7	16.1	17.7	20.6	22.8
07:04	88	16.135	0.09111	-0.4125	12.7	13.4	14.7	16.1	17.7	20.7	22.9
07:05	89	16.1456	0.09123	-0.4258	12.7	13.4	14.7	16.1	17.7	20.7	23
07:06	90	16.2285	0.09129	-0.4359	12.7	13.4	14.7	16.2	17.8	20.8	23.1
07:07	91	16.2586	0.09254	-0.4458	12.8	13.4	14.7	16.2	17.8	20.8	23.2
07:08	92	16.2753	0.09299	-0.4528	12.8	13.4	14.7	16.2	17.8	20.8	23.3
07:09	93	16.3158	0.09311	-0.4658	12.8	13.4	14.8	16.3	17.8	20.8	23.4
07:10	94	16.3452	0.09322	-0.4789	12.8	13.4	14.8	16.3	17.8	20.9	23.5
07:11	95	16.3689	0.09355	-0.4852	12.8	13.4	14.8	16.3	17.9	20.9	23.6
08:00	96	16.4285	0.09388	-0.4951	12.9	13.4	14.8	16.4	17.9	20.9	23.7
08:01	97	16.4658	0.09399	-0.4999	12.9	13.5	14.8	16.4	18	21	23.9
08:02	98	16.4902	0.09401	-0.5044	12.9	13.5	14.8	16.4	18	21	24
08:03	99	16.5054	0.09409	-0.5124	12.9	13.5	14.8	16.5	18	21.1	24.2
08:04	100	16.5125	0.09412	-0.5214	12.9	13.5	14.9	16.5	18	21.1	24.3
08:05	101	16.668	0.09422	-0.5369	12.9	13.6	14.9	16.6	18.1	21.2	24.5
08:06	102	16.6785	0.09455	-0.5417	12.9	13.6	14.9	16.6	18.1	21.2	24.6
08:07	103	16.7075	0.09466	-0.5528	13	13.6	14.9	16.7	18.1	21.3	24.8
08:08	104	16.7285	0.09475	-0.5652	13	13.6	14.9	16.7	18.2	21.4	24.9
08:09	105	16.82358	0.09488	-0.5789	13	13.7	14.9	16.8	18.2	21.4	25.1

08:10	106	16.83568	0.09498	-0.5841	13	13.7	15	16.8	18.3	21.5	25.3
08:11	107	16.9752	0.09502	-0.5962	13	13.7	15	16.9	18.3	21.5	25.5
09:00	108	16.9963	0.09522	-0.5989	13.1	13.7	15	16.9	18.3	21.6	25.6
09:01	109	16.9996	0.09536	-0.6014	13.1	13.8	15	16.9	18.4	21.6	25.8
09:02	110	17.0456	0.09545	-0.6125	13.1	13.8	15	17	18.4	21.7	25.9
09:03	111	17.0562	0.09565	-0.6258	13.1	13.8	15.1	17	18.4	21.7	26
09:04	112	17.1185	0.09575	-0.6364	13.1	13.8	15.1	17.1	18.4	21.8	26.2
09:05	113	17.1258	0.09622	-0.6458	13.1	13.8	15.1	17.1	18.5	21.9	26.3
09:06	114	17.2685	0.09755	-0.6521	13.2	13.9	15.1	17.2	18.5	22	26.5
09:07	115	17.2285	0.09841	-0.6621	13.2	13.9	15.2	17.2	18.6	22.1	26.7
09:08	116	17.3658	0.09962	-0.6741	13.2	13.9	15.2	17.3	18.6	22.2	26.8
09:09	117	17.3952	0.10003	-0.6874	13.2	13.9	15.2	17.3	18.7	22.3	26.9
09:10	118	17.4175	0.10023	-0.6958	13.2	13.9	15.2	17.4	18.7	22.4	27
09:11	119	17.4956	0.10057	-0.6988	13.3	13.9	15.3	17.4	18.8	22.5	27.2
10:00	120	17.5458	0.10111	-0.7018	13.3	13.9	15.3	17.5	18.8	22.6	27.4
10:01	121	17.5963	0.10254	-0.7022	13.3	14	15.4	17.5	18.9	22.7	27.5
10:02	122	17.5993	0.10365	-0.7147	13.3	14	15.4	17.5	18.9	22.7	27.6
10:03	123	17.6257	0.10478	-0.7248	13.3	14	15.4	17.6	19	22.8	27.8
10:04	124	17.6658	0.10569	-0.7325	13.4	14	15.5	17.6	19	22.8	28
10:05	125	17.7175	0.10698	-0.7425	13.4	14.1	15.5	17.7	19.1	22.9	28.1
10:06	126	17.7523	0.10789	-0.7528	13.4	14.1	15.5	17.7	19.2	22.9	28.3
10:07	127	17.7785	0.10814	-0.7635	13.4	14.1	15.6	17.7	19.3	23	28.4
10:08	128	17.8201	0.10874	-0.7789	13.5	14.1	15.6	17.8	19.3	23.1	28.6
10:09	129	17.8513	0.10911	-0.7852	13.5	14.2	15.6	17.8	19.4	23.2	28.7
10:10	130	17.9074	0.10925	-0.7936	13.5	14.2	15.7	17.9	19.4	23.3	28.9
10:11	131	17.9632	0.10955	-0.8125	13.5	14.2	15.7	17.9	19.5	23.4	29
11:00	132	18.042	0.10999	-0.8258	13.6	14.3	15.7	18	19.6	23.5	29.2
11:01	133	18.067	0.11005	-0.8458	13.6	14.3	15.8	18	19.6	23.5	29.3
11:02	134	18.085	0.11009	-0.8582	13.6	14.3	15.8	18	19.7	23.6	29.5
11:03	135	18.1125	0.11022	-0.8635	13.6	14.4	15.8	18.1	19.7	23.7	29.7
11:04	136	18.1345	0.11066	-0.8952	13.7	14.4	15.9	18.1	19.8	23.7	29.8
11:05	137	18.1345	0.11089	-0.9125	13.7	14.4	15.9	18.1	19.9	23.8	29.9
11:06	138	18.22452	0.11098	-0.9365	13.7	14.5	15.9	18.2	20	23.9	30
11:07	139	18.2364	0.11123	-0.9587	13.7	14.5	16	18.2	20	24	30.2
11:08	140	18.3563	0.11129	-0.9852	13.7	14.5	16	18.3	20	24	30.4
11:09	141	18.3756	0.11132	-0.9925	13.8	14.5	16	18.3	20.1	24.1	30.5
11:10	142	18.4105	0.11149	-1.0009	13.8	14.6	16.1	18.4	20.2	24.2	30.6
11:11	143	18.4357	0.11158	-1.0099	13.8	14.6	16.1	18.4	20.3	24.3	30.7
12:00	144	18.521	0.11169	-1.0125	13.8	14.6	16.1	18.5	20.4	24.4	30.9
12:01	145	18.5732	0.11171	-1.0357	13.9	14.7	16.2	18.5	20.5	24.5	31
12:02	146	18.5993	0.11189	-1.0591	13.9	14.7	16.2	18.5	20.6	24.6	31.2
12:03	147	18.6212	0.11193	-1.0852	14	14.7	16.3	18.6	20.6	24.7	31.3
12:04	148	18.6632	0.11199	-1.0999	14	14.8	16.3	18.6	20.7	24.8	31.4
12:05	149	18.7045	0.11201	-1.1125	14	14.8	16.4	18.7	20.8	24.9	31.5
12:06	150	18.7358	0.11209	-1.1258	14	14.8	16.5	18.7	20.9	25	31.6
12:07	151	18.801	0.11233	-1.1456	14.1	14.9	16.5	18.8	20.9	25.1	31.7
12:08	152	18.9635	0.11255	-1.1658	14.1	15	16.6	18.9	21	25.2	31.8
12:09	153	19.045	0.11265	-1.1789	14.1	15	16.6	19	21.1	25.3	32

12:10	154	19.1158	0.11278	-1.1899	14.2	15	16.7	19.1	21.2	25.4	32.2
12:11	155	19.1358	0.11298	-1.1936	14.2	15.1	16.7	19.1	21.3	25.5	32.4
13:00	156	19.2258	0.11299	-1.2002	14.2	15.1	16.8	19.2	21.3	25.6	32.6
13:01	157	19.2652	0.11301	-1.2022	14.3	15.2	16.9	19.2	21.4	25.7	32.7
13:02	158	19.3275	0.11322	-1.2123	14.3	15.2	17	19.3	21.5	25.8	32.9
13:03	159	19.3358	0.11333	-1.2369	14.4	15.3	17	19.3	21.6	25.9	33
13:04	160	19.4452	0.11345	-1.2456	14.4	15.3	17.1	19.4	21.6	26	33.2
13:05	161	19.5963	0.11355	-1.2589	14.4	15.3	17.1	19.5	21.6	26.1	33.4
13:06	162	19.6052	0.11366	-1.2698	14.5	15.4	17.2	19.6	21.7	26.2	33.6
13:07	163	19.7624	0.11389	-1.2789	14.5	15.4	17.2	19.7	21.7	26.3	33.7
13:08	164	19.7963	0.11399	-1.2985	14.6	15.4	17.3	19.7	21.8	26.4	33.8
13:09	165	19.8204	0.11401	-1.3058	14.6	15.5	17.3	19.8	21.8	26.5	33.9
13:10	166	19.8602	0.11422	-1.3129	14.7	15.5	17.4	19.8	21.9	26.6	34
13:11	167	19.9304	0.11436	-1.3299	14.7	15.6	17.4	19.9	22	26.7	34.1
14:00	168	20.043	0.11444	-1.3369	14.7	15.6	17.4	20	22.1	26.8	34.2
14:01	169	20.0576	0.11455	-1.3587	14.8	15.7	17.5	20	22.2	26.9	34.3
14:02	170	20.1152	0.11465	-1.3639	14.8	15.7	17.5	20.1	22.3	27	34.4
14:03	171	20.1963	0.11478	-1.3789	14.8	15.7	17.6	20.1	22.4	27.1	34.6
14:04	172	20.2243	0.11498	-1.3985	14.9	15.8	17.6	20.2	22.5	27.2	34.8
14:05	173	20.2538	0.11499	-1.4123	14.9	15.8	17.7	20.2	22.6	27.3	34.9
14:06	174	20.3279	0.11501	-1.4369	14.9	15.9	17.8	20.3	22.7	27.4	35
14:07	175	20.3685	0.11522	-1.4759	15	15.9	17.8	20.3	22.8	27.5	35.1
14:08	176	20.4135	0.11533	-1.4999	15	16	17.9	20.4	22.8	27.6	35.2
14:09	177	20.4896	0.11587	-1.5258	15	16	17.9	20.4	22.9	27.7	35.3
14:10	178	20.5357	0.11598	-1.5456	15.1	16.1	18	20.5	23	27.8	35.4
14:11	179	20.5687	0.11601	-1.5852	15.1	16.1	18	20.5	23.1	27.9	35.6
15:00	180	20.6152	0.11622	-1.5999	15.2	16.2	18.1	20.6	23.2	28	35.7
15:01	181	20.6685	0.11636	-1.6125	15.2	16.3	18.2	20.6	23.2	28.1	35.8
15:02	182	20.6963	0.11646	-1.6456	15.2	16.3	18.3	20.6	23.3	28.2	35.9
15:03	183	20.7245	0.11656	-1.6852	15.3	16.4	18.3	20.7	23.3	28.3	36
15:04	184	20.7356	0.11678	-1.6963	15.3	16.4	18.3	20.7	23.4	28.4	36.1
15:05	185	20.7789	0.11688	-1.7003	15.3	16.5	18.4	20.7	23.4	28.5	36.2
15:06	186	20.8052	0.11699	-1.7125	15.4	16.5	18.4	20.8	23.5	28.6	36.3
15:07	187	20.8605	0.11701	-1.7009	15.4	16.5	18.5	20.8	23.5	28.7	36.3
15:08	188	20.8785	0.11711	-1.6852	15.4	16.6	18.5	20.8	23.6	28.8	36.3
15:09	189	20.9301	0.11723	-1.6521	15.5	16.6	18.6	20.9	23.7	28.9	36.4
15:10	190	21.08	0.11745	-1.6123	15.5	16.7	18.6	21	23.8	29	36.4
15:11	191	21.0963	0.11798	-1.5987	15.6	16.7	18.7	21	23.8	29.1	36.4
16:00	192	21.1342	0.11799	-1.5258	15.6	16.7	18.7	21.1	23.9	29.2	36.5
16:01	193	21.1356	0.11801	-1.4963	15.6	16.8	18.8	21.1	24	29.3	36.6
16:02	194	21.2275	0.11825	-1.4528	15.6	16.9	18.8	21.2	24.1	29.4	36.6
16:03	195	21.2369	0.11865	-1.4325	15.7	17	18.9	21.2	24.1	29.5	36.7
16:04	196	21.3356	0.11888	-1.4111	15.7	17	18.9	21.3	24.2	29.6	36.7
16:05	197	21.3563	0.11899	-1.3987	15.7	17	18.9	21.3	24.3	29.7	36.8
16:06	198	21.3756	0.11902	-1.3528	15.8	17.1	19	21.3	24.4	29.8	36.9
16:07	199	21.4205	0.11936	-1.3411	15.8	17.1	19	21.4	24.4	29.9	36.9
16:08	200	21.4356	0.11945	-1.3211	15.9	17.2	19.1	21.4	24.5	30	37
16:09	201	21.5453	0.11999	-1.3009	15.9	17.2	19.1	21.5	24.5	30.1	37

16:10	202	21.5896	0.12009	-1.2951	15.9	17.2	19.2	21.5	24.6	30.2	37
16:11	203	21.6234	0.12019	-1.2841	16	17.2	19.2	21.6	24.6	30.3	37
17:00	204	21.6863	0.12036	-1.2211	16	17.2	19.3	21.6	24.7	30.4	37
17:01	205	21.6932	0.12099	-1.2022	16	17.3	19.3	21.6	24.7	30.4	37.1
17:02	206	21.69921	0.12111	-1.1528	16.1	17.3	19.4	21.6	24.8	30.5	37.1
17:03	207	21.7025	0.12112	-1.1321	16.1	17.3	19.4	21.7	24.8	30.6	37.1
17:04	208	21.7325	0.12236	-1.1009	16.1	17.4	19.5	21.7	24.9	30.6	37.1
17:05	209	21.7685	0.12325	-1.0899	16.1	17.4	19.5	21.7	24.9	30.7	37.2
17:06	210	21.8985	0.12456	-1.0528	16.1	17.4	19.5	21.8	25	30.7	37.2
17:07	211	21.8996	0.12526	-1.0235	16.1	17.4	19.5	21.8	25.1	30.8	37.2
17:08	212	21.8999	0.12599	-1.0009	16.1	17.4	19.6	21.8	25.1	30.8	37.2
17:09	213	21.90257	0.12601	-0.9963	16.2	17.5	19.6	21.9	25.2	30.9	37.2
17:10	214	21.92145	0.12636	-0.9852	16.2	17.5	19.6	21.9	25.2	30.9	37.2
17:11	215	22.0258	0.12689	-0.9753	16.2	17.5	19.7	22	25.2	31	37.2
18:00	216	22.3548	0.12699	-0.9654	16.2	17.5	19.7	22	25.3	31	37.2
18:01	217	22.1125	0.12714	-0.9521	16.2	17.6	19.7	22.1	25.3	31.1	37.3
18:02	218	22.1355	0.12752	-0.9421	16.3	17.6	19.7	22.1	25.4	31.1	37.3
18:03	219	22.2357	0.12798	-0.9325	16.3	17.6	19.8	22.2	25.4	31.2	37.3
18:04	220	22.2685	0.12799	-0.9254	16.3	17.7	19.8	22.2	25.4	31.2	37.3
18:05	221	22.2963	0.12801	-0.9125	16.3	17.7	19.8	22.2	25.5	31.3	37.3
18:06	222	22.3235	0.12822	-0.9111	16.3	17.7	19.9	22.3	25.5	31.3	37.3
18:07	223	22.3657	0.12833	-0.8936	16.3	17.8	19.9	22.3	25.6	31.4	37.3
18:08	224	22.3769	0.12855	-0.8852	16.3	17.8	19.9	22.3	25.6	31.4	37.3
18:09	225	22.4025	0.12866	-0.8745	16.3	17.8	20	22.4	25.6	31.4	37.3
18:10	226	22.4357	0.12865	-0.8625	16.3	17.8	20	22.4	25.7	31.4	37.3
18:11	227	22.4568	0.12898	-0.8528	16.3	17.8	20	22.4	25.7	31.4	37.3
19:00	228	22.4963	0.12899	-0.8421	16.3	17.8	20	22.4	25.7	31.4	37.3

Table (6): shows Egyptian LMS and z scores BMI for age for girls from 5 years to 19 years

BMI-for-age GIRLS

Egyptian Z-score 5 Years to 19 Years

Y:M	M	Mean	S	L	-3SD	-2SD	-1SD	Median	1SD	2SD	3SD
05:01	61	15.5985	0.08852	-0.7965	12	13	14.5	15.5	17.5	20.6	21.7
05:02	62	15.5756	0.08963	-0.8569	12	13	14.5	15.5	17.5	20.7	21.8
05:03	63	15.5685	0.08999	-0.8899	12	13	14.5	15.5	17.5	20.8	21.9
05:04	64	15.544	0.09009	-0.8999	12	13	14.5	15.5	17.5	20.8	22
05:05	65	15.5356	0.09011	-0.9002	12	13	14.5	15.5	17.5	20.9	22
05:06	66	15.5305	0.09123	-0.9016	12	13	14.5	15.5	17.6	20.9	22.1
05:07	67	15.5012	0.09222	-0.9111	12	13	14.5	15.5	17.6	21	22.2
05:08	68	15.4756	0.09299	-0.9569	12	13	14.5	15.5	17.6	21	22.3
05:09	69	15.4358	0.09369	-0.9889	12	13	14.5	15.5	17.6	21.1	22.4
05:10	70	15.6420	0.09456	-1.0258	12	13	14.5	15.6	17.6	21.2	22.5
05:11	71	15.6589	0.09588	-1.0369	12	13	14.5	15.6	17.6	21.3	22.6
06:00	72	15.6689	0.09623	-1.0458	12	13	14.5	15.6	17.7	21.3	22.7
06:01	73	15.686	0.09789	-1.0789	12	13	14.5	15.6	17.7	21.3	22.7
06:02	74	15.696	0.09825	-1.0899	12	13	14.5	15.6	17.7	21.3	22.8
06:03	75	15.704	0.09963	-1.0936	12	13	14.5	15.7	17.7	21.3	22.9
06:04	76	15.7357	0.09999	-1.1022	12	13	14.5	15.7	17.7	21.3	23
06:05	77	15.7583	0.10015	-1.1055	12	13	14.5	15.7	17.7	21.4	23.1
06:06	78	15.7862	0.10049	-1.1125	12	13	14.5	15.7	17.8	21.4	23.2
06:07	79	15.7963	0.10109	-1.1222	12	13	14.5	15.7	17.8	21.4	23.3
06:08	80	15.8042	0.10199	-1.1325	12	13	14.5	15.8	17.8	21.4	23.3
06:09	81	15.8358	0.10212	-1.1369	12	13	14.5	15.8	17.8	21.5	23.4
06:10	82	15.8458	0.10222	-1.1399	12	13	14.5	15.8	17.8	21.5	23.4
06:11	83	15.7687	0.10236	-1.1411	12	13	14.5	15.8	17.9	21.5	23.5
07:00	84	15.8358	0.10288	-1.1502	12	13	14.5	15.8	17.9	21.6	23.6
07:01	85	15.8785	0.10299	-1.1602	12.1	13	14.6	15.8	17.9	21.6	23.7
07:02	86	15.8962	0.10311	-1.1632	12.1	13	14.6	15.9	17.9	21.7	23.9
07:03	87	15.994	0.10333	-1.1706	12.1	13	14.6	15.9	18	21.8	24
07:04	88	15.999	0.10365	-1.1709	12.1	13	14.6	15.9	18	21.8	24.2
07:05	89	16.014	0.10399	-1.1836	12.1	13	14.6	16	18	21.9	24.4
07:06	90	16.045	0.10411	-1.1936	12.1	13	14.7	16	18.1	21.9	24.6
07:07	91	16.068	0.10454	-1.1989	12.1	13.1	14.7	16.1	18.1	22	24.7
07:08	92	16.115	0.10499	-1.2009	12.1	13.1	14.7	16.1	18.1	22	24.8
07:09	93	16.1358	0.10501	-1.2055	12.1	13.1	14.8	16.1	18.2	22.1	25
07:10	94	16.2258	0.10522	-1.2123	12.1	13.1	14.8	16.2	18.2	22.2	25.1
07:11	95	16.2456	0.10533	-1.2254	12.1	13.1	14.8	16.2	18.2	22.3	25.2
08:00	96	16.3358	0.10555	-1.2299	12.1	13.1	14.9	16.3	18.3	22.4	25.4
08:01	97	16.3456	0.10599	-1.2311	12.2	13.2	14.9	16.3	18.3	22.5	25.5
08:02	98	16.4752	0.10612	-1.2345	12.2	13.2	14.9	16.4	18.3	22.6	25.7
08:03	99	16.4962	0.10632	-1.2398	12.2	13.2	14.9	16.4	18.4	22.7	25.9
08:04	100	16.5254	0.10657	-1.2417	12.2	13.2	14.9	16.5	18.4	22.7	26
08:05	101	16.5532	0.10666	-1.2587	12.3	13.2	15	16.5	18.4	22.8	26.1
08:06	102	16.6014	0.10699	-1.2599	12.3	13.3	15	16.6	18.5	22.9	26.2
08:07	103	16.6856	0.10711	-1.2602	12.3	13.3	15	16.6	18.5	23	26.3
08:08	104	16.7245	0.10755	-1.2613	12.3	13.3	15.1	16.7	18.6	23	26.5
08:09	105	16.7625	0.10766	-1.2687	12.3	13.3	15.1	16.7	18.6	23.1	26.6

08:10	106	16.812	0.10777	-1.2699	12.3	13.3	15.1	16.8	18.7	23.1	26.8
08:11	107	16.8358	0.10799	-1.2709	12.3	13.3	15.2	16.8	18.7	23.2	26.9
09:00	108	16.8752	0.10801	-1.2711	12.4	13.4	15.2	16.9	18.8	23.2	27
09:01	109	16.9015	0.10932	-1.2789	12.4	13.4	15.2	16.9	18.8	23.2	27.2
09:02	110	16.9358	0.11002	-1.2799	12.4	13.4	15.2	17	18.9	23.3	27.3
09:03	111	17.075	0.11125	-1.2802	12.5	13.4	15.3	17.1	19	23.3	27.5
09:04	112	17.0956	0.11236	-1.2825	12.5	13.5	15.3	17.1	19	23.4	27.6
09:05	113	17.1158	0.11369	-1.2855	12.5	13.5	15.3	17.2	19.1	23.5	27.8
09:06	114	17.2357	0.11456	-1.2888	12.6	13.5	15.4	17.3	19.2	23.6	27.9
09:07	115	17.3102	0.11569	-1.2899	12.6	13.6	15.4	17.3	19.3	23.7	28
09:08	116	17.4357	0.11698	-1.2905	12.6	13.6	15.4	17.4	19.4	23.8	28.2
09:09	117	17.4852	0.11754	-1.2946	12.6	13.6	15.5	17.4	19.4	23.9	28.4
09:10	118	17.5421	0.11852	-1.2988	12.7	13.7	15.5	17.5	19.4	24	28.6
09:11	119	17.5965	0.11963	-1.2999	12.7	13.7	15.5	17.5	19.5	24.1	28.7
10:00	120	17.654	0.11999	-1.3005	12.7	13.7	15.5	17.6	19.5	24.2	28.8
10:01	121	17.635	0.12009	-1.3009	12.8	13.8	15.5	17.6	19.5	24.2	28.9
10:02	122	17.7752	0.12125	-1.3041	12.8	13.8	15.5	17.7	19.6	24.3	29
10:03	123	17.8245	0.12258	-1.3069	12.9	13.8	15.6	17.8	19.6	24.4	29.2
10:04	124	17.885	0.12369	-1.3099	12.9	13.9	15.6	17.8	19.7	24.5	29.3
10:05	125	17.9175	0.12456	-1.3148	12.9	14	15.6	17.9	19.8	24.5	29.5
10:06	126	17.9358	0.12569	-1.3189	13	14	15.6	17.9	19.9	24.6	29.7
10:07	127	17.99912	0.12698	-1.3201	13	14	15.7	18	20	24.7	29.9
10:08	128	18.028	0.12789	-1.3222	13	14	15.7	18	20.1	24.8	30.1
10:09	129	18.1258	0.12852	-1.3299	13.1	14.1	15.7	18.1	20.2	24.9	30.3
10:10	130	18.2352	0.12963	-1.3302	13.1	14.1	15.8	18.2	20.3	25	30.5
10:11	131	18.2856	0.12987	-1.3311	13.1	14.1	15.8	18.2	20.4	25.1	30.6
11:00	132	18.3358	0.13006	-1.3333	13.2	14.2	15.8	18.3	20.5	25.2	30.7
11:01	133	18.3697	0.13022	-1.3458	13.2	14.2	15.9	18.3	20.5	25.3	30.9
11:02	134	18.3965	0.13055	-1.3569	13.3	14.3	15.9	18.4	20.6	25.3	31
11:03	135	18.4258	0.13066	-1.3698	13.3	14.3	16	18.5	20.7	25.4	31.1
11:04	136	18.5635	0.13099	-1.3789	13.4	14.4	16.1	18.6	20.8	25.5	31.2
11:05	137	18.6752	0.13101	-1.3852	13.5	14.5	16.1	18.7	20.9	25.6	31.4
11:06	138	18.7963	0.13111	-1.3914	13.5	14.5	16.2	18.8	21	25.7	31.6
11:07	139	18.8258	0.13122	-1.4008	13.6	14.6	16.3	18.8	21	25.8	31.7
11:08	140	18.9452	0.13133	-1.4123	13.6	14.6	16.4	18.9	21.1	25.8	31.8
11:09	141	19.0586	0.13144	-1.4254	13.7	14.7	16.5	19	21.2	25.9	32
11:10	142	19.0863	0.13155	-1.4369	13.8	14.7	16.5	19.1	21.2	26	32.2
11:11	143	19.2158	0.13166	-1.4411	13.9	14.8	16.6	19.2	21.3	26.1	32.3
12:00	144	19.2752	0.13177	-1.4399	14	14.9	16.6	19.2	21.4	26.2	32.4
12:01	145	19.3345	0.13189	-1.4302	14	15	16.7	19.3	21.5	26.3	32.5
12:02	146	19.3752	0.13196	-1.4287	14.1	15.1	16.7	19.3	21.6	26.4	32.6
12:03	147	19.4756	0.13201	-1.4211	14.1	15.1	16.8	19.4	21.6	26.5	32.7
12:04	148	19.5258	0.13222	-1.4205	14.2	15.2	16.8	19.5	21.7	26.6	32.8
12:05	149	19.6658	0.13236	-1.4066	14.2	15.2	16.9	19.6	21.8	26.7	32.9
12:06	150	19.7258	0.13245	-1.4033	14.3	15.3	16.9	19.7	21.8	26.8	33
12:07	151	19.7685	0.13255	-1.3987	14.3	15.4	17	19.7	21.9	26.9	33.2
12:08	152	19.8258	0.13266	-1.3903	14.4	15.4	17	19.8	22	27	33.4
12:09	153	19.8685	0.13278	-1.3888	14.4	15.4	17.1	19.8	22	27.1	33.6

12:10	154	19.9375	0.13289	-1.3814	14.5	15.5	17.1	19.9	22.1	27.2	33.8
12:11	155	19.9658	0.13333	-1.3802	14.5	15.5	17.2	19.9	22.2	27.3	33.9
13:00	156	20.0158	0.13345	-1.3798	14.5	15.5	17.2	20	22.3	27.4	34
13:01	157	20.0452	0.13355	-1.3789	14.5	15.5	17.3	20.1	22.4	27.4	34.1
13:02	158	20.2257	0.13366	-1.3711	14.6	15.6	17.3	20.2	22.5	27.5	34.2
13:03	159	20.3358	0.13378	-1.3705	14.6	15.6	17.3	20.3	22.5	27.6	34.3
13:04	160	20.4425	0.13388	-1.3687	14.7	15.7	17.4	20.4	22.6	27.7	34.4
13:05	161	20.4961	0.13399	-1.3674	14.8	15.8	17.4	20.4	22.7	27.7	34.5
13:06	162	20.3258	0.13401	-1.3611	14.8	15.8	17.5	20.4	22.8	27.8	34.6
13:07	163	20.5354	0.13411	-1.3609	14.9	15.9	17.5	20.5	22.8	27.9	34.7
13:08	164	20.6752	0.13422	-1.3587	14.9	15.9	17.5	20.6	22.9	28	34.8
13:09	165	20.7015	0.13444	-1.3578	15	16	17.6	20.7	23	28.1	34.9
13:10	166	20.8752	0.13454	-1.3533	15.1	16	17.6	20.8	23.1	28.2	35
13:11	167	20.9346	0.13455	-1.3511	15.1	16	17.7	20.9	23.2	28.3	35.1
14:00	168	20.9892	0.13466	-1.3505	15.1	16.1	17.7	20.9	23.3	28.4	35.2
14:01	169	21.0157	0.13477	-1.3485	15.1	16.1	17.8	21	23.3	28.5	35.3
14:02	170	21.0358	0.13488	-1.3357	15.2	16.2	17.8	21	23.4	28.6	35.4
14:03	171	21.1125	0.13499	-1.3258	15.2	16.2	17.9	21.1	23.5	28.7	35.5
14:04	172	21.2345	0.13501	-1.3222	15.2	16.2	17.9	21.2	23.6	28.7	35.6
14:05	173	21.2962	0.13511	-1.3199	15.2	16.2	18	21.2	23.6	28.8	35.7
14:06	174	21.3204	0.13522	-1.3155	15.2	16.2	18	21.3	23.7	28.9	35.7
14:07	175	21.3820	0.13533	-1.3142	15.2	16.2	18.1	21.3	23.7	29	35.8
14:08	176	21.4123	0.13544	-1.3101	15.3	16.3	18.1	21.4	23.8	29	35.8
14:09	177	21.47125	0.13555	-1.3009	15.3	16.3	18.2	21.4	23.8	29.1	35.9
14:10	178	21.5264	0.13565	-1.2999	15.3	16.3	18.2	21.5	23.9	29.2	35.9
14:11	179	21.5852	0.13575	-1.2951	15.3	16.3	18.3	21.5	23.9	29.3	36
15:00	180	21.6486	0.13585	-1.2911	15.3	16.4	18.3	21.6	24	29.4	36
15:01	181	21.5382	0.13599	-1.2896	15.3	16.4	18.4	21.6	24	29.5	36.1
15:02	182	21.719	0.13601	-1.2888	15.3	16.4	18.4	21.7	24.1	29.6	36.1
15:03	183	21.7204	0.13622	-1.2855	15.3	16.4	18.4	21.7	24.1	29.6	36.2
15:04	184	21.8587	0.13633	-1.2843	15.3	16.4	18.4	21.8	24.2	29.7	36.2
15:05	185	21.8375	0.13644	-1.2801	15.3	16.5	18.5	21.8	24.2	29.8	36.3
15:06	186	21.9352	0.13654	-1.2799	15.3	16.5	18.5	21.9	24.3	29.9	36.4
15:07	187	21.9963	0.13636	-1.2788	15.3	16.6	18.5	21.9	24.3	30	36.4
15:08	188	22.0178	0.13646	-1.2763	15.3	16.7	18.6	22	24.4	30	36.5
15:09	189	21.9258	0.13656	-1.2751	15.4	16.7	18.6	22	24.5	30.1	36.5
15:10	190	22.1358	0.13666	-1.2741	15.4	16.8	18.7	22.1	24.5	30.2	36.5
15:11	191	22.2346	0.13676	-1.2733	15.4	16.8	18.7	22.2	24.6	30.2	36.6
16:00	192	22.3852	0.13686	-1.2707	15.4	16.9	18.8	22.3	24.7	30.3	36.6
16:01	193	22.3992	0.13696	-1.2632	15.4	16.9	18.8	22.3	24.7	30.3	36.6
16:02	194	22.415	0.13701	-1.2606	15.4	16.9	18.8	22.4	24.8	30.3	36.6
16:03	195	22.4752	0.13711	-1.2599	15.4	16.9	18.8	22.4	24.8	30.3	36.6
16:04	196	22.5589	0.13722	-1.2684	15.4	16.9	18.8	22.5	24.9	30.4	36.7
16:05	197	22.5962	0.13733	-1.2598	15.4	16.9	18.9	22.5	24.9	30.4	36.7
16:06	198	22.5996	0.13745	-1.2541	15.4	17	18.9	22.5	25	30.4	36.7
16:07	199	22.6357	0.13755	-1.2458	15.4	17	18.9	22.6	25	30.4	36.7
16:08	200	22.6657	0.13765	-1.2436	15.4	17	18.9	22.6	25.1	30.5	36.7
16:09	201	22.7052	0.13775	-1.2369	15.5	17	18.9	22.7	25.1	30.5	36.7

16:10	202	22.73457	0.13785	-1.2258	15.5	17	18.9	22.7	25.2	30.5	36.7
16:11	203	22.8573	0.13795	-1.2125	15.5	17	18.9	22.8	25.2	30.5	36.7
17:00	204	22.8758	0.13799	-1.2099	15.5	17.1	19	22.8	25.3	30.6	36.7
17:01	205	22.8893	0.13801	-1.2006	15.5	17.1	19	22.8	25.3	30.6	36.8
17:02	206	22.8925	0.13811	-1.1952	15.5	17.1	19	22.9	25.3	30.6	36.8
17:03	207	22.9012	0.13823	-1.1847	15.5	17.1	19	22.9	25.3	30.6	36.8
17:04	208	22.8325	0.13833	-1.1741	15.5	17.1	19	22.9	25.4	30.6	36.8
17:05	209	23.0258	0.13844	-1.1632	15.5	17.1	19	23	25.4	30.7	36.8
17:06	210	23.0462	0.13855	-1.1528	15.5	17.1	19.1	23	25.4	30.7	36.8
17:07	211	23.0785	0.13865	-1.1478	15.5	17.1	19.1	23	25.5	30.7	36.8
17:08	212	23.0953	0.13875	-1.1321	15.5	17.1	19.1	23.1	25.5	30.7	36.8
17:09	213	23.0992	0.13885	-1.1254	15.5	17.1	19.1	23.1	25.5	30.7	36.8
17:10	214	23.0999	0.13898	-1.1156	15.5	17.1	19.1	23.1	25.6	30.7	36.8
17:11	215	23.1125	0.13902	-1.1099	15.5	17.1	19.2	23.2	25.6	30.8	36.8
18:00	216	23.1235	0.13911	-1.0958	15.5	17.1	19.2	23.2	25.6	30.8	36.8
18:01	217	23.1423	0.13923	-1.0852	15.5	17.2	19.2	23.2	25.6	30.8	36.8
18:02	218	23.2652	0.13932	-1.0789	15.5	17.2	19.2	23.2	25.6	30.8	36.8
18:03	219	23.3011	0.13955	-1.0652	15.5	17.2	19.2	23.3	25.6	30.8	36.8
18:04	220	23.335	0.13966	-1.0002	15.5	17.2	19.2	23.3	25.7	30.8	36.8
18:05	221	23.3754	0.13975	-0.0952	15.5	17.2	19.3	23.3	25.7	30.8	36.7
18:06	222	23.4246	0.13985	-0.0965	15.5	17.2	19.3	23.4	25.7	30.8	36.7
18:07	223	23.4485	0.13999	-0.0912	15.5	17.2	19.3	23.4	25.7	30.8	36.7
18:08	224	23.4679	0.14009	-0.0865	15.5	17.2	19.3	23.4	25.7	30.8	36.7
18:09	225	23.5210	0.14101	-0.0861	15.5	17.2	19.3	23.5	25.8	30.8	36.7
18:10	226	23.5632	0.14222	-0.0852	15.5	17.2	19.3	23.5	25.8	30.9	36.7
18:11	227	23.5785	0.14369	-0.0874	15.5	17.2	19.3	23.5	25.8	30.9	36.7
19:00	228	23.5354	0.14465	-0.0723	15.5	17.2	19.3	23.5	25.8	30.9	36.7

Table (7): Comparison between Egyptian Z score references and WHO references

Comparison between Egyptian Z score references and WHO references	Boys (P value)	Girls (P value)
Weight for age	0.142	0.229
Height for age	0.469	0.361
BMI for age	0.492	0.316

Figures

Figure 1

shows the Egyptian Z score weight for age from 5 years to 10 years for boys

Figure 2

shows the Egyptian Z score weight for age from 5 years to 10 years for girls

Figure 3

shows the Egyptian Z score height for age from 5 years to 19 years for boys

Figure 4

shows the Egyptian Z score height for age from 5 years to 19 years for girls

Figure 5

shows the Egyptian Z score BMI for age from 5 year to 19 years for boys

Figure 6

shows the Egyptian Z score BMI for age from 5 years to 19 years for girls

Figure 7

shows the comparison between Egyptian Z score and WHO Z score references value (weight for age in boys)

Figure 8

shows the comparison between Egyptian Z score and WHO Z score references value (weight for age in girls)

Figure 9

shows the comparison between Egyptian Z score and WHO Z score references value (Height for age in boys)

Figure 10

shows the comparison between Egyptian Z score and WHO Z score references value (Height for age in girls)