Trends of stunting, underweight and overweight among children aged < 5 years in Kuwait: findings from Kuwait Nutritional Surveillance System (2007–2019)

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Abstract

Background: There is a paucity of data on the secular trends of stunting and overweight among children aged < 5 years in oil-rich countries in the Middle East.

Aims: To examine the secular trends of stunting, underweight and overweight in children aged < 5 years in Kuwait between 2007 and 2019.

Methods: We used large individual data records (n=48 108) from the Kuwait Nutritional Surveillance System (KNSS) to calculate height/length-for-age z score (HAZ), weight-for-age z score and body mass index (BMI)-for-age z score using World Health Organization growth references. Stunting and underweight were defined as < -2 standard deviation (SD) and overweight (including obesity) as ≥ +2 SD. Trends of stunting, underweight and overweight were investigated using logistic regression models.

Results: The prevalence of stunting, underweight and overweight was 5.15%, 2.33% and 10.78%, respectively. Stunting increased during the study period, among children aged < 2 years. There was no increasing trend in overweight during the study period. These findings were corroborated by the distribution of HAZ and BMI-for-age z scores. Current prevalence of combined stunting and overweight was 1.53% in boys and 1.98% in girls.

Conclusion: Current prevalence of stunting and underweight is low in Kuwait indicating that undernutrition is no longer a major public health issue. There is a tendency for stunting to increase in children aged < 2 years, highlighting the need to investigate early causes of stunting such as maternal and pregnancy-related factors.

Keywords: children, stunting, underweight, overweight, wasting, Kuwait, Middle East, under-5

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Introduction

Malnutrition in early childhood is a significant public health problem with profound short- and long-term impacts on human health, including high morbidity and mortality, and reduced cognitive and social development (*1*,*2*). Despite progress on several health indicators for children aged < 5 years, malnutrition remains a major cause of death in several low- and middle-income countries (*1*). In early life, both undernutrition (manifested as stunting, underweight or wasting) and overnutrition (manifested as overweight or obesity) are of major concern worldwide. It is estimated that around 45% of deaths among children aged < 5 years are linked to undernutrition, and mostly occur in low- and middle-income countries (*3*). In many developing countries, the acceleration of nutrition transition has led to a decrease in stunting (low height/length for age) (*4*), although it remains more common than underweight (low weight for age) or wasting (low weight for height) (*3*). Globally, the prevalence of overweight in children aged < 5 years increased slightly from 4.8% in 1990 to 5.9% in 2018, showing heterogeneous trends (*5*).

Monitoring trends in malnutrition at regional and country level is needed for planning, priority setting and tracking progress towards specific goals. For example, the World Health Assembly Resolution (65.6) endorsed a comprehensive implementation plan on maternal, infant and young child nutrition (*6*), which includes specified global nutrition targets for 2025; 2 of which aim at no increase in childhood obesity and 40% reduction in the number of children under 5 years with stunted growth. It has been suggested that global estimates of malnutrition cannot be used to monitor trends at the regional level (*4*). Regional level data cannot be extrapolated to national level, particularly in the Middle East and North Africa Region, which includes economically diverse countries such as oil-rich and low- and middle-income countries. Trends in malnutrition are difficult to ascertain in the same population due to the incomparability of data over time or from methodologically heterogeneous surveys (*7*). Systematic reviews of previous studies with little consistency in their methods are more likely to fail to reveal trends in malnutrition than analysis of individual data records collected by the same organization over time (*8*). As an example, a review showed that the prevalence of

overweight and obesity in children aged < 5 years ranged from 1 to 28.6% among European countries, which was attributed to methodological variation (*9*).

Most studies of long-term trends of overweight and obesity in children have focused on school-age children (5–19 years) (*10*) with limited data on those aged < 5 years. Kuwait and other oil-rich countries in the Middle East have undergone rapid economic development and obvious transition of lifestyle in the last few decades. The high oil revenues have resulted in significant improvement in socioeconomic status, with citizens enjoying high standards of living that include highly subsidized food, free education, and free healthcare services. The prevalence of overweight and obesity has significantly increased with the most recent estimates in adults of 40.6%, and 42.1%, respectively (*11*), and 20.19% and 28.39% in schoolchildren (*12*). Previously, we have demonstrated that obesity and overweight increased in schoolchildren in Kuwait between 2007 and 2019 but started to stabilize in girls (*12*). There is limited data on the trends in stunting, underweight and overweight among children aged < 5 years in Kuwait and other oil-rich countries in the Middle East. The present study aimed to examine trends in stunting, wasting, underweight and overweight in children aged < 5 years in Kuwait between 2007 and 2019, using individual data records from the Kuwait Nutritional Surveillance System (KNSS).

Methods

Study setting and participants

KNSS is funded by the Government of Kuwait to monitor nutritional status of the population over time. The system consists of a repeated cross-sectional study that collects data on children aged ≤ 2 years and > 2 to < 5 years, schoolchildren aged 5–19 years, and adults. KNSS recruits children aged < 5 years from vaccination centres at primary healthcare centres in all provinces of Kuwait. These healthcare centres are designated sentinel sites for surveillance. KNSS also recruits children aged < 5 years who are enrolled in kindergartens in all provinces of Kuwait. No sampling strategy is used because all parents attending vaccination centres are invited to participate and usually < 2% refuse to participate. For several logistic reasons (*13*), KNSS includes data only on Kuwaiti nationals. In 2015, data collection forms were reviewed and updated and later approved by the Ethics Committee at the Ministry of Health (No. 98:262/2015). Details of KNSS have been published previously (*12*,*13*). In this study, we conducted a secondary data analysis for anthropometric measurements of children aged < 5 years from 2007 to 2019.

Data collection and anthropometric measurements

Permanently employed data collectors with KNSS measured height and weight of children aged < 5 years at vaccination centres and kindergartens using a standard written protocol. The length of children aged 0–2 years was measured to the nearest 0.1 cm using a length board, with children's knees fully extended and shoes off. The height of children > 2 but < 5 years was measured to the nearest 0.1 cm using a stadiometer, with knees fully extended and shoes off. The weight of children was measured using a digital scale to the nearest 100 g. To maintain accuracy, weighing scales are calibrated regularly using a well-known weight set. Starting from 2015, mothers were asked to report the birth weight of their children if they were < 2 years. This was conducted only for children recruited at the vaccination centres. Data were entered into a database at the Food and Nutrition Administration, which is part of the Kuwait Ministry of Health.

Statistical methods

We calculated age- and sex-specific z scores relative to the WHO growth reference median using the STATA zanthro package (Stata Corp., College Station, TX, USA). We defined obesity as BMI-for-age z score ≥ 3.0 SD, and overweight (including obesity) as BMI-for-age z score ≥ 2.0 SD (*14*). Height/length-for-age z scores (HAZs) were calculated, and stunting was defined as < −2 SD. Similarly, weight-for-age z scores were calculated, and underweight was defined as < −2 SD. Weight-for-length/height z scores were calculated, and wasting was defined as < −SD.

Logistic regression analysis was used to examined trends over time while stratifying by sex and adjusting for age. The regression analysis was performed with stunting, underweight, overweight or obesity (all coded 1 = yes, 0 = no), with the year of measurement fitted as an indicator variable (2007–2009, 2010–2012, 2013–2015 and 2016–2019). The Wald F statistic was used to test the significance of trends with robust estimates of standard error using the variance–covariance matrix (VCE) option in STATA, taking clustering effect by governorate (province) into account. We repeated the analysis with the year of survey used as a continuous independent variable, evaluating linear increase or decrease over time. Linear regression analysis with HAZ or BMI-for-age z score as a dependent variable was conducted as a sensitivity analysis.

Ethics

This was a secondary data analysis of data collected by KNSS. KNSS is a public health activity, and the data collection was approved by the Ethics Committee at the Kuwaiti Ministry of Health (No.98:262/2015).

Results

Prevalence of stunting, underweight and overweight by gender and age

This study included 48 108 children aged < 5 years (0–59 months), of whom 24 072 (50.04%) were girls. The prevalence of stunting during the entire study period was 5.18% [95% confidence interval (CI): 4.56–5.88%], which was significantly higher in boys than in girls (5.66% vs

4.71%; *P* = 0.001). Stunting declined significantly with age in both sexes, particularly after the first year (*P* <0.001). Similarly, the prevalence of obesity and overweight (which also includes obesity) was 2.62% (95% CI: 2.38–2.88%) and 8.77% (95% CI: 8.26–9.31%), respectively, which did not differ significantly between boys and girls (*P* = 0.597 for obesity and P= 0.941 for overweight). Overweight, which includes obesity, increased with age in both sexes (*P* < 0.001 for each). The prevalence of combined stunting and overweight was 1.09% (95% CI: 0.69–1.75%), which did not differ significantly between boys and girls (*P* = 0.679) and did not significantly change with age (*P* = 0.215). The prevalence of underweight was 2.64% (95%CI: 2.30–3.03%), which was significantly higher in boys than girls (2.97% vs 2.30%; *P* = 0.002). Underweight declined with age in both sexes (*P* < 0.001 for boys and *P* =0.004 for girls). The prevalence of wasting (*n* = 37 951 because weight-for-length/height z score could only be calculated for length/height 65–120 cm) was 2.58% (95% CI: 2.21–3.0%), which was significantly higher in boys than girls (2.79% vs 2.36%; *P* = 0.013). Wasting declined with age in both sexes (*P* < 0.001).

Trends in stunting

Tables 1 and 2 show the prevalence of stunting by age in boys and girls over the study period. The weighted prevalence of stunting at the end of the study period was 5.24% in boys and 5.06% in girls (5.15% in both sexes). The trends in stunting over the study period in boys and girls are shown in Figure 1A and B, respectively. Overall, there was evidence of an increasing trend of stunting over the study period among boys (*P* =0.010), particularly in those aged < 2 years, which was corroborated by the decline in HAZ (data not shown). Logistic regression analysis confirmed these findings and showed an increasing trend for stunting in boys, which did not reach significance in girls (Table 3). These findings were further verified by linear regression, which showed a significant decline in HAZ over the study period in both sexes (data not shown).

Trends in obesity and overweight

The prevalence of obesity and overweight (which includes obesity) over the study period by age in boys and girls is shown in Tables 1 and 2, respectively. The weighted prevalence of overweight in boys and girls at the end of the study period was 10.46% and 11.11%, respectively (10.78% in both sexes). Trends in overweight (which includes obesity) in boys and girls are shown in Figures 1A and B, respectively. There was no increasing or decreasing trend in overweight in boys (*P* = 0.329) or girls (*P* = 0.228). These findings were supported by the trends in BMI-for-age z score over the study period in boys and girls (data not shown). Logistic regression analysis supported these findings and showed no evidence for increasing or decreasing trends in overweight or obesity during the study period (Table 3), which was further verified through linear regression analysis that showed no upward or downward trends in BMI-for-age score (data not shown).

Trends in underweight and wasting

Tables 1 and 2 show the prevalence of underweight over the study periods by age in boys and girls, respectively, while trends in underweight in boys and girls are shown in Figures 1A and B, respectively. The weighted prevalence of underweight at the end of the study period was 2.72% in boys and 1.93% in girls (2.33% in both sexes). Although low, there was a tendency for underweight to increase, particularly in children aged < 2 years, which was more common in boys than girls (Tables 1 and 2, respectively). Logistic regression analysis showed an increasing trend in underweight in boys but not girls (Table 3). Table 4 shows the prevalence of wasting over the study period by age in boys and girls. There was no increasing or decreasing trend in wasting over the study period.

Discussion

Over a 13-year period (2007–2019), using the same operational definitions of stunting, underweight and overweight, we found no evidence of increasing or decreasing trends in overweight or obesity in children aged < 5 years in Kuwait. Although stunting and underweight were both low, there was evidence of an increasing trend among children aged < 2 years.

According to the new threshold for the prevalence of stunting suggested by WHO (*15*), the prevalence at the end of our study period was low, between 2.5% and < 10%. Out of 134 countries that have provided data on stunting, 26 fall into this category, while 44 fall into the very high category (≥ 30%) (*15*). Stunting is an irreversible outcome of poor nutrition, and recurrent or chronic infections in childhood reflecting poor overall child well-being and social inequalities. High standards of living in Kuwait may explain the low prevalence of stunting. It may be possible to further reduce the prevalence of stunting in children aged < 2 years, among whom stunting was 11% in boys and 7.98% in girls. At these younger ages, stunting is determined by maternal nutritional and health status before, during and immediately after pregnancy (*16*). Low birth weight (LBW) is the most dominant predictor associated with stunting (*17*) and may account for 20% of cases in childhood (*1*). More than 20% of Kuwaiti children aged < 2 years are born with LBW (< 2.5 kg) (*13*). KNSS started collecting data on birthweight, as recalled by mothers, only in 2015, hence it was not possible to include birthweight in our analysis, and no other source of data on birthweight can be directly linked to individual data records in KNSS.

The increasing trend in stunting in children aged < 2 years may have been due to an increasing trend in moderate or late prematurity, partially as a result of elective caesarean section (> 30% of children aged < 2 years were born by caesarean section (*13*)). We have no data on gestational age (prematurity); therefore, we were unable to use the corrected age with WHO or other growth references for premature babies (*18*). We call for investigation of early causes of stunting, including maternal factors, LBW, and infant and young child

Table 1 Prevalence of stunting, underweight, overweight and obesity in boys aged < 5 years between 2007 and 2019

Boys	Age, yr	Years of study										
		2007–2009		2010–2012		2013–2015		2016–2019			Overall	
Stunting[a]		*n*	%	*n*	%	*n*	%	*n*	%	*P*	*n*	%
	< 1	2108	8.54	1999	7.40	1961	8.72	2639	11.03	0.058	8707	9.07
	1 to < 2	1012	4.74	991	3.73	894	4.25	1233	6.08	0.091	4130	4.79
	2 to < 3	822	4.01	768	3.26	616	4.55	804	3.86	0.686	3010	3.89
	3 to < 4	1077	1.76	1135	2.47	803	3.99	1200	3.33	0.300	4215	2.82
	4 to < 5	1063	2.82	1129	2.30	512	4.30	1080	4.35	0.427	3784	3.30
	All	6082	5.10	6022	4.38	4786	6.08	6956	6.96	0.010	23 846	5.66
	Weighted prevalence		3.71		3.27		5.00		5.24			4.27
Underweight[b]		*n*	%	*n*	%	*n*	%	*n*	%	*P*	*n*	%
	< 1	2121	4.43	2010	3.73	1986	5.09	2659	6.21	0.140	8776	4.96
	1 to < 2	1017	1.87	999	1.70	907	2.54	1257	4.14	0.010	4180	2.66
	2 to < 3	821	1.95	769	1.04	616	1.46	809	1.61	0.591	3015	1.53
	3 to < 4	1077	1.39	1133	1.32	804	1.74	1199	2.00	0.508	4213	1.61
	4 to < 5	1063	1.41	1121	1.25	512	1.37	1079	1.48	0.929	3775	1.38
	All	6099	2.61	6032	2.14	4825	3.19	7003	3.86	0.025	23 959	2.97
	Weighted prevalence		1.92		1.60		2.32		2.72			2.14
Overweight[c]		*n*	%	*n*	%	*n*	%	*n*	%	*P*	*n*	%
	< 1	2112	5.92	2006	5.78	1995	5.71	2645	6.65	0.608	8758	6.06
	1 to < 2	1013	13.52	994	13.28	908	12.11	1244	13.67	0.819	4159	13.20
	2 to < 3	815	7.85	765	10.85	615	10.73	803	8.09	0.075	2998	9.27
	3 to < 4	1073	7.83	1129	7.53	798	7.64	1191	9.57	0.334	4191	8.21
	4 to < 5	1058	10.40	1114	9.07	508	9.25	1069	12.72	0.199	3749	10.51
	All	6071	8.57	6008	8.61	4824	8.25	6952	9.51	0.329	23 855	8.79
	Weighted prevalence		9.14		9.00		8.88		10.46			9.43
Obesity[d]		*n*	%	*n*	%	*n*	%	*n*	%	*P*	*n*	%
	< 1	2112	1.33	2006	1.05	1995	1.60	2645	1.29	0.547	8758	1.31
	1 to < 2	1013	3.06	994	2.82	908	3.85	1244	3.22	0.684	4159	3.22
	2 to < 3	815	2.21	765	3.27	615	3.41	803	2.37	0.305	2998	2.77
	3 to < 4	1073	2.61	1129	3.01	798	2.26	1191	3.44	0.447	4191	2.89
	4 to < 5	1058	4.16	1114	3.41	508	4.13	1069	5.24	0.416	3749	4.24
	All	6071	2.45	6008	2.43	4824	2.63	6952	2.73	0.534	23 855	2.57
	Weighted prevalence		2.94		2.92		3.00		3.48	0.534		3.10

[a]*Defined as height/length-for-age z score < −2.0 SD. Out of 24 030 boys, height/length-for-age z score was < −6 SD or > +6 SD for 190 participants.*
[b]*Defined as weight-for-age z score < −2.0 SD. Out of 24 030 boys, weight-for-age z score was < −6 SD or > +5 SD for 77 participants.*
[c]*Defined as BMI-for-age z score ≥ +2.0 SD (obesity included in overweight). Out of 24 030 boys, BMI-for-age z score was < −5 SD or > +5 SD for 181 participants.*
[d]*Defined as BMI-for-age z score ≥ +3.0 SD. Out of 24 030 boys, BMI-for-age z score was < − 5 SD or > +5 SD for 181 participants. P generated by design-based (corrected) F statistic.*

Table 2 Prevalence of stunting, underweight, overweight and obesity in girls aged < 5 years between 2007 and 2019

Girls	Age, yr	Years of study: 2007–2009		2010–2012		2013–2015		2016–2019			Overall	
Stunting[a]		*n*	%	*n*	%	*n*	%	*n*	%	*P*	*n*	%
	< 1	2128	7.10	2052	5.70	1982	6.91	2608	7.98	0.132	8770	6.99
	1 to < 2	985	2.44	1027	3.60	838	5.01	1163	4.39	0.245	4013	3.84
	2 to < 3	798	2.13	769	2.99	660	1.67	845	2.49	0.288	3072	2.34
	3 to < 4	1107	2.53	1147	2.18	845	2.72	1142	4.20	0.151	4241	2.92
	4 to < 5	1088	3.95	1091	3.48	560	3.39	1070	5.89	0.541	3809	4.28
	All	6106	4.31	6086	3.94	4885	4.75	6828	5.73	0.062	23 905	4.71
	Weighted prevalence		3.53		3.34		3.73		5.06			3.95
Underweight[b]		*n*	%	*n*	%	*n*	%	*n*	%	*P*	*n*	%
	<1	2138	3.13	2060	2.96	1999	3.95	2635	3.42	0.269	8832	3.36
	1 to < 2	990	0.91	1032	1.26	849	2.59	1179	3.39	0.083	4050	2.07
	2 to < 3	801	0.87	769	0.13	660	1.82	846	0.83	0.084	3076	0.88
	3 to < 4	1104	1.36	1148	1.31	845	2.01	1143	1.22	0.344	4240	1.44
	4 to < 5	1086	2.49	1092	2.01	560	2.86	1070	1.68	0.515	3808	2.18
	All ages	6119	2.04	6101	1.84	4913	2.97	6873	2.46	0.074	24 006	2.30
	Weighted prevalence		1.84		1.58		2.59		1.93			1.94
Overweight[c]		*n*	%	*n*	%	*n*	%	*n*	%	*P*	*n*	%
	< 1	2132	5.30	2059	4.76	2006	5.13	2633	6.65	0.249	8830	5.54
	1 to < 2	986	12.78	1027	12.85	842	10.93	1165	12.19	0.587	4020	12.24
	2 to < 3	796	9.80	767	10.43	659	10.17	840	10.83	0.920	3062	10.32
	3 to < 4	1102	8.98	1146	7.24	838	8.47	1135	11.10	0.239	4221	8.98
	4 to < 5	1086	9.48	1088	9.47	558	13.26	1062	12.99	0.317	3794	11.02
	All	6102	8.51	6087	8.15	4903	8.30	6835	9.83	0.228	23 927	8.75
	Weighted prevalence		9.25		8.81		9.67		11.11			9.74
Obesity[d]		*n*	%	*n*	%	*n*	%	*n*	%	*P*	*n*	%
	< 1	2132	1.22	2059	0.97	2006	1.25	2633	1.71	0.465	8830	1.31
	1 to < 2	986	3.25	1027	3.21	842	2.61	1165	2.58	0.750	4020	2.91
	2 to < 3	796	2.76	767	4.17	659	3.03	840	2.62	0.411	3062	3.14
	3 to < 4	1102	3.54	1146	3.05	838	2.51	1135	4.23	0.348	4221	3.39
	4 to < 5	1086	3.59	1088	4.69	558	5.02	1062	4.61	0.289	3794	4.40
	All	6102	2.59	6087	2.81	4903	2.37	6835	2.84	0.224	23 927	2.67
	Weighted prevalence		3.10		3.51		2.99		3.51			3.30

[a]*Defined as height/length-for-age z score < −2 SD. Out of 24 072 girls, height/length-for-age z score was < −6 SD or > +6 SD for 167 participants.*
[b]*Defined as weight-for-age z score < −2.00 SD. Out of 24 072 girls, weight-for-age z score was < −6 SD or > +5 SD for 66 participants.*
[c]*Defined as BMI-for-age z score ≥ +2 SD (obesity included in overweight). Out of 24 072 girls, BMI-for-age z score was < −5 SD or > +5 SD for 145 participants.*
[d]*Defined as BMI-for-age z score ≥ +3 SD. Out of 24 072 girls, BMI-for-age z score was < −5 SD or > +5 SD for 145 participants. P was generated by design-based (corrected) F statistic.*

Table 3 Trends in the prevalence of stunting, underweight, overweight (including obesity) and obesity in children (< 5 years) in Kuwait between 2007 and 2019 using logistic regression

	Stunting[a] OR (95% CI)	P	Underweight[b] OR (95% CI)	P	Overweight[c] OR (95% CI)	P	Obesity[d] OR (95% CI)	P
Boys								
Year								
2007–2009	1.00 (Reference)		1.00 (Reference)		1.00 (Reference)		1.00 (Reference)	
2010–2012	0.87 (0.67–1.11)	0.274	0.83 (0.59–1.17)	0.293	1.00 (0.83–1.20)	1.000	0.98 (0.66–1.44)	0.899
2013–2015	1.12 (0.98–1.28)	0.089	1.13 (0.87–1.48)	0.360	0.98 (0.85–1.14)	0.833	1.16 (0.88–1.53)	0.283
2016–2019	1.35 (1.15–1.58)	<0.001	1.44 (0.99–2.08)	0.054	1.13 (0.94–1.37)	0.191	1.15 (0.83–1.60)	0.399
Girls								
Year								
2007–2009	1.00 (Reference)		1.00 (Reference)		1.00 (Reference)		1.00 (Reference)	
2010–2012	0.92 (0.70–1.20)	0.536	0.90 (0.60–1.35)	0.614	0.95 (0.70–1.28)	0.723	1.08 (0.71–1.65)	0.724
2013–2015	1.07 (0.85–1.35)	0.554	1.43 (1.04–1.95)	0.026	1.01 (0.80–1.28)	0.923	0.98 (0.62–1.56)	0.943
2016–2019	1.32 (0.98–1.78)	0.072	1.18 (0.82–1.69)	0.371	1.20 (0.98–1.45)	0.070	1.14 (0.82–1.58)	0.425

[a] *Defined as height/length-for-age z-score < ?2.00 SD.*
[b] *Defined as weight-for-age z-score< ?2.00 SD.*
[c] *Define as BMI-for-age z-score ≥ +2.00 SD (obesity is included in overweight).*
[d] *Define as BMI-for-age z-score ≥ +3.00 SD.*
In all models, we adjusted for age as a categorical variable. Fitting year of study as a continuous variable showed: Stunting OR 1.04 (95% CI: 1.02–1.06) P<0.001 in boys and 1.03 (95% CI: 1.00–1.07) P=0.063 in girls; Underweight: OR 1.04 (95% CI: 1.01–1.08) P=0.021 in boys and 1.02 (95% CI:0.98–1.06) P=0.209 in girls; Overweight: OR 1.02 (95% CI: 1.00–1.04) P=0.122 in boys and 1.02 (95% CI: 0.98–1.05) P=0.232 in boys and 1.02 (95% CI: 0.98–1.05) P=0.378 in girls; Obesity: OR 1.02 (95% CI: 1.00–1.04) P= 0.024 for girls; and
OR = odds ratio; 95% CI = 95% confidence interval.

feeding practices to elucidate the underlying causes of this trend. It is worth noting that we previously reported that children aged < 2 years with stunted growth were likely to have been exclusively breastfed (*13*), which could be due to the lack of use of growth charts that take prematurity into account.

In our setting, the prevalence of overweight (which includes obesity) at the end of the study period was medium (5 to < 10%) or high (10 to < 15%) according to the new threshold for overweight in children aged < 5 years (*15*). Out of 128 countries that have provided data to WHO, 50 countries fall in this category. This high prevalence highlights the need for policies and actions aimed to improve infant and young child feeding practices, focusing on improving exclusive breastfeeding which has been shown (age-appropriate breastfeeding) to be negatively associated with overweight among children aged < 2 years in Kuwait(*13*) and among children, adolescents and adults worldwide (*19*).

Although the prevalence of overweight in children aged < 5 years was high, there was no evidence of an increasing trend during the study period. Data on secular trends in obesity and overweight in children aged < 5 years are lacking in Kuwait and other Arabian Gulf countries. A previous review showed that, up to 2010, there were only 6 cross-sectional studies on this age group in Arabian Gulf countries, and they used different definitions of overweight and obesity (*20*). A protocol for systematic review and meta-analysis of overweight and obesity in early childhood in the Gulf Cooperation Council countries was published previously (*21*), but we were unable to locate any published results from this work. The lack of evidence for an increasing trend in overweight among children aged < 5 years should not encourage complacency because the prevalence of overweight at the end of the study period was high (weighted prevalence in both sexes in 2016–2019 was 10.78%), exceeding the global prevalence of 6–7% (*5*, *22*). This suggests that the increasing trend in overweight may have occurred before the study period, which is supported by the findings of a previous review that estimated obesity to be 8.2% in 1998 (*20*).

At the end of the study period, other anthropometric indicators of malnutrition in children aged < 5 years such as underweight, wasting and combined stunting with overweight were all low. This is not surprising given the standards of living, which minimize the possibility of low caloric intake. There was no significant trend in underweight, and fluctuation shown in children aged < 2 years may reflect variation in moderate or late prematurity and the lack of data on gestational age; hence using corrected age or other growth references suitable for premature babies. Combined stunting and overweight is increasingly recognized as a distinct indicator. For example, the prevalence of concurrent overweight and stunting was 5% in nonindigenous children, and > 10% in indigenous children aged 2–5 years in impoverished areas of rural Mexico (*23*). The combined prevalence of overweight and stunting was 1.99% in Ethiopia (*24*), 1.2% in Ghana (*25*) and 1% in children aged < 7 years in China

Figure 1A Prevalence of stunting, underweight and overweight and 95% confidence intervals (CIs) among boys aged < 5 years in 2007–2019.

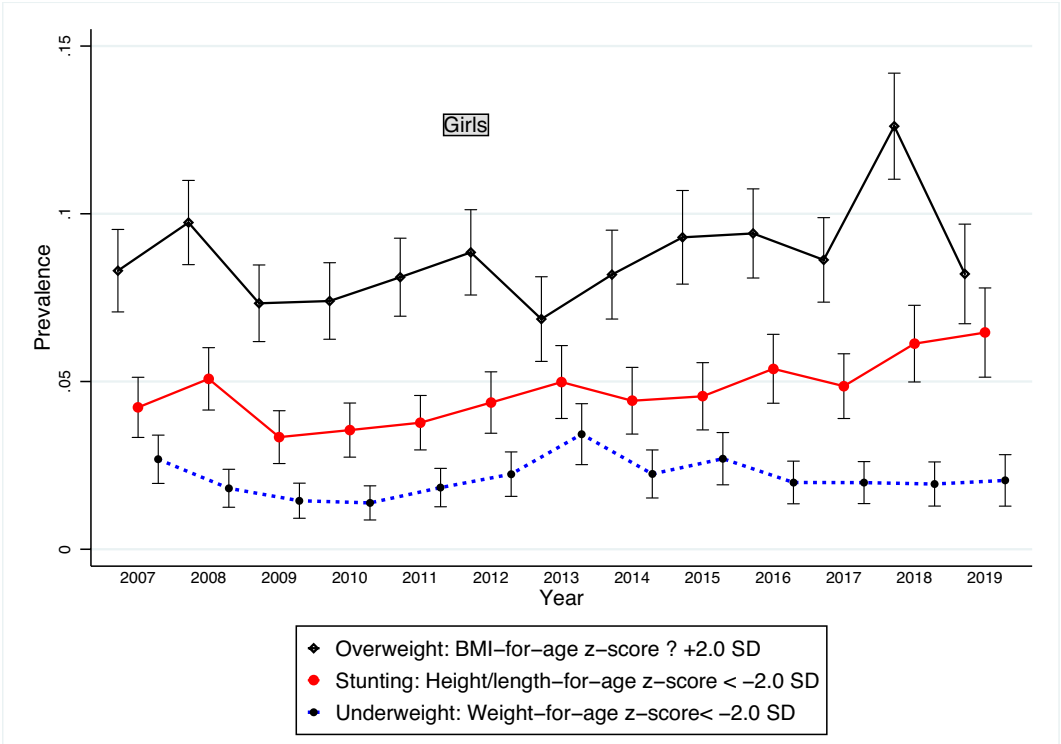
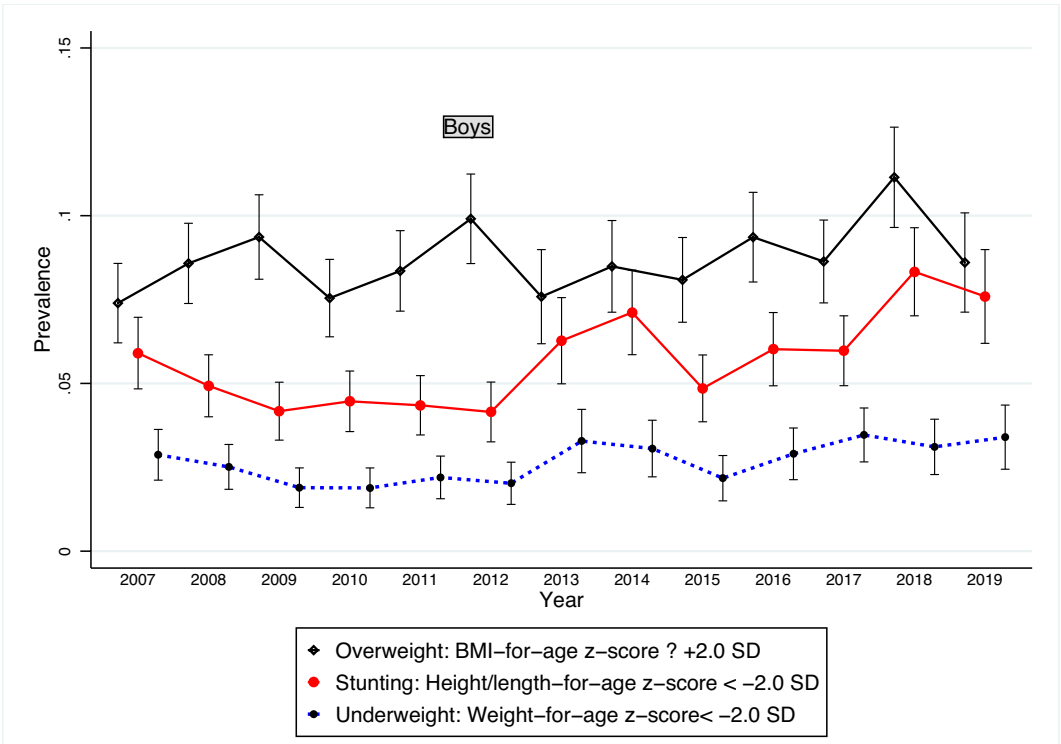


Figure 1B Prevalence of stunting, underweight and overweight and 95% CIs among girls aged < 5 years in 2007–2019.



(*26*). Concurrent overweight and stunting seems not to be a major public health issue in children aged < 5 years in Kuwait, nor is it increasing over time.

There were several strengths in this study, including the large sample size, which allowed us to investigate sex- and age-specific trends in stunting, underweight and overweight over a 13-year period. We have provided data for the first time on the prevalence of combined stunting and overweight in children aged < 5 years in Kuwait. This study had some limitations, including the lack of data on the socioeconomic status of children aged < 5 years. By their nature, surveillance data are descriptive and aim to

Table 4 Prevalence of wasting and combined stunting and overweight children under-5 years between 2007 and 2019

		Years of study										
Boys	Age, yr	2007–2009		2010–2012		2013–2015		2016–2019			Overall	
Wasting[a]		*n*	%	*n*	%	*n*	%	*n*	%	*P*	*n*	%
	< 1	1015	5.02	1043	4.12	1016	3.94	1261	5.08	0.641	4335	4.57
	1 to < 2	1010	1.29	992	1.71	891	2.47	1220	2.62	0.073	4113	2.04
	2 to < 3	817	1.47	767	1.56	615	3.09	804	2.11	0.208	3003	2.00
	3 to < 4	1075	2.88	1128	2.48	799	2.00	1194	2.26	0.587	4196	2.43
	4 to < 5	1053	3.32	1113	2.70	505	1.58	1067	2.25	0.327	3738	2.59
	All	4970	2.86	5043	2.58	3826	2.74	5546	2.96	0.755	19 385	2.79
	Weighted prevalence		2.74		2.43		2.36		2.51			2.52
Stunting with overweight[b]		*n*	%	*n*	%	*n*	%	*n*	%	P	*n*	%
	< 1	1875	1.55	1795	1.23	1760	1.08	2254	1.11	0.295	7684	1.24
	1 to < 2	860	1.40	844	0.71	782	1.15	1052	1.62	0.505	3538	1.24
	2 to < 3	743	1.21	681	1.47	541	1.66	732	1.23	0.891	2697	1.37
	3 to < 4	993	0.91	1030	0.39	719	0.56	1073	1.21	0.506	3815	0.79
	4 to < 5	943	0.95	1002	—[c]	447	0.45	939	2.13	0.382	3331	0.93
	All	5414	1.26	5352	0.78	4249	1.01	6050	1.39	0.373	21 065	1.13
	Weighted prevalence		1.11		0.55		0.89		1.53			1.04
		Years of study										
Girls	Age, yr	2007–2009		2010–2012		2013–2015		2016–2019			Overall	
Wasting		*n*	%	*n*	%	*n*	%	*n*	%	*P*	*n*	%
	< 1	836	3.11	866	3.81	855	3.86	978	3.68	0.795	3535	3.68
	1 to < 2	983	1.83	1019	2.36	831	1.93	1142	1.40	0.554	3975	1.86
	2 to < 3	796	1.88	768	0.91	658	1.98	840	1.19	0.202	3062	1.47
	3 to < 4	1102	1.72	1145	1.92	838	2.39	1133	1.85	0.734	4218	1.94
	4 to < 5	1075	3.91	1084	2.03	558	3.41	1059	2.46	0.406	3776	2.89
	All	4792	2.50	4882	2.21	3740	2.70	5152	2.12	0.564	18 566	2.36
	Weighted prevalence		2.62		1.97		2.62		2.00			2.28
Stunting with overweight		*n*	%	*n*	%	*n*	%	*n*	%	*P*	*n*	%
	< 1	1930	1.40	1872	0.59	1809	0.77	2323	1.16	0.170	7934	1.00
	1 to < 2	856	0.82	885	1.13	733	1.09	1011	1.09	0.893	3485	1.03
	2 to < 3	717	0.70	685	1.31	588	0.51	752	1.06	0.425	2742	0.91
	3 to < 4	992	0.60	1056	0.76	759	0.53	1002	1.60	0.317	3809	0.89
	4 to < 5	962	1.04	965	0.73	467	—[d]	936	3.53	0.305	3330	1.50
	All	5457	1.01	5463	0.82	4356	0.67	6024	1.58	0.218	21300	1.05
	Weighted prevalence		0.89		0.85		0.53		1.98			1.11

[a]*Defined as weight-for-height/length z-score < −2.00 SD. Data were available for 37 951 because weight-for-height z score was calculated only for length/height 65–120 cm.*
[b]*Defined as having both stunting (height/length-for-age z-score < −2.00 SD) and overweight (BMI-for-age z score ≥ +2.00 SD).*
[c]*Of 1002 boys none has combined stunting and overweight.*
[d]*Of 467 girls none has combined stunting and overweight.*

ascertain trends over time and highlight issues for further investigations but not to identify the underlying causes or risk factors, which requires analytical studies that collect extensive data on risk factors and potential confounders. We had no data on gestational age or birthweight to investigate whether trends in stunting among children aged < 2 years reflected an increase in prematurity. Although KNSS collected data on birthweight recalled by mothers, these were available only from 2015 and many mothers were unable to recall their child's birthweight.

Conclusion

Long-term trends in malnutrition are difficult to ascertain due to incomparability of data from different time periods and methodological variation. Over a 13-year period, using individual data records and the same operational definitions of stunting, underweight and overweight, we found no evidence of increasing or decreasing trends in overweight in children aged < 5 years in Kuwait. Although stunting and underweight were both low, there was some evidence for an increasing trend among children aged < 2 years, which highlights the need to investigate the early causes of stunting.

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Tendances du retard de croissance, de l'insuffisance pondérale et du surpoids chez les enfants de moins de cinq ans au Koweït : résultats du système koweïtien de surveillance nutritionnelle (2007-2019)

Résumé

Contexte : Il existe peu de données sur les tendances séculaires du retard de croissance et du surpoids chez les enfants âgés de moins de cinq ans dans les pays riches en pétrole du Moyen-Orient.

Objectifs : Examiner les tendances séculaires du retard de croissance, de l'insuffisance pondérale et du surpoids chez les enfants âgés de moins de cinq ans au Koweït entre 2007 et 2019.

Méthodes : Nous avons utilisé de grands enregistrements de données individuelles (*n* = 48 108) provenant du système de surveillance nutritionnelle du Koweït pour calculer les scores z de taille/longueur pour l'âge, du poids pour l'âge et de l'indice de masse corporelle (IMC) selon l'âge en utilisant les références de croissance de l'Organisation mondiale de la Santé. Le retard de croissance et l'insuffisance pondérale ont été définis comme inférieurs à –2 écarts types (ET) et le surpoids (y compris l'obésité) comme supérieur ou égal à +2 ET. Les tendances en matière de retard de croissance, d'insuffisance pondérale et de surpoids ont été analysées à l'aide de modèles de régression logistique.

Résultats : La prévalence du retard de croissance, de l'insuffisance pondérale et du surpoids était respectivement de 5,15 %, 2,33 % et 10,78 %. Le retard de croissance a augmenté pendant la période de l'étude, mais cette augmentation était limitée aux enfants âgés de moins de deux ans. Il n'y avait pas de tendance à l'augmentation du surpoids pendant la période de l'étude. Ces résultats ont été corroborés par la distribution des scores z de taille/longueur pour l'âge et de l'IMC pour l'âge. La prévalence du retard de croissance et du surpoids combinés au moment de l'étude était de 1,53 % chez les garçons et de 1,98 % chez les filles.

Conclusion : La prévalence du retard de croissance et de l'insuffisance pondérale au moment de l'étude était faible au Koweït et reflétait le fait que la dénutrition n'est plus un problème majeur de santé publique. Le retard de croissance tend à augmenter chez les enfants âgés de moins de deux ans, ce qui souligne la nécessité d'étudier les causes précoces du retard de croissance, comme les facteurs liés à la mère et à la grossesse.

اتجاهات التقزُّم، ونقص الوزن، وزيادة الوزن في صفوف الأطفال الأقل من 5 سنوات في الكويت: نتائج نظام الترصُّد التغذوي في الكويت (2007–2019)

نوال القعود، عبد الله الطيار

الخلاصة

الخلفية: هناك نُدرة في البيانات بشأن الاتجاهات الطويلة الأجل للتقزم وزيادة الوزن في صفوف الأطفال الذين تقل أعمارهم عن 5 سنوات في البلدان الغنية بالنفط في الشرق الأوسط.

الأهداف: هدفت هذه الدراسة إلى فحص الاتجاهات الطويلة الأجل للتقزم، ونقص الوزن، وزيادة الوزن لدى الأطفال الذين تقل أعمارهم عن 5 سنوات في الكويت بين عامي 2007 و2019.

طرق البحث: استخدمنا سجلات كبيرة للبيانات الفردية (العدد= 48108) من نظام الترصُّد التغذوي في الكويت لحساب مقياس Z للارتفاع/الطول المقابل للعمر، و مقياس Z للوزن المقابل للعمر، و مقياس Z لِنسب كتلة الجسم المقابل للعمر باستخدام مراجع النمو الخاصة بمنظمة الصحة العالمية. وحُدِّد التقزم ونقص الوزن كلاهما بأنهما أقل من 2– > انحرافيْن معياريين، بينما كانت زيادة الوزن (ومن ذلك السمنة) أكبر من أو تساوي انحرافيْن معياريين موجبيْن. واستُقصيت اتجاهات التقزم، ونقص الوزن، وزيادة الوزن باستخدام نماذج الانحدار اللوجستي.

النتائج: كان معدل انتشار التقزُّم، ونقص الوزن، وزيادة الوزن 5.15٪، و2.33٪، و10.78٪ على التوالي. وازداد التقزم خلال مدة الدراسة، لكن اقتصر ذلك على الأطفال الذين تقل أعمارهم عن عامين. ولم يكن هناك اتجاه متزايد في زيادة الوزن خلال مدة الدراسة. وتأكدت صحة هذه النتائج من خلال توزيع مقاييس Z للطول المقابل للعمر ومَنسب كتلة الجسم المقابل للعمر. فكان معدل الانتشار الحالي للتقزم وزيادة الوزن مجتمعين 1.53٪ في صفوف الفتيان، و1.98٪ في صفوف الفتيات.

الاستنتاجات: يُعدُّ معدل الانتشار الحالي للتقزم ونقص الوزن في الكويت منخفضًا، وهو ما يشير إلى أن نقص التغذية لم يعد يمثل مسألة رئيسية من مسائل الصحة العامة. وهناك اتجاه نحو زيادة التقزم في صفوف الأطفال الذين تقل أعمارهم عن عامين، الأمر الذي يسلط الضوء على الحاجة إلى استقصاء الأسباب المبكرة للتقزم، مثل العوامل المتعلقة بالأمومة والحمل.

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