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Prevalence of malnutrition among children under 5 year's old living in Al-kadhymia city, Baghdad 2019

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Abstract
Background: Malnutrition, a dual burden of undernutrition and overnutrition, affects children globally. In developing countries, one in five children is undernourished, contributing to half of all child deaths. This study examines the distribution of wasting, stunting, underweight, overweight, and obesity in under-5-year-old Iraqi children and the association of sociodemographic and lifestyle factors with these nutritional health issues.
Methods: A three-month cross-sectional study evaluated the nutritional status of 140 malnourished children under five at two Baghdad health care centers, using WHO and UNICEF benchmarks to measure stunting, wasting, underweight, and overnutrition. Demographic data, birth weight, feeding type, immunization, and maternal education were collected. The study was approved by the health care center administrators.
Results: The study evaluated the nutritional status of 140 children under five in Baghdad, finding a high prevalence of overnutrition (75.5%) and stunting (23.5%), with male dominance in malnutrition. Stunting was significantly linked to mothers' low education levels, while both low birth weight and incomplete immunizations were associated with severe wasting. No significant correlations were found between breastfeeding in the first year and severity of malnutrition.
Conclusion: In the study, most children were under one-year-old, with boys outnumbering girls, while stunting was mainly seen in those with less educated mothers despite overall nutritional gains. Overnutrition is a significant issue correlated with birth weight and maternal education, and both birth weight and immunization status significantly affect the severity of wasting in children.

Keywords: Al-kadhymia city, Baghdad, prevalence, malnutrition, children, under 5 years

Introduction

Malnutrition, a dual burden of undernutrition and overnutrition, affects children globally. In developing countries, one in five children is undernourished, contributing to half of all child deaths [1]. Stunting remains high at 25%, primarily in Asia and Africa, while childhood overweight and obesity are rising globally, with a significant increase in developing countries [2, 3]. This trend raises the risk of chronic diseases, with the WHO projecting that three-quarters of deaths in the developing world by 2020 will be due to noncommunicable diseases [4]. In the Eastern Mediterranean Region (EMR), including Iraq, overweight and obesity are escalating among children, with lifestyle changes and urbanization being major contributors [5]. Preventive measures are critical, as obesity in childhood significantly increases the likelihood of adult obesity and its health consequences [6]. Stunting in these regions also poses a risk for later overweight and obesity [7]. Despite the alarming levels of obesity and its associated no communicable diseases (NCDs), which account for over 50% of deaths in the EMR, national intervention programs are scarce [8]. Overweight and obesity, gauged by BMI, have become global health concerns, with 43 million children worldwide affected, and the majority in developing countries [9]. Meanwhile, malnutrition remains a leading risk factor for child morbidity and mortality, with 150 million children under 5 being underweight [10]. Efforts to address malnutrition must consider both undernutrition and overnutrition to effectively tackle the health, economic, and social impacts on societies, especially as undernutrition alone is linked to 60% of deaths among children under five in low and middle-income countries [11]. Child health is crucial for economic progress, as optimal growth and development hinge on good nutrition [12]. Factors influencing children's nutrition include age, sex, family size, parents' education and occupation, and environmental conditions such as war and socio-political instability, as seen in Iraq [13].

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Gender can affect nutritional outcomes, with varying research findings, some indicating girls in India are worse off [14], while others report no significant difference [15], or even boys being more affected [16]. Overcrowded households tend to have higher rates of malnourished children [17]. Parental education particularly that of mothers, is instrumental in reducing underweight children [18]. Clinical management of malnourished children includes nutritional assessments and anthropometric measurements, necessary for identifying at-risk hospital patients [19]. Growth retardation in children can lead to increased disease susceptibility and cognitive impairments [20], and anthropometric indices like WHZ, HAZ, and WAZ are essential for assessing malnutrition [21]. Globally, undernutrition contributes to a significant number of young child deaths annually [22]. The aim of study is to investigate the distribution of various types of malnutrition in a sample of under five-year-old Iraqi children in terms of wasting, stunting, and underweight, in addition to overweight and obesity, and to identify the association of some sociodemographic and lifestyle characteristics with these nutritional health problems.

Methods
A cross-sectional study was conducted at two primary health care centres in Baghdad's AlKahdymia district-Al-Zahraa and Al-Shaheed Al-Sader PHCCs-over three months from July to September 2019 to investigate the nutritional status of children under five years of age. The researcher visited each centre twice weekly, gathering data on 140 malnourished children from a total attendance of 2500 using IMNCH cards. The lack of a socioeconomic classification system in Iraq meant that demographic factors like residence, education, and family size were used to categorize participants. The nutritional assessment utilized four measures: Stunting, wasting, underweight, and over-weight/obesity, based on WHO and UNICEF standards. Stunting (Chronic malnutrition) was indicated by a height-for-age Z-score (HAZ) below-2 SD, wasting (acute malnutrition) by a weight-for-height Z-score (WHZ) below -2 SD, and underweight by a weight-for-age (WAZ) below -2 SD. Overweight and obesity were classified using BMI-for-age Z-scores with cut-offs at Z=1 for probable overweight, Z>2 for overweight, and Z>3 for obesity according to the UNICEF classification adopted by the PHCCs. Data collected via structured questionnaires included demographic information, birth weight, recent weight and height/length, type of feeding, immunization status, and maternal factors such as mode of delivery and educational level. The study protocol received approval from the health care centre administrators. Statistical analysis was performed with SPSS-16, applying the Chi-square test to assess associations between qualitative variables, with a p-value of ≤ 0.05 considered significant. This summary provides a comprehensive overview of the study's methodology and diagnostic criteria without delving into specific results or findings.

Results
The study examined a total of 140 children, with an average age of 11.8±2 months, spanning from 1 to 60 months. The majority, 87 children (62.2%), fell within the 2-month to less-than-1-year age bracket, while the smallest group comprised of 6 children (4.2%) who were less than 2 months old. In terms of gender distribution, the sample included slightly more male children, with 83 (59.3%), compared to 57 female children [40.7%] as detailed in Table

1. With respect to the prevalence of malnutrition categories within the sample, there were 12 children (8.5%) who were underweight, 33 children (23.5%) who were stunted, and 21 children (15%) who were experiencing wasting as shown in Table 1.
About 75.5% of study sample had various types of over nutrition including probable overweight (40%), overweight (23%), and obesity (12.5%) with male predominance in all these categories in Table 2.
The study's examination of anthropometric measurements in children under five years old, particularly focusing on stunting and overweight in relation to age, revealed that children between 2 to 23 months exhibited the highest instances of stunting and severe stunting, at 21% and 36.5%, respectively. The analysis indicated that there was no significant correlation between the children's age and the severity of stunting, with a p-value greater than 0.05, as shown in Table 3.
In the study, the mother's education level was found to have a significant correlation with the incidence of stunting in children: 58% of children with stunting had mothers with only primary education, while only 6% of stunted children had mothers with higher education, indicating a significant association (p-value < 0.05). There appeared to be no significant relationship between the mother's mode of delivery and the severity of stunting in their children, with nearly equal distribution observed across different modes of delivery (48.5% for cesarean section vs. 51.5% for vaginal delivery, p-value > 0.05). Similarly, family size, whether below or above five persons, did not significantly affect the likelihood of stunting (p-value > 0.05). For overnutrition, approximately one-third (34%) of the children aged 2-23 months were likely overweight, while the group aged 48 to 60 months showed the lowest rate of probable overweight (1.8%), with no significant correlation with age (p-value < 0.05). Interestingly, mother's education was significantly associated with overnutrition; children of mothers with secondary education had the highest rates of probable overweight (23.6%), whereas children of illiterate mothers had the lowest rate (2.8%), showing a significant association (p-value < 0.05). Lastly, the type of childbirth showed that mothers who had cesarean sections had a higher proportion of children with probable overweight (31.2%) compared to those who had natural vaginal deliveries (21.8%), however, this difference was not statistically significant (p-value > 0.05). as shown in Table 4.
The study revealed that low birth weight (less than 2.5 kg) was significantly associated with severe wasting in children; those with severe wasting (below-3 SD) accounted for 42.5% of the low birth weight group. Conversely, children with a birth weight of 2.5 kg or more showed a higher rate (46.4%) of probable overweight (+1 SD), indicating a strong correlation between birth weight and nutritional status (p-value < 0.05).
Breastfeeding practices in the first year of life were also examined in relation to nutritional outcomes. A majority (56%) of severely wasted children (below-3 SD) were breastfed during their first year. However, there was no significant association found between the history of breastfeeding in the first year and the severity of wasting or over nutrition (p-value > 0.05). In terms of immunization status, about half of the children with severe wasting (52%) had not received complete immunizations. In contrast, a high percentage (41.6%) of children who were probably overweight had their immunizations up to date, suggesting a significant link between timely immunizations and reduced severity of wasting (p-value < 0.05). However, the

relationship between immunization status and over nutrition was not statistically significant (p-value > 0.05). As shown in Table 5.

Table 1: Age and gender distribution of study sample (N= 140)

Age	Sex Female (%) Male (%)	Total (%)
Less than 2 months	3 (2.1) 3 (2.1)	6 (4.2)
Two months –less than 1 year	36 (25.7) 51 (36.5)	87 (62.2)
1year – less than 2 years	14 (10) 22 (15.7)	36 (25.7)
2years – 5 years	4 (2.9) 7 (5)	11 (7.9)
Total	57 (40.7) 83 (59.3)	140

Table 2: Distribution of underweight, stunting and wasting in study sample

	Underweight (W/A) No. (%)			Stunting (H/A) No. (%)			Wasting (W/H) No. (%)		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
<-2 SD	6 (50)	3 (25)	9# (75)	10 (30)	6 (18.2)	16 * (48.2)	3 (14.3)	1 (4.8)	4 (19.1)
<-3 SD	1 (8.3)	2 (16.7)	3## (25)	11 (33.6)	6 (18.2)	17** (51.8)	10 (47.7)	7 (33.2)	17 (80.9)
Total	7 (58.3)	5 (41.7)	12 (100)	21 (63.6)	12 (36.4)	33 (100)	13 (62)	8 (38)	21 (100)

*combined (stunting <-2 SD and probable overweight +1SD) =11
**combined (sever stunting <-3 SD and severe wasting <-2SD) = 13
#combined (underweight <-2 SD and stunting <-2 SD) =5 chi
##combined (severe underweight <-3 SD and severe wasting <-3 SD) =

Table 3: Distribution of probable overweight, overweight and obesity in study sample

	Probable OW > +1SD No. (%)	Overweight >+2SD No. (%)	Obese > +3 SD No. (%)	Total
Male	30(53.6)*	17 (53)	14 (77.7)	61 (57.5)
Female	26(46.4)	15 (47)	4 (22.3)	45 (42.5)
Total	56 (100)	32 (100)	18 (100)	106 (100)

Table 4: Anthropometric measures of children under 5 years old regarding the stunting and overweight with some Sociodemographic characteristics

Variable	(Stunting)			(Overweight)			Total
	-2 SD	-3 SD	Total	+1 SD	+2 SD	+3 SD	
Age in months							
<2	2 (6%)	1 (3%)	3 (9%)	4 (3.7%)	0 (0%)	0 (0%)	4 (3.7%)
2 to 23	7 (21.5%)	12 (36.5%)	19 (58%)	36 (34%)	20 (18.8%)	10 (9.5%)	66 (62.3%)
24 to 47	5 (15%)	3 (9%)	8 (24%)	14 (13.3)	9 (8.6%)	6 (5.7%)	29 (27.6%)
48 to 60	2 (6%)	1 (3%)	3 (9%)	2 (1.8)	3 (2.8%)	2 (1.8%)	7 (6.4%)
Total	16 (48.5%)	17 (51.5%)	33 (100%)	56 (52.8%)	32 (30.2%)	18 (17%)	106 (100%)
Pearson Chi square	P=0.48			P=0.66			
Education level of mother							
Illiterate	2 (6%)	4 (12%)	6 (18%)	3 (2.8%)	4 (3.7%)	2 (1.8%)	9 (8.3%)
Primary	9 (27.5%)	10 (30.5%)	19 (58%)	16 (15.1%)	8 (7.5%)	3 (2.8%)	27 (25.4%)
Secondary	5 (15%)	1 (3%)	6 (18%)	25 (23.6%)	13 (12.2%)	6 (5.8%)	44 (41.6%)
Higher	0 (0%)	2 (6%)	2 (6%)	12 (11.5%)	7 (6.6%)	7 (6.6%)	26 (24.7%)
Total	16 (48.5%)	17 (51.5%)	33 (100%)	56 (53%)	32 (30%)	18 (17%)	106 (100%)
Pearson Chi square	P=0.004			P=0.001			

Variable	(Stunting)			(Overweight)			Total
	-2 SD	-3 SD	Total	+1 SD	+2 SD	+3 SD	
Mode of delivery							
NVD	9 (27.5%)	8 (24%)	17 (51.5%)	23 (21.8%)	19 (18.5%)	5 (4.7%)	47 (45%)
C/S	7 (21%)	9 (27.5%)	16 (48.5%)	33 (31.2%)	12 (11.5%)	13 (12.3%)	58 (55%)
Total	16 (48.5%)	17 (51.5%)	33 (100%)	56 (53%)	32 (30%)	18 (17%)	106 (100%)
Pearson Chi square	P=0.469			P=0.140			
Family size							
<5	5 (15%)	7 (21.5%)	12 (36.5%)	32 (30%)	19 (17.8%)	8 (7.5%)	59 (55.3%)
5+	11 (33.5%)	10 (30%)	21 (63.5%)	24 (23%)	13 (12.2%)	10 (9.5%)	47 (44.7%)
Total	16 (48.5%)	17 (51.5%)	33 (100%)	56 (53%)	32 (30%)	18 (17%)	106 (100%)
Pearson Chi square	P=0.144			P=0.145			

Table 5: Anthropometric measures of children under 5 years old regarding the wasting and overweight with some predisposing factors

Variable	Wasting			Overnutrition			Total
	-2SD	-3SD	Total	+1SD	+2SD	+3SD	
Birth weight (Kg)							
<2.5	1 (4.8%)	9 (42.5%)	10 (47.3%)	7 (6.6%)	1 (0.9%)	3 (2.8%)	11 (10.3%)
2.5 +	4 (19.2%)	7 (33.5%)	11 (52.7%)	49 (46.4%)	31 (29.1%))	15 (14.2%)	95(89.7%)
Total	5 (24%)	16 (76%)	21 (100%)	56 (53%)	32 (30%)	18 (17%)	106 (100%)
Pearson Chi square	P= 0.000			P= 0.001			
BF during 1st year							

Yes	4 (19.2%)	12 (56.8%)	16 (76%)	51 (48.2%)	29 (27.3%)	16 (15.2%)	96 (90.7%)
No	1 (4.8%)	4 (19.2%)	5 (23%)	5 (4.8%)	3 (2.7%)	2(1.7%)	10 (9.3%)
Total	5 (24%)	16 (76%)	21 (100%)	56 (53%)	32 (30%)	18 (17%)	106 (100%)
Pearson Chi square	P=0.113			P=0.142			
Immunization Status up to date							
Yes	3 (14.4%)	5 (23.6%)	8 (38%)	44 (41.6%)	23 (21.6%)	14 (13.2%)	81 (76.4%)
No	2 (9.6%)	11 (52.4%)	13 (62%)	12 (11.4%)	9 (8.4%)	4 (3.8%)	25 (23.6%)
Total	5 (24%)	16 (76%)	21 (100%)	56 (53%)	32 (30%)	18 (17%)	106 (100%)
Pearson Chi square	P=0.003			P=0.063			

Discussion

Malnutrition remains a critical global health challenge, especially in developing countries. In the present study, the mean age of malnourished children was 11.8 ± 7.5 months, ranging from 1 to 48 months, with a higher prevalence in boys (59.3%) compared to girls (40.7%), Reflecting gender-based disparities seen in other regions such as India [23] but not in Iraq, where girls show potential for achieving optimal growth [15]. The study highlighted higher rates of underweight, stunting, and wasting in males compared to females, which could be due to biological vulnerabilities among males, echoing findings from China [24]. The rates of overweight in the sample were higher than all other types of malnutrition combined (75.7%), suggesting a shift towards overnutrition, a trend consistent with data from the United States [25] and South Asian countries like India [26] and Pakistan [27]. Economic development since 1990 has been associated with rising obesity rates, paralleling lifestyle and industrialization changes [28]. The study found a male predominance in all categories of overnutrition, resonating with findings from Tehran, Iran [29], and indicating that physical activity, physiological, and sociocultural factors play roles in these differences [30]. The socioeconomic status and maternal education were significant factors in children's nutritional status, with stunting and low weight-for-age especially prevalent among those from lower socioeconomic backgrounds and with mothers having only primary education [31]. Despite no significant association with the mode of delivery, stunting was highest among children aged 2-23 months from larger families and those with mothers with primary education [32]. The prevalence of overweight and obesity was notably higher among males and children under 23 months, potentially due to early introduction and types of added food, along with low physical activity levels. This study found that mothers with secondary education had children with higher overweight rates, and family size also influenced overnutrition prevalence, although the mode of delivery did not show a significant association [33, 34]. Comparing WHO data, there's been an improvement in nutritional disorders among Iraqi preschoolers, with a prevalence of 15% overweight and obesity in 2006, dropping to 12% in 2014, and stunting at 23% [35]. However, the study sample's lower socioeconomic status suggests a higher rate of undernutrition and a lower rate of obesity than the general population. Interestingly, the study did not find a protective effect of breastfeeding against overweight, aligning with findings from Kuwait [36]. Also, the study documented that half of the severely wasted children had incomplete immunizations, linking up-to-date immunization with reduced severity of wasting and indicating that immunized children, who are healthier overall, may be more prone to over nutrition due to better food consumption (41%).

Conclusion

The majority of children participating in the study were aged between 2 months and less than a year, with boys representing a larger portion of this group. Although there has been a noted enhancement in the nutritional wellbeing of children under five compared to past data, stunting persists predominantly among children born to mothers with lower levels of education. The community faces a significant challenge with over nutrition, which necessitates further exploration. A no table correlation exists between a child's birth weight and the mother's level of education concerning different categories of over nutrition. There is a meaningful link between birth weight and the completeness of a child's immunization schedule, both of which are connected to the intensity of wasting, classified as less than -2 or -3 standard deviations.

Conflict of Interest
Not available

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Not available

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