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# Nutritional status of children less than five years and associated factors in Jazan Region, Saudi Arabia

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## RESEARCH

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## ABSTRACT

**Background**
The nutritional status of children below five years is considered as one of the most important indicators for child survival and it is a reflection of their overall health.

**Aims**
The main objective of this research is to investigate the nutritional status of children below five years of age and to assess the different associating factors that could likely influence the nutritional status of the children.

**Methods**
A cross-sectional survey targeted 440 children aged below five years who were randomly selected from four clusters in the Jazan region. A questionnaire was designed to collect a set of information related to the nutritional status of the children.

**Results**
The prevalence of underweight among the children was 15.9 per cent. Moderately underweight accounted for 14.1 per cent [95 per cent CI:11.8–19.0], while less than 1 percent [0.8 per cent; 95 per cent CI:0.28–2.25] were severely underweight. Up to 89.5 per cent [95 per cent CI:85.9–92.3] of the children had normal weight for their height. Prevalence of wasting was only 10.5 per cent; about 9.9 per cent moderately, while 0.6 per cent were severely wasted. No significant difference was found between these indicators for males and females. Significant positive correlation was found between underweight, stunting and wasting among the children of 0–59 months ($r$=0.578, $p$<0.0001) and ($r$=0.413, $p$<0.0001), respectively.

**Conclusion**
In conclusion, the nutritional status of children under five years produced acceptable intermediate results, but it is still below levels for other parts of the Kingdom of Saudi Arabia (KSA). Future interventions are needed to address some of the shortfall in the nutritional status among the Jazan population.

**Key Words**
Nutritional status, underweight, stunting

## What this study adds:

**1. What is known about this subject?**
The nutritional status of children under five years is considered as one of the most important indicators for child survival and a reflection of their overall health.

**2. What new information is offered in this study?**
The nutritional status of children under 5 produced acceptable intermediate results, but it is still below levels for other parts of the Kingdome of Saudi Arabia (KSA).

**3. What are the implications for research, policy, or practice?**

Future interventions are needed to address some of the shortfall in the nutritional status among the Jazan population.

## Background

The nutritional status of children under five years is considered one of the most important indicators for child survival and a reflection of their overall health. When children have access to an adequate food supply, are not exposed to repeated illness, and are well cared for, they reach their growth potential and are considered well-nourished.[1]

The health and nutritional situation of the Saudi population has undergone crucial changes over the past four decades. The economic and human development witnessed in Saudi Arabia has led to changes in life style and the factors affecting diseases and causes of death. Particularly, notable examples of these changes are in the area of nutrition, which witnessed a sharp decline in malnutrition in children and an increase in life expectancy, as well as a sharp decline in infant and child mortality.[2]

Globally, malnutrition is associated with more than half of all child deaths.[1] Undernourished children are more likely to die from common childhood ailments, and those who survive, suffer recurring sicknesses and faltering growth. Three quarters of the children who die from causes related to malnutrition are only mildly or moderately malnourished – showing no outward sign of their vulnerability.[2-6]

Saudi Arabia is one of the countries that is characterized by a low level of malnutrition in the Arab world.[7,8] Some reports suggest the existence of a low level of malnutrition in the country,[9] while others reveal problems of anaemia and unhealthy life styles.[10-12] and a mild to moderate degree of stunting, wasting and overweight among preschool children.[13]

In view of the National Transformation Program 2020, the Saudi Arabian government is attempting to cause a radical change in population health through the health-care system and different preventive measures. This research focuses on the nutritional status of children below five years who are attending Primary Health Care Centres (PHCCs) in Jazan City, where there is a dearth of studies focusing on the nutritional status of children below five years of age.

## Method

**Study design and setting**

This was an observational cross-sectional study conducted in Jazan region during the period of April – May, 2018. Jazan is one of the administrative regions of the Kingdom of Saudi Arabia.

**Participants and sampling procedures**

This study focused on children aged 0−5 years in the Jazan area who had a medical file in the PHCCs. The total sample size was determined, with a power of a 95 per cent confidence level (two-sided) and anticipated population proportion (p) is estimated to be 50 per cent because this is the safest choice for (p), since P=50 per cent gives the largest sample size. A total of 440 children aged below five years of age were enrolled for the study, giving an allowance of 10 per cent for both expected refusal and incomplete information. For implementation of the sampling plan, the Jazan region was divided into three geographical distinct zones: the mountains; plains; and the coastal zones. We randomly selected two PHCCs from each sector.

**Data collection and instruments**

The data were collected through a structured questionnaire by meeting and interviewing face to face the child's guardian (i.e., mother, father, sister… etc.). The questionnaire consisted of approximately 40 questions, most of which were closed with a few open-ended questions containing the study variables. The questionnaire was designed to collect a set of information on demographic characteristics: age of children; educational status of mother; weight at birth; weaning practices. The anthropometric variables such as the age, weight and height were coded using the WHO guidelines.[14]

A digital paediatric scale was used for the measurement of the body weight of children under two years. For children over two years, we used a portable digital scale with a precision of 100g and maximum capacity of 150kg. The length of children under two years was obtained by a portable infantometer placed on a flat surface. The height of children over two years were measured using a wooden stadiometer with accuracy of 0.1cm fixed to a wall.

**Operational definitions**

**The research utilizes the following definitions:**

Underweight: The proportion of children less than five years who fall below -2 (moderate and severe) and below -3 (severe) standard deviations (SD) from median weight for age of the WHO reference population.

Stunting: The proportion of children below five years who fall below - 2 (moderate and severe) and below -3 (severe) SD from median height for age of the WHO reference population.

Wasting: The proportion of children less than five years who fall below -2 (moderate and severe) and below -3 (severe) SD from median weight for height of the WHO reference population.

**Statistical analysis**

Data collected were checked for inconsistency and missing values and thereafter analysed using the Statistical Package for Social Sciences (SPSS) program. In addition to conventional measures of malnutrition, frequency distributions were obtained and descriptive statistics were calculated. The Chi-square test of association was used to determine some associations. P value of less than 0.05 was used to indicate statistical significance. The anthropometric measurements were converted into three indices: weight for age, weight for height and height for age.

**Study ethics**

Before the commencement of the data collection, ethical clearance for the study was obtained from the Jazan University Ethics Committee ref# REC39/9S045. The children's parents or guardians were asked to read and sign consent forms prior to the data collection. Moreover, the participants' privacy was respected, and the data were kept confidential and utilized for study purposes only.

## Results

The number of children surveyed was 433, with 204 (47.2 per cent) boys and 228(52.8 per cent) girls. Table 1 shows the background characteristics of the children. According to the same table, the age distribution of the children shows that more than 25 per cent of the children fall within the same age group; 12−23 months. With regard to the mothers, 50.0 per cent of them were between 22 and 34 years of age, which represents the biggest group. Forty-nine percent of the mothers had a University degree and were above the level of education. The majority of the mothers were housewives (58.0 per cent), followed by government employees (20.7 per cent).

Table 2 illustrates the overall prevalence of malnutrition among children under the ages of five in the Jazan region. The prevalence of underweight among the children was 15.9 per cent. Moderately underweight accounts for 14.1 per cent (95 per cent CI:11.8−19.0), while less than 1 percent (0.8 per cent; 95 per cent CI:0.28−2.25) were severely underweight. Up to 89.5 per cent (95 per cent CI:85.9−92.3) of the children had normal weight for their height. Prevalence of wasting was only 10.5 per cent; about 9.9 per cent moderately, while 0.6 per cent were severely wasted. The prevalence of moderate wasting was 20.7 per cent (95 per cent CI:16.6−25.4), compared to only 1.9 per cent (95 per cent CI:0.86−2.3.9) for severe wasting.

Table 3 presents anthropometric measurements for children under five in Jazan according to some selected characteristics. There were significant differences in the prevalence of underweight children according to age groups ($p$=0.011). The prevalence of underweight children starts with a high prevalence in the first age group and then declines until the third-year age group and then increases again. Wasting was highest in the fifth year of life and lowest in the second age groups, but it did not differ significantly according to years ($p$=0.67). Children of women who are working in the private sector were free of underweight and stunting.

The correlation between nutritional indicators based on wasting, stunting, underweight, age of weaning and weight at birth are shown in Table 4. Significant positive correlation was found between underweight, stunting and wasting among the children of 0−59 months ($r$=0.578, $p$<0.001) and ($r$=0.413, $p$<0.001), respectively. Positive and significant correlations were observed between children's weight at birth and nutritional status based on underweight and wasting, ($r$=.200, $p$<0.0001) and ($r$=.104, $p$=0.043). A negative weak relationship was observed between the age of weaning and nutritional status based on underweight and wasting, but without statistically significant correlation ($r$=-0.008, $p$=0.916) and ($r$=-0.012, $p$=0.871), respectively.

Table 5 provides univariate logistic regression analyses for child growth-related factors. In this table, the children were categorized into two groups only for each nutritional indicator in order to conduct the logistic regression analysis. According to the table, children with birth weight less than 2.5kg are significantly at higher risk of underweight (OR=1.83, 95 per cent CI: 1.15−2.93, $p$ valueless than 0.05).

## Discussion

It is well documented that Gulf Arabian countries have witnessed an outstanding socioeconomic development in the last three decades, this was reflected in all life aspects including population health. These economic and social developments led to an improvement in child health generally and nutritional status specifically.[15,16] In this study, we tried to investigate the pattern of growth and nutritional

status in children below five years of age in Jazan southwest KSA, as no previous research has been conducted to investigate the picture of population growth in this highly populated region.

Our study results revealed that the malnutrition rate in children under five years of age in Jazan was slightly lower compared to some countries in the Eastern Mediterranean region,[17,18] and these agree with the regional disparity in the prevalence of malnutrition, which revealed that the southwestern region has the highest rate of malnutrition among children under five years of age in Saudi Arabia.[19]

With regard to Gulf Arab countries, our estimates were slightly higher than that of Kuwait[20] and Qatar.[21] Comparing our results with other Arabian countries for underweight, stunting and wasting, it could be observed that our measures were less than the three indicators for Sudan,[22,23] Yemen,[24] Iraq[25,26] and Libya.[27] Globally, our results produced a prevalence of malnutrition lower than the prevalence of stunting in Tanzania (44.2 per cent),[28] India (46.9 per cent)[29] and (39 per cent) in Kenya.[30]

Contrary to some studies,[21,31–33] this study did not find significant association between nutritional status and gender with regard to prevalence of different kinds of malnutrition indicators, although there were more boys with wasting and stunting than girls. Some literature suggests that boys were at a higher risk of stunting than girls.[32-35] This might be due to cultural, socioeconomic and environmental factors.[32]

The present study showed a significant association between low birth weight (less than 2.5kg) and underweight, which is consistent with other studies.[33] Many studies conducted also reported that low birth weight is a significant risk factor for malnutrition.[36,37]

The main strength of this paper is that it is the first attempt to explore nutritional status in the region; however, some shortcomings should be outlined. The prime limitation is the study design, since it is not suitable for assessing the factors associated with nutritional status. Second, the study sample may not be well representative for all the Jazan population, since the study was conducted using a limited number of PHCCs in the Jazan region. Finally, Information other than anthropometric measures was collected using standardized questionnaire. Responses were based on participant's reply which may not be very accurate.

## Conclusion

In conclusion, the nutritional status of children under the age of five produced acceptable intermediate results, but it is still below the levels for other parts of the KSA. Future interventions are needed to address some of the shortfalls in the nutritional status of children in the Jazan population.

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## PEER REVIEW

Not commissioned. Externally peer reviewed.

## CONFLICTS OF INTEREST

The authors declare that they have no competing interests.


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## ETHICS COMMITTEE APPROVAL

Jazan University Ethics Committee ref# REC39/9S045

## Abbreviations

KSA Kingdom of Saudi Arabia
SPSS Statistical Package for Social Sciences
HAZ Height-for-age z-scores
SD Standard deviation
SPSS Statistical Package for the Social Sciences
WAZ Weight-for-age z-scores
WHO World Health Organization
WHZ Weight-for-height z-scores

**Table 1: Background characteristics of the children under the age of five in Jazan (n=433)**

| Characteristics | | N | % |
|---|---|---|---|
| Gender(n=432) | Male | 204 | 47.2 |
| | Female | 228 | 52.8 |
| Mode of Living (n=405) | Urban | 273 | 67.4 |
| | Rural | 132 | 32.6 |
| Nationality (n=425) | Saudi | 351 | 82.6 |
| | Non-Saudi | 74 | 17.4 |
| Mother's Occupation(n=429) | Housewife | 249 | 58.0 |
| | Government Sector | 89 | 20.7 |
| | Private Sector | 23 | 5.4 |
| | Private Work | 15 | 3.5 |
| | Others | 53 | 12.4 |
| Mother's Level of Education (n=425) | Illiterate | 36 | 8.5 |
| | Primary | 24 | 5.6 |
| | Elementary education | 44 | 10.4 |
| | High School | 109 | 25.6 |
| | University and above | 212 | 49.9 |
| Mother's Age | 15–24 years | 127 | 30.0 |
| | 25–34 years | 212 | 50.0 |
| | 35–50 years | 85 | 20.0 |
| Child Age (Months) | 0–5 | 88 | 20.3 |
| | 6–11 | 94 | 21.7 |
| | 12–23 | 112 | 25.9 |
| | 24–35 | 61 | 14.1 |
| | 36–47 | 41 | 9.5 |
| | 48–60 | 37 | 8.5 |
| ***Total*** | | 433 | 100 |
| **Measures (Mean, SD)** | Child's age in months | 18.2 | 15.0 |
| | Weight at birth (kg) | 2.7 | 0.7 |
| | Current weight (kg) | 9.3 | 3.7 |
| | Height(Cm) | 73.8 | 17.4 |

**Table 2: Overall prevalence of malnutrition among children under five in Jazan region**

| Anthropometric indices | Category | N | % | 95%C.I. |
|---|---|---|---|---|
| **Weight for age (underweight)** | Normal | 324 | 84.2 | 80.2–87.5 |
| | Moderate underweight | 58 | 15.1 | 11.8–19.0 |
| | Severe underweight | 3 | 0.8 | 0.28–2.25 |
| **Weight for height (wasting)** | Normal | 316 | 89.5 | 85.9–92.3 |
| | Moderate wasting | 35 | 9.9 | 7.2–13.5 |
| | Severe wasting | 2 | 0.6 | 1.8–2.0 |
| **Height for age (stunting)** | Normal | 255 | 77.5 | 72.7–81.7 |
| | Moderate stunting | 68 | 20.7 | 16.6–25.4 |
| | Severe stunting | 6 | 1.8 | 0.86–2.3.9 |

**Table 3: Anthropometric measurement in children under five years in Jazan according to some selected criteria**

| Variables | Weight for age | | | Weight for height | | | Height for age | | |
|---|---|---|---|---|---|---|---|---|---|
| | Normal | Moderate | Severe | Normal | Moderate | Severe | Normal | Moderate | Severe |
| **Gender** | | | | | | | | | |
| Male | 83.5% | 16.5% | **0.0%** | 88.4% | 11.6% | **0.0%** | 75.6% | 23.7% | 0.6% |
| Female | 84.7% | 13.8% | 1.5% | 90.6% | 8.3% | 1.1% | 79.2% | 17.9% | 2.9% |
| ***p*. value** | **0.205** | | | **0.230** | | | **0.145** | | |
| **Child's Age (Months)** | | | | | | | | | |
| (0–05) | 69.7% | 27.6% | 2.6% | 89.4% | 9.1% | 1.5% | 75.0% | 21.9% | 3.1% |
| (06–11) | 87.1% | 12.9% | 0.0% | 97.7% | 2.3% | 0.0% | 76.3% | 23.7% | 0.0% |
| (12–23) | 89.3% | 9.7% | 1.0% | 89.4% | 10.6% | 0.0% | 80.2% | 17.4% | 2.3% |
| (24–35) | 94.2% | 5.8% | 0.0% | 83.7% | 16.3% | 0.0% | 62.5% | 33.3% | 4.2% |
| (36–47) | 85.7% | 14.3% | 0.0% | 84.4% | 12.5% | 3.1% | 92.9% | 7.1% | 0.0% |
| (48–60) | 76.5% | 23.5% | 0.0% | 80.0% | 20.0% | **0.0%** | 88.9% | 11.1% | 0.0% |
| ***p*. value** | **0.011** | | | **0.67** | | | **NA** | | |
| **Nationality** | | | | | | | | | |
| **Saudi** | 84.3% | 15.4% | 0.3% | 89.4% | 9.9% | 0.7% | 77.3% | 21.2% | 1.5% |
| **Non-Saudi** | 83.3% | 13.6% | 3.0% | 90.5% | 9.5% | 0.0% | 77.6% | 19.0% | 3.4% |
| ***p*. value** | **0.131*** | | | **0.099*** | | | **0.461*** | | |
| **Mother's Occupation** | | | | | | | | | |
| Housewife | 84.2% | 14.4% | 1.4% | 87.1% | 12.4% | 0.5% | 80.6% | 17.3% | 2.1% |
| Government Sector | 82.1% | 17.9% | 0.0% | 88.7% | 11.3% | 0.0% | 70.6% | 27.9% | 1.5% |
| Private Sector | 100.0% | 0.0% | 0.0% | 100.0% | 0.0% | 0.0% | 75.0% | 25.0% | 0.0% |
| Private Work | 83.3% | 16.7% | 0.0% | 100.0% | 0.0% | 0.0% | 100.0% | 0.0% | 0.0% |
| Others | 80.0% | 20.0% | 0.0% | 93.2% | 4.5% | 2.3% | 71.1% | 26.3% | 2.6% |
| ***p*. value** | **0.422*** | | | **0.285*** | | | **0.378*** | | |
| **Mother's Level of Education** | | | | | | | | | |
| Illiterate | 84.4% | 15.6% | 0.0% | 80.0% | 20.0% | 0.0% | 76.9% | 19.2% | 3.8% |
| Primary | 95.2% | 4.8% | 0.0% | 94.7% | 5.3% | 0.0% | 63.2% | 31.6% | 5.3% |
| Elementary | 75.0% | 22.5% | 2.5% | 93.8% | 6.3% | 0.0% | 81.8% | 15.2% | 3.0% |
| High School | 83.3% | 15.6% | 1.0% | 91.2% | 8.8% | 0.0% | 76.5% | 22.2% | 1.2% |
| University and above | 85.1% | 14.4% | 0.5% | 89.0% | 9.8% | 1.2% | 79.0% | 19.8% | 1.2% |
| ***p*. value** | **0.538*** | | | **0.645*** | | | **0.520*** | | |
| **Mother's Age** | | | | | | | | | |
| 15–24 years | 81.0% | 18.1% | 0.9% | 90.8% | 7.3% | 1.8% | 74.7% | 23.2% | 2.1% |
| 25–34 years | 85.2% | 13.8% | 1.1% | 91.3% | 8.7% | 0.0% | 80.1% | 18.1% | 1.8% |
| 35–50 years | 86.1% | 13.9% | 0.0% | 82.9% | 17.1% | 0.0% | 76.1% | 22.4% | 1.5% |
| ***p*. value** | **0.807** | | | **0.042** | | | **0.880** | | |

**Table 4: Correlation matrix for anthropometric measurement**

| Variables | WHZ | HAZ | WAZ | Age at weaning | Weight At birth |
|---|---|---|---|---|---|
| **WHZ** | 1 | | | | |
| **HAZ** | -.461** | 1 | | | |
| **WAZ** | .413** | .578** | 1 | | |
| **Age of weaning** | -0.012 | -0.037 | -0.008 | 1 | |
| **Weight at birth** | .104* | 0.04 | .200** | .170* | 1 |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | | | |
| *. Correlation is significant at the 0.05 level (2-tailed). | | | | | |
| **WHZ =** Weight-for-age z-scores, **HAZ=** Height-for-age z-scores and **WAZ=** Weight-for-age z-scores | | | | | |

**Table 5: Univariate logistic regression analyses for child growth-related factors**

| Variables | Weight for age | | | Weight for height | | | Height for age | | |
|---|---|---|---|---|---|---|---|---|---|
| | OR | 95% CI | | OR | 95% CI | | OR | 95% CI | |
| **Gender** | | | | | | | | | |
| Female (ref) | | | | | | | | | |
| Male | 1.09 | .700 | 1.70 | 1.17 | 0.70 | 1.950 | 1.21 | 0.81 | 1.81 |
| **Child Age (Months)** | | | | | | | | | |
| (0–05) (ref) | | | | | | | | | |
| (06–11) | 2.74* | 1.35 | 5.16 | 1.21 | 0.66 | 2.21 | 1.21 | 0.66 | 2.21 |
| (12–23) | 3.11* | 1.61 | 5.98 | 1.44 | 0.79 | 2.61 | 1.44 | 0.79 | 2.61 |
| (24–35) | 2.62* | 1.22 | 5.63 | 0.84 | 0.43 | 1.67 | 0.84 | 0.43 | 1.67 |
| (36–47) | 1.75 | 0.78 | 3.95 | 1.58 | 0.70 | 3.56 | 1.58 | 0.70 | 3.56 |
| (48–60) | 1.67 | 0.72 | 3.89 | 2.19 | 0.88 | 5.44 | 2.19 | 0.88 | 5.44 |
| **Nationality** | | | | | | | | | |
| Non-Saudi (ref) | | | | | | | | | |
| Saudi | 0.91 | 0.51 | 1.63 | 1.22 | 0.61 | 2.48 | 1.00 | 0.59 | 1.69 |
| **Mother's Age** | | | | | | | | | |
| 15–24 years(ref) | | | | | | | | | |
| 25–34 years | 1.57 | 0.82 | 3.03 | 0.66 | 0.32 | 1.36 | 1.36 | 0.77 | 2.42 |
| 35–50 years | 1.27 | 0.77 | 2.08 | 0.82 | 0.45 | 1.51 | 1.56 | 0.99 | 2.47 |
| **Weight at Birth** | | | | | | | | | |
| Less than 2.5 kg. | 1.83* | 1.15 | 2.93 | 1.11 | 0.63 | 1.94 | 1.23 | 0.79 | 1.91 |
| 2.5 and More kg.(ref) | | | | | | | | | |