

# Investigating the Food Security of Children's Household in Earthquake-Stricken Areas of Kermanshah

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## Abstract

**Introduction:** Considering that children are the most vulnerable groups at the time of the earthquake, and since reasons such as inaccessibility to food resources affect the child's growth at the time of the earthquake occurrence, it seems that in these conditions children with regard to the limitations suffer stunting, including short height. **Materials and Methods:** From 156 children aged 2 to 5 years, 71 boys and 85 girls participated in this study. The growth status of children in the percentiles of (weight, height and body mass index for age) before the earthquake was completed, and investigated by a morphology questionnaire along with after the earthquake. The ratio of energy received was completed and collected by the 24-hour food recall questionnaire, and household food security was completed and collected by the 18-item questionnaire. **Findings:** The findings show that 34% of the children's households in the study were in a secure food status and 66% were in an insecure food status without hunger. The findings showed that, considering the significance level ( $P < 0.05$ ) in all percentiles, there is a statistically significant relationship between children's growth status after the earthquake and the food security of children households. **Conclusion:** According to the results, the better the food security status ratio of the family is, children will grow naturally with adequate and fortifying energy.

Keywords: Growth Status, Household Food Security, Children, Earthquake

## INTRODUCTION

The most significant and devastating natural disaster that has accompanied mankind and the earth since the beginning of time until now, and there is always the possibility of its emergence in various forms. Dimension is the earthquake, that from this ratio, has allocated more than 60 percent of mortality to itself <sup>[1]</sup>.

One of the major complications and the most important limitation in disasters and crisis conditions is the limitation of food resources and the reduction of energy supply. With the limitation of food resources and the reduction of energy intake, including micronutrients and vitamins due to the earthquake, people of the community in crisis, become prone to various infections and diseases, and this point increases the mortality ratio of children <sup>[2]</sup>. In these times, the most vulnerable group is children. From this perspective, the evaluation of available food resources, proper rationing, prioritizing high-risk groups, especially children, and foodstuff distribution should be considered concerning the evaluation of minimum energy and micronutrient needs.

In a crisis, children need foods with higher nutritional value than adults. Investigating the nutrition status and identifying the nutritional needs of children is one of the most important initial measures in nutritional planning in a crisis <sup>[3]</sup>.

Significant progress has been made in recent decades to reduce the prevalence of malnutrition. But malnutrition may cause damages to the process of physical, mental, and psychological growth and development, especially between the ages of 2 and 5 that are irrecoverable.

The main and most common cause of losing weight and inadequate growth is insufficient foodstuff intake. Therefore, studies and plans for its prevention and treatment should also focus on foodstuff interventions and diet, both in terms of production, distribution, foodstuff access, and also in terms of the awareness and attitude of community and nutrition

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training. Now, concerning the importance of physical health, and due to having food security and life satisfaction ratio, proper nutrition is an important factor in people's physical health can be effective. Also, 6 to 59-month-old children are more sensitive to nutritional tensions and destructive factors and can be selected and evaluated as an indicator to show the malnutrition situation in the whole population.

The main criterion for adequate growth is the amount of energy received by the child <sup>[4]</sup>. In terms of crisis incidence, cases such as losing weight and stunted growth in children less than 5 years of age, that respectively, with the indicators of weight for age and height for age, body mass index for age and energy intake ratio is important in terms of nutrition should be examined and measured. In times of crisis, children under the age of 5, items such as: wasting and stunting, which have the characteristics of weight, height, body mass index for age and the amount of energy received, respectively, that are important in terms of nutrition have to be examined and measured, because paying attention to the health status and nutrition of children is one of the important issues of the World Health Organization (WHO). Nutrition and the growth status of children are the best indicators for children's health <sup>[5]</sup>. Growth means the physical dimension increase in general, or an increase in any of the components referred to it, which causes a quantitative change in the body. These components usually include height, weight, head circumference, arm circumference, chest circumference, and total body surface. Growth deviations are often recognized as the first sign of the existence of a problem in the child <sup>[6]</sup>.

To evaluate the child's growth, the growth curve is used, but since Iranian standards are not available, to evaluate and compare the growth percentile of the child, the growth trend of children is compared with non-Iranian standards such as the pediatrics of Nelson, Forfar and Carnet <sup>[7]</sup>.

On the other hand, concerns in the crisis are double when the issue of food insecurity is also raised. Food security is one of the most important distorting variables that can have a great impact on children's energy intake ratio and growth status. Food is among the basic needs of human society, that supplying it lies in the food security domain. According to the definition of food security, food insecurity can be mentioned as the limitation of access to adequate intake of acceptable food <sup>[8]</sup>. The results of numerous researches indicate a significant relationship between nutrition status and health status.

In 2011, a study was conducted by Royce *et al.* on 1,800 families who survived the earthquake in 2010, Haiti, to investigate food insecurity in children after the earthquake. Data extraction was performed by investigating the Port-au-Prince (before and six weeks after the earthquake). The results of this study showed that the prevalence of food insecurity in children has been 22.6%. And education has been accompanied by a significant reduction in food insecurity indicators. The existence of chronic and acute

illnesses, poor living conditions, low family income, and mental health have a significant relationship with food security. That group of families that had vulnerability before the earthquake was also more vulnerable to food insecurity after the earthquake <sup>[9]</sup>.

In 2011, Larson *et al.* conducted a review study on the nutrition security status of children and their households, that generally no significant relationship was observed between food insecurity and children's weight status, and indicated that the risk of weight increase may go up in food aid program in the long-term <sup>[10]</sup>.

In the earthquake of 2017 in Kermanshah province, 91 children were left unsupervised, of which 31 cases lost their mothers, the fathers of 47 cases lost their lives, and 13 cases lost both parents <sup>[11]</sup>. A study in Iran by Ahmad Koosha *et al.* in 2012 to investigate the status of malnutrition and stunting in children aged 6 to 59 months was performed in Varzeqan city 2 months after the earthquake occurrence on 128 children. Of the total population under study, 70 people (54.7%) were boys and 58 people (45.3%) were girls. They were evaluated before and after the earthquake. The results of this study showed that in the conducted investigation 10 people (7.8%) before the earthquake and 37 people (28.9%) after the earthquake had stunting, 14 people (10.9%) had growth slowness (that can be related to nutrition problems) 15 people (11.7%) had growth stop and 8 people (6.25%) had growth decline, therefore the situation of acute malnutrition in the earthquake-stricken areas of Varzeqan after the earthquake occurrence is similar to the situation before the earthquake, but the stunting in children after the earthquake occurrence had increased <sup>[12]</sup>.

According to the above-stated points, unhealthy nutrition and poor health and food insecurity in childhood may affect the cognitive abilities needed to learn and thus gaining success in education <sup>[13]</sup>. For this reason, comparing and examining the nutrition status of children in critical areas to maintain and promote health and to ensure the normal process of growth, is of particular importance. On the other hand, having proper and complete nutrition is considered as one of the most important indicators of growth, that in the present research we seek to answer the following questions.

- 1- What was the growth status of children aged 2 to 5 years in the study before the earthquake?
- 2- What is the growth status of children aged 2 to 5 years in the study after the earthquake?
- 3- Has the growth status of children aged 2 to 5 years been changed before and after the earthquake in the earthquake-stricken areas?
- 4- How is the food security of the children's household in the study after the earthquake?

## MATERIALS AND METHODS

This research is a retrospective cohort study. The population under study is the children aged 2 to 5 years along with the head of household among the survivors of the 2017

earthquake in the cities of Sarpol-e-Zahab and Salas-e-Babajani, which had been known as the most damaged cities in Kermanshah province. In the present research, for determining the sample size we consider the confidence level equal to 95% and the error of the first type equal to 0.05. Also, the total population size is equal to 263, of which 71 are boys and 85 are girls, that the population under study is composed of 156 children aged 2 to 5 years. In this case, according to the formula <sup>[14]</sup>, the optimal size of our sample was equal to 156 people. Among the criteria to enter the study, the care of the child at least 4 months before the earthquake at the Sarpol-e-Zahab and Salas-e-Babajani health centers, and having physical health can be mentioned. Also, the criteria for leaving the study included not having the consent or the non-cooperation of the parents in responding, suffering from chronic diseases, malnutrition and not having physical health, food allergy, and observing a special diet and not cooperating with health centers.

### Implementation Method

Since the cities of Sarpol-e-Zahab and Salas-e-Babajani had been known as vulnerable areas due to the Kermanshah earthquake in 2017, the target population was selected from children aged 2 to 5 years with the children's household supervisor from the same areas. After receiving the code of ethics numbered as (IR.TUMS.VCR.REC.1397.225) from the ethics committee of Tehran University of Medical Sciences and obtaining a written agreement from the health deputy of Kermanshah University of Medical Sciences to coordinate and refer to health centers for collecting initial information to complete, compare and investigate, the cluster sampling method was performed.

Observation and interview methods have been used to collect information and data.

### Data Collection Tool

In this study, the tools of children's anthropometric questionnaire before and after the earthquake, the 24-hour food recall questionnaire to estimate children's energy intake ratio, the 18-item household's food security (USDA) questionnaire (Appendix 4), the children household's satisfaction with life (SWL) questionnaire and the questionnaire of general, economic and social status of children's households have been used.

### The Method of Anthropometric Evaluation and Morphology

In this study, weight was measured in terms of kilograms with minimum clothing and without shoes by digital scale (seca) with an accuracy of 20 grams in two steps for more accuracy and less error. The children's height in this study have been measured in terms of a centimeter with a non-stretch tape meter fixed on the wall without shoes and hat and straight without bending the waist, fractures of the knees-heels clinging to the corner of the wall and looking forward. The age of the child was taken into account based on the age of the birth certificate. Finally, BMI (Body Mass Index) was

obtained by dividing the weight ratio (Kg) to the square of height (m). The body mass index of a child is calculated differently based on the usual classification. Although the application method for them is almost similar to that of adults, it provides a percentage for children to compare a child with children of the same age and gender.

Energy intake was calculated by energy calorie volume received in 24 hours (daily). Children's nutrition status was measured by the child's growth percentile based on WHO indicators. To evaluate the child's body mass index based on anthropometric criteria, the following standard indicators have been used: <sup>[15]</sup>

Weight Indicators for Age (WAZ)

Height Indicators for Age (HAZ)

BMI Indicators for Age (BAZ)

### Evaluating Food Recall

To measure the energy intake ratio of the children under study, the food recall questionnaire was used in two non-holiday and one holiday days. And the results obtained from the three-time mean have been analyzed using the nutrition software (NUT 4). This questionnaire was completed by interviewing the head of the children's household.

### Food Security Evaluation

Information related to the Food Security Questionnaire was asked by the head of the children's household and completed. This 18-item questionnaire (USDA) presented in appendix 4, investigates for 12 months before completing the questionnaire. This questionnaire was used in 1995 by the United States of America Department of Agriculture as a valid global questionnaire for epidemiological studies. This questionnaire has also been validated in previous studies in Iran <sup>[16]</sup>. The Household Food Security 18-Item (USDA) Questionnaire scoring based on the method of Gary Bickel *et al.* is such that the answers of "often correct", "sometimes correct" in questions 1 to 3 and 11 to 13, "almost every month", "some months" in questions 5-10 and 16 "Yes", in questions 4 and 6 to 9, 15, 17 and 18 are given positive points (1 score), and the answers of "are not correct", "I don't know" or "it refuses" only 1 or 2 months and "No", the zero scores are given; the final score of the food security questionnaire is calculated by summing up the number of positive answers <sup>[17]</sup>.

### Methods of Data Statistical Analysis

Descriptive-inferential statistical methods were used to organize and summarize information, prepare tables, draw diagrams, and describe the collected data. Indexes were used with anthropometric indicators (WHOAnthroPlus) to investigate the growth status of children. The ratio of energy received by children was analyzed by the nutrition software (NUT4). Independent t-tests, analysis of variance test, Chi-square test, ANOVA, and regression test using SPSS18 software were used to investigate the research hypotheses. Also, the data of this study were analyzed in two descriptive and inferential sections with a significance level lower than  $P = 0.05$ .

## FINDINGS

### Demographic Related Findings of the Participants

**Table 1:** Frequency Distribution of Respondents in Terms of Gender

Gender	Number (Absolute Frequency)	Percentage (Relative Frequency)
Boy	71	45.5
Girl	85	54.5
Total	156	100

Table 1 shows that among 156 children, 71 children (45.5%) were boys and 85 children (54.5%) were girls. The relative frequency number of girls (54.5%) has allocated the majority of the population under study to itself.

**Table 2:** Frequency Distribution, in Terms of the Growth Status of Children (Weight for Age) before and after the Earthquake

	Weight for Age (Before the Earthquake)		Weight for Age (After the Earthquake)	
	Number (Absolute Frequency)	Percentage (Relative Frequency)	Number (Absolute Frequency)	Percentage (Relative Frequency)
<b>Obese</b>	2	1.3	1	0.6
<b>Overweight</b>	46	29.5	24	15.4
<b>Normal</b>	88	56.4	99	63.5
<b>Lightweight</b>	19	12.2	30	19.2
<b>Severe Lightweight</b>	1	0.6	2	1.3
<b>Total</b>	156	100	156	100

Therefore, considering Table 2, it can be concluded that the growth status of most children under study in this research in terms of (weight for age) before and after the earthquake, with a quorum of 56.4% before the earthquake and 63.5% after the earthquake is normal.

### Findings Related to the Frequency Distribution in Terms of the Growth Status (Height for Age) of the Children under Study before and after the Earthquake

**Table 3:** Frequency Distribution in Terms of the Growth Status of Children (Height for Age) under Study before and after the Earthquake

	Height for Age (Before the Earthquake)		Height for Age (After the Earthquake)	
	Number (Absolute Frequency)	Percentage (Relative Frequency)	Number (Absolute Frequency)	Percentage (Relative Frequency)
<b>Very Tall</b>	4	2.6	24	15.4
<b>Tall</b>	21	13.3	44	28.2
<b>Normal</b>	84	53.8	63	40.4
<b>Short Height</b>	43	27.6	19	12.2
<b>Severely Short Height</b>	4	2.6	6	3.8
<b>Total</b>	156	100	156	100

### Anthropometric Related Findings of Children Aged 2 to 5 Years Old

#### Findings Related to Frequency Distribution in Terms of the Growth Status of Children (Weight for Age) under Study before and after the Earthquake

Table (2) shows that before the earthquake, out of 156 children, 2 children (1.3%) were obese and 46 children (29.5%) had overweight and 88 children (56.4%) had normal growth and 19 children (12.2%) had lightweight and only 1 child (0.6%) had severely lightweight. It also shows that after the earthquake among 156 children, 24 children (15.4%) had overweight, 99 children (63.5%) had normal growth, 30 children (19.2%) had lightweight and 2 children (3.1%) had severely lightweight, and 1 child (0.6) was obese.

The results of Table (3) show that before the earthquake, out of 156 children, 4 children (6.2%) were very tall and 21 children (13.3%) were tall and 84 children (53.8%) had normal growth and 43 children (27.6%) had short height, and 4 children (2.6%) had severely short height. Also, after the earthquake, it shows that among 156 children, 24 children (15.4%) are very tall and 44 children (28.2%) are tall and 63 children (40.4%) have normal growth and 19 children (12.26%) have short height and 6 children (3.8%) have a severe short height.

Therefore, according to Table 3, it can be concluded that the growth trend of children under study in this research in terms of (height for age) with a quorum of 53.8% before the earthquake and 40.4% after the earthquake have normal growth.

### Findings Related to the Frequency Distribution in Terms of the Growth Status (Body Mass Index for Age) of Children under Study before and after the Earthquake

The results of Table (4) before the earthquake indicate that out of 156 children, 8 children (5.1%) had overweight and 19

children (12.2%) had a potential risk of overweight and 91 children (58.3%) had normal growth and 23 children (14.7%) had a potential risk of wasting the weight and 10 children (4.6%) had lightweight, of which 4 children (6.2%) had severe lightweight and 1 child (0.6) was obese. Also, the results obtained after the earthquake indicate that among these 156 children, 4 children (6.2%) are obese and 4 children (2.6%) have overweight and 30 children (19.2%) have a potential risk of overweight and 93 children (59.6%) have normal growth and 14 children (9%) have a potential risk of wasting the weight, 5 children (3.2%) have lightweight and 6 people (3.8%) have severe lightweight.

**Table 4:** Distribution of Children in Terms of (Body Mass Index for Age) Status before and after the Earthquake

	Body Mass Index for Age (Before the Earthquake)		Body Mass Index for Age (After the Earthquake)	
	Frequency	Percentage	Frequency	Percentage
<b>Obese</b>	1	0.6	4	2.6
<b>Overweight</b>	8	5.1	4	2.6
<b>Potential Risk of Overweight</b>	19	12.2	30	19.2
<b>Normal</b>	91	58.3	93	59.6
<b>Potential Risk of Wasting the Weight</b>	23	14.7	14	9
<b>Lightweight</b>	10	6.4	5	3.2
<b>Severely Lightweight</b>	4	2.6	6	3.8
<b>Total</b>	156	100	156	100

Therefore, considering Table 4, it can be concluded that the growth status of most children under study in this research in terms of (body mass index for age) before and after the earthquake with a quorum of 58.3% before the earthquake and 59.6% after the earthquake has a normal growth.

### Findings Related to the Food Security Status of the Household in the Study

The prevalence ratio of food insecurity mentioned in Table 5 is 53 people (34%) of the respondents are in a secure food status and 63 (40.6%) of the households are in an insecure food status without hunger and 23 people (14.7%) of the households are in an insecure food status with moderate hunger, and 17 people (10.9%) of the households are in an insecure food status with severe hunger.

**Table 5:** Absolute and Relative Frequency Distribution of Food Security Status of People under Study

	Number (Absolute Frequency)	Percentage (Relative Frequency)
Food Security	53	34.0
Food Insecurity without Hunger	63	40.4
Food Insecurity with Moderate Hunger	23	14.7
Food Insecurity with Severe Hunger	17	10.9

Total	156	100
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Therefore, according to Table 5, in the absolute and relative frequency distribution in terms of the food security status (USDA), most of the people under study in this research, by acquiring 40.4% are in the food insecurity status without hunger.

### Findings of K-S (Kolmogorov-Smirnov) Test to Investigate the Normality of Variables

H<sub>0</sub>: Variables Are Normal; Sig. ≥ 0.05

H<sub>1</sub>: Variables Are Not Normal; Sig. < 0.05

**Table 6:** Findings of the K-S (Kolmogorov-Smirnov) Test

Variable	Test Statistics	P-Value
<b>Child's Growth Status before the Earthquake</b>	0.539	0.940
<b>Energy Received</b>	1.292	0.071
<b>Child's Growth Status after the Earthquake</b>	0.845	0.473
<b>Evaluating Food Security of the Child's Household</b>	2.421	0.250

\*Kolmogorov-Smirnov Test

Considering Table 6 and the obtained values, and the significance level, all variables (P-Value > 0.05) show that

the zero hypothesis is not rejected. And it can be claimed with 95% confidence that all variables follow the normal distribution. Therefore, the parameter equivalence of tests is used to analyze the research hypotheses.

**Findings Related to the Relationship between the Growth Status of Children Aged 2 to 5 Years before the Earthquake and the Growth Status of Children under Study after the Earthquake**

H<sub>0</sub>: There is no statistically significant difference between the growth of children aged 2 to 5 years before the earthquake and the growth status of children aged 2 to 5 years after the earthquake; Sig. ≥ 0.05.

H<sub>1</sub>: There is a statistically significant difference between the growth of children aged 2 to 5 years before the earthquake and the growth status of children aged 2 to 5 years after the earthquake; Sig. < 0.05.

**Table 7: Descriptive Indicators of the Growth Status of the Children under Study before and after the Earthquake**

Child's Growth Status		Standard Deviation	Mean
Weight for Age	Growth Status of the Children before the Earthquake	0.34	1.26

Height for Age	Growth Status of the Children after the Earthquake	-0.07	1.11
	Growth Status of the Children before the Earthquake	0.85	2.18
	Growth Status of the Children after the Earthquake	-0.22	1.46
Body Mass Index for Age	Growth Status of the Children before the Earthquake	-0.14	1.36
	Growth Status of the Children after the Earthquake	0.10	1.40

The results of Table 7 show the descriptive index of children's growth status before and after the earthquake that the mean of the variable of children's growth (weight for age and height for age) before the earthquake is higher than the mean of the child's growth after the earthquake, and the mean of the child's growth variable (body mass index for age) before the earthquake is lower than the mean of the child's growth after the earthquake. Of course, this claim is measured by an independent t-test to make our hypothesis more complete.

**Comparison of the Growth Status of Children Aged 2 to 5 Year Old under Study before and after the Earthquake**

**Table 8: Comparison of Growth Status of Children Aged 2 to 5 Years**

Growth Status of the Child	T Statistics	Degree of Freedom	Significance Level	Mean Difference	Confidence Interval 95%		
					High	Low	
Weight for Age	Growth Status of the Child before and after the Earthquake	3.09	310	0.002	0.41	0.68	0.15
Height for Age	Growth Status of the Child before and after the Earthquake	5.13	271.44	0.000	1.08	1.49	0.66
Body Mass Index for Age	Growth Status of the Child before and after the Earthquake	-1.59	309.6	0.11	-0.24	0.058	-0.55

The results of Table 8 above show the independent t-test in the percentile of (weight and height for age) (Sig <0.05). Therefore, the zero hypothesis for these two research variables is rejected. And it can be claimed with 95% confidence that there is a statistically significant difference between the growth status of children aged 2 to 5 years before the earthquake and after the earthquake. On the other hand, in the percentile of (body mass index for age), it is (Sig > 0.05). Therefore, the zero hypothesis for this research variable is confirmed. That is, it can be claimed with 95% confidence

that there is no statistically significant difference between the growth status of children aged 2 to 5 years before the earthquake and after the earthquake.

**Findings Related to the Relationship between the Growth Status of Children Aged 2 to 5 Years after the Earthquake and the Food Security of the Household of Children under Study**

**Table 9: Investigating the Relationship between Children's Growth Status Variables after the Earthquake and Food Security Status**

Growth Percentiles	Growth Status Variable Levels	Food Security Status Variable Levels					Total
		Food Security	Food Insecurity without Hunger	Food Insecurity with Moderate Hunger	Food Insecurity with Severe Hunger		
Weight for Age	Obese	0	1	0	0	1	
	Overweight	11	11	1	1	24	

	Normal	35	35	18	11	99
	Lightweight	7	15	4	4	30
	Severe Lightweight	0	1	0	1	2
	Very tall	2	2	0	0	4
	Tall	11	7	3	0	21
Height for Age	Normal	31	32	12	9	84
	Short Height	8	22	7	6	43
	Severe Short Height	1	0	1	2	4
	Obese	1	2	0	1	4
	Overweight	0	3	1	0	4
	Probable risk of Wasting the Weight	14	9	4	3	30
Body Mass Index for Age	Normal	30	35	15	13	93
	Probable Risk of Wasting the Weight	3	8	3	0	14
	Lightweight	1	4	0	0	5
	Severe Lightweight	4	2	0	0	6
	Chi-Square Test	Chi-Square Test	Degree of Freedom	Significance Level	Rejection or Confirmation of Research Hypothesis	
	Weight for Age	12.65	12	0.039	Confirmed	
	Height for Age	18.67	12	0.047	Confirmed	
	Body Mass Index for Age	18.83	18	0.04	Confirmed	

\* Chi-Square

\* Relationship between Variables Survey Test

The data in Table 9 of Chi-Square test in investigating the relationship between the variables of growth status of 2 to 5 years old children after the earthquake and the household food security shows that according to the significance level ( $P < 0.05$ ), the zero hypothesis is rejected. Therefore, it can be claimed with 95% confidence that there is a statistically significant relationship between children's growth status after

the earthquake and children's household's food security in every three percentiles.

### Findings Related to the Relationship between the Growth Status of Children Aged 2 to 5 Years and the Ratio of Energy Intake of Children under Study

**Table 10:** Comparison of the Mean of Energy Intake in Terms of the Levels of the Child's Growth Status

Growth Percentiles	Levels	Frequency	Significance Level			
			Mean	Standard Deviation	F Value	
Weight for Age	Obese	1	583.783	0	13.18	0.0322
	Overweight	24	899.1254	444.9069		
	Normal	99	742.4781	373.5545		
	Lightweight	30	701.7654	294.1423		
	Severe Lightweight	2	866.2575	265.4444		
Height for Age	Very Tall	4	833.676	212.1115	1.478	0.542
	Tall	21	756.1954	342.0292		
	Normal	84	789.689	418.1531		
	Short Height	43	702.8548	308.0212		
	Severe Short Height	4	670.5393	268.9606		
Body Mass Index for Age	Obese	4	712.3735	145.2742	20.029	0.041
	Overweight	4	908.9845	325.0311		
	Probable Risk of Wasting the Weight	30	882.6579	492.1583		
	Normal	93	722.8087	344.0755		
	Probable Risk of Wasting the Weight	14	710.788	272.5098		

<b>Lightweight</b>	5	631.6566	346.3667
<b>Severe Lightweight</b>	6	859.6515	415.3147

\* ANOVA test

\* Scoring the Dependent Variable of Test

The results of Table 10 of the ANOVA test show that in terms of the levels of growth status of children aged 2 to 5 years, according to the significance level ( $P=0.03$ ) which is lower than 0.05 (in the percentile of weight for age) and significance level ( $P=0.04$ ) which is lower than 0.05 (in the percentile of body mass index for age) after the earthquake, there is a statistically significant relationship between the energy received and the variables of children's growth (percentiles of weight and body mass index for age), which in terms of the table of the mean energy intake in the two groups of overweight was higher than the other groups. However, according to the significance level ( $P=0.54$ ) which is higher than 0.05, it shows that there is no statistically significant relationship between the received energy and the variables of children's growth (percentile of height for age).

### The Final Model of Multivariate Logistic Regression Related to the Relationship between the Food Security of Children's Household and the Growth Status of Children under Study after the Earthquake

**Table 11:** The Logistic Regression of the Relationship between Food Security and the Growth Status of Children after the Earthquake

Growth Status Dependent Variable	Independent Variable	OR (95%CI)	P- Value
<b>Body Mass Index for Age</b>	Food Security	45.63	0.015
<b>Weight for Age</b>	Food Security	45.33	0.032
<b>Height for Age</b>	Food Security	57.79	0.048

\* Regression test

In Table 11 the multivariate regression of the relationship between the variables has been measured. Investigating the relationship between food security and children's growth status (body mass index and weight and height for age) with respect to the significance level ( $P < 0.05$ ) which is positive in every three percentiles, there is a statistically significant relationship. These results show that children understudy in the food security group has 49.58 times more chance than in food insecurity groups.

## DISCUSSION

All child growth data were measured according to the global index standards (NCHS, WHO). This study was also adapted according to the validity and reliability of the performed studies. The present research, with a different approach and from another point of view, seeks to examine the importance of comparing the growth of children along with considering all the disturbing variables that affect the child's growth

process. This research seeks to specify what relationship the related independent and dependent variables have with children's growth indicators. Using the Kolmogorov-Smirnov (k-s) test for the research variables and the obtained values, the significance level of all variables is ( $P\text{-value} > 0.05$ ) and shows that all variables follow the normal distribution.

To describe the growth status of children before and after the earthquake, a descriptive index was used which showed that the mean of children's growth variable (weight and height for age) before the earthquake is higher than the mean of children's growth after the earthquake, and the mean of children's growth variable (body mass index for age) before the earthquake is lower than the mean of children's growth after the earthquake. Of course, we measured this claim through an independent t-test, to make our hypothesis more complete. The results of the independent t-test for the children's growth variable (weight and height for age) showed that ( $\text{Sig} < 0.05$ ). Therefore, the zero hypothesis for these two research variables is rejected. By the performed investigations in both groups ( $P < 0.05$ ), they show that the weight and height after the earthquake did not grow enough than before the earthquake. Therefore, the present study is consistent with the study conducted in Iran by Yarpurvar *et al.* to investigate the malnutrition status and stunting in 500 children aged 6 to 59 months in Varzeqan city after the earthquake occurrence in 2004, and the study results showed that the prevalence ratio of lightweight, short height and medium and severe thinness of children under study have respectively been 15.2%, 8.9%, and 5.6%, and the prevalence of thinness in children aged 6 to 24 months has significantly been higher than older children <sup>[18]</sup> and by another study conducted by Zangmo *et al.* in 2012 in Bhutan, which investigated the nutrition status of 2,376 children aged 6 to 59 months in Bhutan, and concerning the results of this study, 34.9% of children had short height and 10.4% had lightweight, and 4.4% had overweight, also, 4.7% suffered from malnutrition, which had a significant relationship <sup>[19]</sup>. However, it is not consistent with the study conducted in Iran by Ahmad Koosha *et al.* in 2012 to investigate the status of malnutrition and stunting in children aged 6 to 59 months in Varzeqan city on 128 children aged 2 months after the earthquake occurrence and its results showed that before the earthquake 10 people (7.8%) and after the earthquake 37 people (28.9%) had stunting, 14 people (10.9%) had growth slowness, 15 people (11.7%) had growth stop and 8 people (6.25%) had stunting <sup>[20]</sup>. This is because the children under their study had stunting before the earthquake, and the earthquake did not have much effect on the stunting of the results obtained from their study.

To compare between the ratio of energy intake and the variables of children's growth a study was conducted and the

findings show that in terms of the levels of the growth status of children aged 2 to 5 years old, according to the significance level ( $P < 0.03$ ) of the percentile of (weight for age) ( $P < 0.04$ ) and the percentile of (body mass index for age) there is a statistically significant relationship between the growth status of children and the received energy variable. Therefore the present study is consistent with the study of Sayari *et al.* in investigating the malnutrition of received energy protein performed on 342,000 children under the age of 5 years in November 1998 by measuring the height and weight and the results showed that 15.4% of children under the age of 5 years in the country had short height and moderate to severe nutrition (less than 2 SD of the standard mean), 4.9% thinness based on an index of (weight for height), 10.9% moderate and severe wasting the weight based on the index of (weight for age) [21]. But no inconsistent study was found in this regard.

In investigating the relationship between the variables of the growth status of children aged 2 to 5 years after the earthquake and the food security of children's household, Chi-square test was performed, the results showed that according to the significance level ( $P < 0.05$ ) in all three percentiles, there is a statistically significant relationship between children's growth after the earthquake and the food security of children's household. Considering the results of multivariate logistic regression table, according to ( $P < 0.05$ ), it also shows that there is a statistically significant relationship between household food security and children's growth status (body mass index for age and weight for age and height for age) in all three percentiles, that is the more the household was in food security status, the children under study had better growth. In other words, in the food security group, they had 49.58 times more chance than the food insecurity groups. Therefore, it can be concluded that the better the economic situation of the household is, the household will be in a secure food status. And food security affects other variables. Therefore, the present study is consistent with the study of Royce *et al.*, conducted in 2011 on 1,800 households survived from the 2010 earthquake in Haiti to investigate food insecurity in children after the earthquake, and the results of that study showed that the prevalence of food insecurity in children has been 22.6% and low education and the poor economic conditions of household, and low income of the family had significant relationship with food security, and those families that had more vulnerability before the earthquake from various dimensions, also had more vulnerability to food insecurity after the earthquake [14], but it is not consistent with a study conducted in Iran by Basirat *et al.* in 2011 by investigating the relationship between household food security and BMI status of 314 primary school students of 6-12 year olds in Farrokhsahr, and the results of the study showed that no significant relationship was observed with other variables related to obese between the BMI status in none of the criteria of CDC, IOTF, and WHO, and the national criterion, and food insecurity, whether alone or after adjustment, [22]

## CONCLUSION

Since the nutritional status of individuals seriously depends on the factors of the food chain, including economic and physical access, food consumption and food bioavailability in the body, and any factor that can disrupt this chain, it can cause malnutrition. Therefore, natural disasters and events like earthquakes, in addition to the prevailing bad weather conditions, due to affecting almost all components of this chain, are considered as factors impacting on disrupting this food chain. In this research, the earthquake with factors disrupting the food chain also affected stunting. According to the assessments made, the present study shows that the better the food security status of the household is, the children will have complete and healthy nutrition and will have normal developmental growth, and on the contrary, the families of children with stunting have relative to poor satisfaction, as a result, they have food insecurity without hunger to food insecurity with severe hunger. Finally, a society will be healthy when households are in food security status, and the ratio of satisfaction with household life is at an acceptable level. As a result, children enjoy adequate, healthy, and strengthening nutrition, because healthy and strengthening nutrition and adequate growth of children ensure the health of a community. The results of this research emphasize care programs and nutrition interventions in young children (2-5 years). Because addressing the stunting of children at this age has more beneficial effects than children with upper age (5 years old). Also by repeating this type of study in the same fields and the need to focus on promoting the health of children, nutrition training in the form of educational programs compiled for adults and inserting it in school education program, as well as improving family income adequacy and raising family satisfaction level with life, indicate the emphasis on continuity of work.

Today, creating and stabilizing the healthy nutrition of society is one of the most important goals of democratic governments. This point is valuable and important not only in terms of health dimension but also in terms of political, economic, and social aspects in the society. The severity of malnutrition created due to this type of event depends on the severity and the time duration of the event and the nutritional status before their occurrences. In such events, at first nutrition deployment is an urgent and essential issue that must be paid special attention.

In the critical conditions, one of the groups that their nutritional status and, ultimately their health is expected to be affected is children, especially 2 to 5 years old children; in unexpected events, such as earthquake, any deficiency and gap in addressing nutritional and health status mean threatening their health and growth and the reduction of their intellectual and physical strength, and as a result, causes heavy costs for society. Healthy and adequate nutrition of children under 6 years of age in unexpected events in the country is a category that should always be considered so that by removing the needs and deficiencies of nutritional materials, high physical preparedness and proper muscle composition can have the right growth curve diagram.

Sick children are especially more vulnerable to foodstuff consumption inadequacy because if children stay away from good physical health, they will not be able to have a good life in society. As a result, addressing the nutritional status and eating habits of children and the household of children and nutritional intervention to reduce the risk of lightweight and to improve the eating habits of children aged 24 to 59 months, including proper breastfeeding nutrition pattern and other age-related eating habits, will be a proper guarantee for better confrontation in natural or man-made disasters.

It is suggested that more studies be conducted in the earthquake-stricken areas to complete information and statistics related to the nutrition status and growth of children. What needs to be considered deeply and should be dealt with more is the nutritional intervention, which, unfortunately, according to the statements of the children's households of the study, nutritionists were not present. According to the shreds of evidence and narrations, one of the main and most prevalent causes of wasting the weight and normal growth is inadequate and improper foodstuff intake along with food insecurity; therefore, it is suggested that more studies and plans be performed for nutritional interventions to prevent and treat such complications due to unexpected events.

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