

Original Article



Relationship Between Household Food Insecurity and Growth Disorders in Children Aged 3 to 6 in Qazvin City, Iran

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ABSTRACT

Purpose: Food insecurity, which is the inability to obtain food or inadequate food consumption in terms of quality and quantity, has physical and psychological consequences on children's health. This study aimed to investigate the relationship between children's growth disorders and food insecurity in Qazvin city, Iran.

Methods: A case-control study was conducted on 177 cases and 355 controls of children aged 3 to 6 years, who were referred to health centers in Qazvin city. The case group consisted of children with growth disorders. Data were obtained with the 18-item US Department of Agriculture questionnaire, a household socioeconomic questionnaire, and a growth monitoring card. The data were analyzed with using IBM SPSS Version 22.0, by independent sample *t*-test, chi-square test, and logistic regression.

Results: A significant relationship was found between children's growth disorders and household food insecurity with ($p<0.05$, odds ratio [OR]=17.0, confidence interval [CI]=5.9, 48.8) and without hunger ($p<0.05$, OR=2.69, CI=1.4, 4.9). There were also significant relationships between children's growth disorders and socioeconomic status ($p<0.05$, OR=3.4, CI=1.4, 8.5), the duration of breastfeeding ($p<0.05$, OR=0.94, CI=0.9, 0.98), and children's ages ($p<0.05$, OR=0.94, CI=0.92, 0.96). Sex and birth order, and the age of the parents was not found to be significantly related with growth disorders.

Conclusion: Lower socioeconomic status and household food insecurity were the important predictors of children's growth disorders. Policymakers should focus more on promoting steady employment and income among family members. Nutritional education for mothers is also recommended, in order to better meet the nutritional needs of the children.

Keywords: Food security; Growth disorder; Socioeconomic factors; Breast feeding

INTRODUCTION

Food is a basic human need that should be met to ensure food security. Food security is the access of all individuals in a society to adequate food at all times, in order to maintain a healthy and active life and includes the availability of safe and adequate food and the assurance that the food available meets acceptable standards [1]. Food insecurity is a complex

Conflict of Interest

The authors have no financial conflicts of interest.

phenomenon with social, cultural, and psychological aspects, including quantity and quality of life, and can be either temporary or chronic, at the household, regional, and national levels [2]. About 820 million people across the world (about one in every nine people) receive less food than they should and their health and well-being are affected [3].

Food security is a measure of individual and family health, as the inadequate availability of food can lead to several health problems and developmental challenges in children [4]. Children are at a significantly greater risk for malnutrition due to their special nutrition requirements for ensuring proper growth and development [5]. Children's malnutrition is associated with an increased risk of early death and reduced cognitive skills [6]. Malnutrition is more prevalent in children in poverty-stricken areas due to their lack of access to food and also in areas with cultural poverty and poor nutritional knowledge [7]. Ahmadihoseini et al. [8] found that about 61% of preschool children from low-income households were food insecure. In another study on the primary school children of Sistan and Baluchestan Province, the prevalence of food insecurity was found to be 42.3% [9]. In both of the above-mentioned studies, food insecurity was associated with children's malnutrition characteristics [8,9].

Goal 2 of the World Health Organization's Sustainable Development Goals is that hunger and all forms of malnutrition be ended by 2030 [10], and given that few studies have been conducted on the relationship between food insecurity and children's growth disorders (for both children with under- and overnutrition) in Iranian children, this study was conducted to investigate the relationship between household food insecurity and growth disorders in children aged 3 to 6 presenting to health centers in Qazvin city, Iran.

MATERIALS AND METHODS

Study design, population, and data collection

The present case-control study was conducted on 532 children referred to seven community health centers (out of 14) in Qazvin city, from April 2014 to January 2015. These selected community health centers were geographically and demographically representative of all the centers in the city. The sample consisted of 177 case and 355 control participants based on a 23% household food insecurity rate [11], and a 35% prevalence of food insecurity in children with growth disorders [12], making for two controls per case.

The case group consisted of children aged 3 to 6 years (36 to 72 months) with growth disorders (weight and height growth cessation, delayed height and weight growth, and weight loss) or those below the 3rd percentile or above the 97th percentile during two consecutive visits, based on Centers for Disease Control and Prevention (CDC) growth charts. The control group consisted of children aged 3 to 6 years who were growing typically (according to the growth charts), and were between the 3rd and 97th percentile in two recent visits, or were considered to be growing typically based on the current visit despite having an abnormal growth rate at the time of their previous visit [13,14]. Participants in both groups were randomly selected among the children who presented to health centers in Qazvin city (proportional to size). For each case, two controls were selected from the same center. The inclusion criteria for both the case and control groups were being aged 3 to 6 years (from either sex), being healthy (having no specific diseases, such as thyroid disorders, growth hormone disorders, and congenital disorders) and not

currently taking any medication, being a singleton with a birth weight of more than 2,500 g, having stopped breastfeeding or formula feeding, and having started the consumption of solid food. Prior written informed consent was obtained from the parents of the children, and existing data (growth monitoring card or health records) and data obtained by observation and from interviews were used.

Instruments

1. Demographic, socioeconomic, and children information

A questionnaire designed for the study was used to obtain general information about the household and their socioeconomic status. The questionnaire consisted of items on household size, parents' ages and level of education, whether they owned a car and certain home appliances, the floor area of the family's residence, and the average monthly household income. Data on the child's birth order and his or her duration of breastfeeding were also collected via questionnaire.

2. Assessment of children's growth disorders

Children's current anthropometric information was obtained by experienced health staff. Current weight status was measured with a SECA scale (SECA 700; Seca GmbH & Co. Kg, Hamburg, Germany), with 100 g accuracy, and a tape meter (SECA), with 0.1 cm accuracy, was used to measure standing height. The children's growth monitoring cards and health records at the health center were used to determine their growth status from previous visits, birth weight, and height. The children who had weight and height growth cessation, delayed height and weight growth and weight loss, or those below the 3rd percentile or above the 97th percentile (based on CDC growth charts) during two consecutive visits, were considered to have growth disorders [13].

3. Assessment of household food security

Household food security was assessed using a standard 18-item US Department of Agriculture questionnaire validated for use in Iran, by Ramesh et al. [15]. The questionnaire, which examines household food security status over the past 12 months, was filled through face-to-face interviews with the mothers. Scoring was as follows: Positive responses (e.g., "often correct," "sometimes correct," "almost every month," and "some months") were scored 1, and unanswered questions or negative responses (e.g., "no," "is not correct," "don't know," and "only one or two months") were scored 0. For example, for the question "In the last 12 months, since last (name of current month), did (you/you or other adults in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food?" positive responses, which included "yes, almost every month" and "yes, some months," were scored 1, and negative responses, which included "no," "don't know," and "yes, but for only one or two months," were scored 0. Based on the total positive score, household food security status was classified as follows: food secure (0–2), food insecure without hunger (3–7), food insecure with moderate hunger (8–12), and food insecure with severe hunger (13–18). The last two groups (food insecure with moderate hunger and food insecure with severe hunger) were merged for analysis (into the food insecure group with hunger).

Statistical analysis

Data were analyzed with using IBM SPSS Statistics for Windows, Version 22.0 (IBM Co., Armonk, NY, USA) using the chi-square test, the independent sample *t*-test, and logistic regression to determine the relationship between growth disorders in children aged 3 to 6 years and household food insecurity.

RESULTS

In this study, 532 children were assessed (177 case and 355 control participants). The mean age of the children, mothers, and fathers were 53.5±14.2 months, 29.6±4.3 years, and 34.4±5.0 years respectively. The duration of breastfeeding was 19.9±3.4 months, among studied children (data is not shown). The majority of children (more than 70%) in the case group were children with weight and height growth cessation, delayed height and weight growth, and weight loss, or those below the 3rd percentile based on CDC growth charts, which was more than the overweight and obese children.

Data on the relationship between children's growth disorders and qualitative variables are presented in **Table 1**. There was no significant difference in sexes between the two groups ($p>0.05$). There was a significant ($p<0.001$) relationship between growth disorders and birth order, as determined with the chi-square test. In the case group, about 43% of children were first-borns, compared with 72% in the control group (**Table 1**).

Household socioeconomic status was determined using the data on family size, parents' level of education, ownership of a car and certain home appliances, floor area of the family's residence, and the average monthly household income. Because there was strong collinearity among these variables, the principal component analysis method was used in constructing the socioeconomic status variable. Based on these data, families were classified into three levels of socioeconomic status: low, medium, and high. As shown in **Table 1**, the majority of children with growth disorders were from households with low socioeconomic status, and this relationship was statistically significant between the two groups ($p<0.001$). Household food insecurity status was significantly related to growth disorders and to household socioeconomic status ($p<0.001$). More than half of the children without growth disorders ($n=219$) were from food secure households, whereas only about 17% ($n=30$) of case group participants were from food secure households. Food insecurity with hunger was also higher in case group participants (29.3%) compared with control group participants (2%) (**Table 1**).

Table 1. Relationships between children's growth disorders and qualitative variables

Variable	Case group	Control group	Total	<i>p</i> -value*
Child's sex				0.256
Female	79 (30.9)	177 (69.1)	256 (100.0)	
Male	98 (35.5)	178 (64.5)	276 (100.0)	
Total	177 (33.3)	355 (66.7)	532 (100.0)	
Birth order				<0.001
1st	76 (22.9)	256 (77.1)	332 (100.0)	
2nd	67 (42.4)	91 (57.6)	158 (100.0)	
3rd and 4th	34 (81.0)	8 (19.0)	42 (100.0)	
Total	177 (33.3)	355 (66.7)	532 (100.0)	
Household socioeconomic status				<0.001
Low	87 (65.4)	46 (34.6)	133 (100.0)	
Medium	74 (28.0)	190 (72.0)	264 (100.0)	
High	15 (11.2)	119 (88.8)	134 (100.0)	
Total	176 (33.1)†	355 (66.7)	531 (100.0)	
Household food security status				<0.001
Secure	30 (12.0)	219 (88.0)	249 (100.0)	
Food secure	95 (42.4)	129 (57.6)	224 (10.0)	
Food insecure without hunger	52 (88.1)	7 (11.9)	59 (100.0)	
Food insecure with hunger	177 (33.3)	355 (66.7)	532 (100.0)	
Total				

Values are presented as number (%).

*Chi-square test. †Missing data=1.

Table 2. Relationships between children's growth disorders and quantitative variables

Variable	Case group	Control group	Standard error	<i>p</i> -value*
Child's age (mo)	46.8±11.8	56.9±14.1	1.23	<0.001
Mother's age (yr)	31.8±6.1	29.9±4.4	1.91	<0.001
Father's age (yr)	35.8±6.0	33.8±4.3	2.02	<0.001
Breastfeeding duration (mo)	17.6±5.9	21.0±4.7	-3.41	<0.001

Values are presented as mean±standard deviation.

*Independent *t*-test.

The relationship between children's growth disorders and quantitative variables was assessed by independent sample *t*-test (**Table 2**). The mean age of the children was 46.9±11.8 months in the case group and 56.9±14.1 months in the control group ($p<0.001$). The mean duration of breastfeeding was statistically higher in the control group (21.0±4.7 months) compared with the case group (17.6±5.9 months) ($p<0.001$), and the mothers in the control group were significantly younger than the mothers in the case group ($p<0.001$). This was also true for the fathers ($p<0.001$) (**Table 2**).

After adjusting the confounding factors, the logistic regression showed that low household socioeconomic status, household food insecurity, the child's age (growth disorders decreased with aging) and the duration of breastfeeding were significantly related to growth disorders in the children examined ($p<0.05$) (**Table 3**).

DISCUSSION

This study was conducted on children referred to community health centers in Qazvin city, in order to determine the relationship between children's growth disorders and household food insecurity. The results indicate significant relationships between lower socioeconomic status, lower breastfeeding duration, younger age, and food insecurity, and children's growth disorders. The child's gender and birth order, and the age of the parents were not found to be significantly related to children's growth disorders.

Table 3. Results of the analysis of the relationships between children's growth disorders and household food security status after adjusting confounding factors in the logistic regression model

Variable	Odds ratio	95% Confidence interval		<i>p</i> -value
		Lower	Upper	
Sex	0.82	0.52	1.32	0.422
Child's age (mo)	0.94	0.92	0.96	0.001
Mother's age (yr)	0.97	0.87	1.08	0.573
Father's age (yr)	1.11	0.99	1.24	0.059
Household socioeconomic status				
High	Reference	-	-	-
Medium	1.58	0.75	3.33	0.230
Low	3.46	1.41	8.52	0.007
Breastfeeding duration (months)	0.94	0.90	0.98	0.002
Birth order				
1st	Reference	-	-	-
2nd	0.73	0.36	1.46	0.365
3rd and 4th	1.21	0.31	4.76	0.784
Household food security status				
Food secure	Reference	-	-	-
Insecure without hunger	2.69	1.47	4.93	0.001
Insecure with hunger	17.04	5.94	48.87	0.001

In its conceptual framework of the causes of children's growth disorders, the United Nations Children's Fund, divide the causes into three levels: basic, underlying, and immediate. Basic causes of children's growth disorders are related to quantity and quality of available resources and social and political context. Underlying causes include insufficient health services, unhealthy environments, inadequate care for children and women, and inadequate access to food. The immediate causes include inadequate dietary intake and disease [16,17]. The present study found that children from households with low socioeconomic status were 3.46 times more likely to have growth disorders compared with children from households with high socioeconomic status. This finding is consistent with those of Vahabzadeh et al. [13] and Barros et al. [18]. Socioeconomic status was also identified as a strong predictor of childhood developmental delay in a systematic review conducted by Sajedi et al. [19]. It has been shown that low socioeconomic status places a child at risk for physical [18] and mental [20] health problems. Low socioeconomic status impacts access to child care and high quality health services [18,21]. Low socioeconomic status is also associated with household food insecurity, which, in turn, is associated with childhood malnutrition [9]. The results of the present study showed a significant difference in food insecurity between children with and without growth disorders (83% vs. 38%); children from food insecure with hunger households, were 17 times more likely to have growth disorders compared with children from food secure households. In consideration of the double burden of malnutrition, the present study examined the relationships between growth disorders and both under- and overnutrition; however, some studies have only examined one of the two. For example, the association of undernutrition (including stunting, wasting, or underweight) with food insecurity was demonstrated in studies conducted by Shahraki et al. [9] on children of the Sistan and Baluchestan Province in Iran, Abdurahman et al. [22] in Ethiopian children, Shen et al. [23] in Chinese children, Mahmudiono et al. [24] in Indonesian children, and Saha et al. [25] in Bangladeshi children. In a study conducted to evaluate the relationship between children's malnutrition (stunting) and household access to food, 800 families from 8 countries were examined in terms of food insecurity and the data obtained were compared with respect to the anthropometric measurements of the families' 24- to 60-month-old children. The study revealed that the Household Food Insecurity Access Scale is a valid tool for examining children's development in different geographical regions [26]. There has been evidence suggesting that obesity and overweight, which is considered a growing public health threat, particularly in low-income populations, is associated with food insecurity [27-30]. This association is sometimes in the form of obesity and overweight combined with stunting [31]. Examination of the impact of food insecurity on children's dietary patterns shows that children from food insecure households are less likely to consume the recommended minimum acceptable diet [32]. The dietary diversity scores is also lower in children from insecure households (whether moderate or severe) [33]. Food insecurity leads to lower intake of energy and nutritious foods, including fruits, vegetables, proteins (from meat, plants, and seafood) and milk products [34-38]. In addition, food insecurity was associated with the intake of poorer quality foods, such as refined grains, fried potatoes, and sugar-sweetened beverages [36,37,39,40]. The impact of food insecurity on childhood development is not limited to diet; there is evidence suggesting that food insecurity affects the mental health of children and adults, which may, in turn, affect childhood development [41]. Fortunately, the Multidisciplinary Program for Improvement of Nutritional Status of Children in Iran, has been developed to address the nutritional needs of malnourished children aged under 5 years. This program was found to effectively improve childhood growth in a study conducted by Ghodsi et al. [42]. However, a process evaluation study showed that some improvements were needed in the contents of provided food baskets [43].

In the current study, duration of breastfeeding was shorter in children with growth disorders compared with the control group. In a study conducted by Zhou et al. [44], shorter duration of breastfeeding (less than 1 year) was associated with stunting. Feeding practices were also associated with obesity in children [45]. Breastfeeding not only affects the physical but also the mental health of children (e.g., cognitive and socio-emotional development) and mothers (e.g., stress and mood) [46]. Although feeding practices are affected by socioeconomic [47] and household food insecurity status [48], the negative effects of food insecurity on children's health can be reduced by choosing the proper foods [49]. In addition to breastfeeding, mothers should provide complementary foods to children aged 6 months or more [50]. By promoting breastfeeding and educating mothers on the importance of breastfeeding for the entire time required, malnutrition and its complications in later life can be prevented [51].

This study was one of the few to investigate the relationship between children's growth disorders (involving both over- and undernutrition) and household food insecurity in Iran. The results can provide a better understanding of the situation for policymakers and other decision makers. However, this study did have some limitations. As the vaccination program for children is suspended after 18 months to 6 years, further monitoring of child growth will be interrupted during this period. Therefore, there were few community health center referrals, and this made data collection more difficult. It should be noted that maternal nutritional knowledge and food intake were not examined in this study. Determining which nutrients are related to food security and whether their consumption affects growth disorders would help in preventing childhood malnutrition. It should also be determined whether encouraging the intake of these nutrients through nutrition education helps improve growth disorders. Therefore, future studies are warranted.

In conclusion, the present study was conducted to determine the relationship between children's growth disorders and household food insecurity. Lower socioeconomic status and household food insecurity were important predictors of children's growth disorders. In order to prevent children's malnutrition, policymakers should ensure that household members (especially the head of household), have access to steady employment throughout the year, and should allocate a proper budget to nutrition in addition to the family's other expenses. Furthermore, educating mothers about children's nutritional requirements at different ages (with the help of nutrition experts from the health centers), emphasizing the importance of children's growth monitoring, and regularly following up until school age can also improve the situation.

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