



## ORIGINAL ARTICLE

# Effectiveness Comparison of Mothers' In-person Versus Written Nutritional Education Intervention on Infant Growth in Iran

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## ABSTRACT

**Background:** In 1990, the Iranian Ministry of Health implemented a health plan to increase mothers' knowledge of infant feeding using health workers and health volunteers. This study evaluates the effects of nutrition education on mothers' knowledge and whether increase in mothers' knowledge was associated with increase in growth of their children in Ardabil, Iran.

**Methods:** A quasi-experimental study of the impact of written nutritional education and in-person nutritional education given to the participants (mothers) from urban health centers by health workers and health volunteers. Sixteen urban health centers located in Ardabil, Iran, were selected randomly for nutritional education. A group of 303 mothers with infants younger than 6 months of age from 16 health centers participated in this study. Height-for-age Z scores and weight-for age Z scores were calculated based on the National Center for Health Statistics reference values.

**Results:** There were significant differences between maternal nutritional knowledge before and after the intervention in all groups. However, the in-person method of instruction given by health workers was more effective in increasing mothers' knowledge than those in non-health worker volunteers intervention group. There were also significant differences between the growth rates of infants' heights and weights before and after the intervention.

**Conclusions and Global Health Implications:** In line with the aims of the government's plan, the education given by health volunteers from non-governmental organizations was effective. However, it was less effective than the one given by professional health workers.

**Keywords:** Iran • Health • Education • Nutrition • Infant growth • Health volunteer

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## Introduction

The health ministry of Iran has stated that the prevalence of growth failure of infants younger than two years of age is high in Tehran, the nation's capital. In fact, many Iranian children are born with normal weight,<sup>[1]</sup> but they gradually begin to lose weight in the period between four and six months of age.<sup>[2]</sup> Iranian health centers have begun to educate mothers. Given that Iran does not have enough health workers, the Iranian Ministry of Health has made fundamental changes in its strategies since 1990. Hence, it has made use of volunteers in health affairs. The new government health plan was first implemented in 1990 as an experimental plan in the south of Tehran, and then was put to operation in other big cities.<sup>[3]</sup> It has been used since then because it was believed that health volunteers are of potential capacity to improve mothers' knowledge, attitudes, and performance. One clinical trial in Iran on 310 mothers instructed by health volunteers indicated that this instruction had a positive effect on scores of the knowledge, attitudes and performance of mothers.<sup>[4]</sup> Childhood malnutrition is due, directly or indirectly, to mothers' poor nutritional knowledge or lack thereof.<sup>[5,6]</sup> The Holy Quran states that mothers should breastfeed their children for two full years.<sup>[7]</sup> According to the Millennium Development Goals (MDG), mothers' training is a key factor in eliminating malnutrition among children younger than five years of age.<sup>[8]</sup> To date, however, few studies in Iran have been designed to evaluate the impact of implementation of the government health plan by health volunteers on infants' growth rate. Therefore, this study was designed to evaluate the effects of the nutrition education on mothers' knowledge and to determine whether the increase in knowledge was associated with increase in growth of their infants.

## Methods

### *Study design and population*

This quasi-experimental study evaluated the effectiveness of two methods of in-person and written training of mothers by health workers and Health volunteers in Ardabil, Iran implemented

between 2011 and 2012. Ardabil is a historical city in north-western of Iran. According to the 2011 national census, the population of Arabil was 564,365 with 156,324 families with the dominant majority being ethnic Azeris. The predominant language spoken in Ardabil is Azerbaijani language. A group of 303 mothers with healthy infants younger than 6 months was selected using random sampling and Sample Size Program Software ( $\alpha=0.05$ , power=0.8), from 16 selected urban health centers of Ardabil and randomly allocated to four groups: 1) Mothers who attended non Health Worker-led nutrition education classes; 2) Mothers who did not attend non Health Worker-led nutrition classes; 3) Mothers who attended Health Worker-led nutrition education classes; and 4) Mothers who did not attend Health Worker-led nutrition education classes. Each group was originally 76 participants but one of the mothers discontinued research. Mothers and infants who became ill during the study were excluded from the study. Selected health centers were randomly divided into two groups: first group comprised of 8 centers for in-person and written training methods with health workers; second group comprised of 8 centers for in-person and written training methods with health volunteers. Eight midwives who were responsible for family health care in health centers and eight women with high school diplomas who live near the health centers and were interested in participating in the educational program as health volunteers were recruited into this study. Educational instructions were delivered in two sessions to health care workers and health care worker volunteers by nutrition experts using a pamphlet on nutrition as the textbook (government health and nutrition plan for mothers & infants), interclass correlation coefficient of the two groups was 0.83. After calculating, the educational intervention for mothers was conducted based on an in-person and a written training method by health workers and health volunteers. They planned two sessions for in-person education and another two sessions for giving pamphlets to mothers. The educational program was evaluated once before the intervention and was repeated two months after it was implemented. The data were collected

by means of questionnaires. The questionnaire consists of 17 questions. These were: 1) the duration of sufficient breast feeding in each meal, 2) allowing breastfeeding the baby immediately after birth, 3) the kinds of food supplements; 4) the proper starting time for the baby to have meals at the family table, 5) the body weight below the third percentile, 6) the kind of food supplements after 6 months of age, 7) How to wean from breast milk, 8) the method and the appropriate time of taking supplements, 9) the appropriate methods to reduce infant food allergies, 10) the appropriate methods of infant feeding during illness, 12) breast milk storage time at room temperature, 13) recommended time to start supplemented food, 14) the role of breastfeeding in preventing diarrhea and vomiting, 15) the comparison between the breast milk, cow's milk and milk powder 16) referring both healthy and ill children to health centers and 17) the duration of breast feeding. Each question was given 1 point, therefore having a total of 17 points. Scores between zero and eight were considered poor (0-8=poor), scores between nine and 13 were considered average (9-13=average) and scores higher than 14 were considered good (14-17= good). A group of 20 nursing women was selected randomly. They completed the questionnaires for reliability twice, once on the first day of the experiment, and the second time 15 days later. The content validity of the questionnaire was calculated and Cronbach's alpha index was used for the internal consistency reliability ( $\alpha=0.86$ ).

### **Anthropometric measurements**

The heights of infants were measured in sleeping status using a portable Stadiometer. The weights of infants were measured using Seca Baby Scale made in Germany with an error range of 0–200g.<sup>[9]</sup> The Body Mass Index (BMI) then could be calculated for each baby. For infants, the mean for height-for-age Z scores (HAZ) was calculated based on the US National Center for Health Statistics reference values. The BMI values were compared to the BMI reference values from the National Health and Nutrition Examination Survey (NHANES) III (CDC, 2000) for the corresponding age in month. Children below the 5th percentile were

considered underweight and those having BMI above the 95th percentile were considered overweight. According to World Health Organization classification,  $z < -3$  was considered severe malnutrition,  $-3 < z < -2$  = moderate malnutrition and  $-2 < z < -1$  = mild malnutrition. Also, the ratio of weight for height above the value  $z > +2$  was considered at risk for obesity (normal range,  $-2 < z < +2$ ). CDC charts were used as reference to compare the physical growth of children against. The criteria of physical growth included the values of weight for age and height for age. Kenneth et al used HAZ and WAZ for collecting anthropometric data.<sup>[10]</sup>

### **Statistical analysis**

The data was analyzed using Chi-square Paired Samples T Test & ANOVA by SPSS (ver.11.5) and Z-scores by Epi-info software (version 3.2) relative to the CDC/WHO 1978 reference curves recommended for international use.<sup>[11]</sup> Results are expressed as the mean  $\pm$  SD, using Chi-square, paired sample T-test and ANOVA. The significance was assumed at  $p < 0.05$ . The Ethics committee of Ardabil University of Medical Sciences approved this study.

### **Results**

As can be seen in table 1, findings from this study demonstrate that the in-person training method by health workers was more effective than the other training methods i.e. the written training method by health workers and the written and in-person training methods by Health volunteers ( $p=0.001$ ). There was a significant difference between maternal nutrition knowledge before and after the intervention in all groups ( $p=0.033$ ), and both of the educational methods, in-person and written, resulted in an increased maternal knowledge on the infant's nutrition (table 2 and 3). The Chi-square test also confirmed this correlation ( $p=0.017$ ,  $df=3$ ). There were significant differences between the growth rates of infants' heights and weights before and after the intervention ( $p=0.015$ ) (Table 1). The different methods of education for mothers improved both their infants' growth percentile of weight for age and growth percentile of height for age (table 2).

**Table 1.** Selected Sociodemographic Characteristics of Mothers and Infants who Participated in the Intervention

Variable	N	%
Maternal age		
<20	224	74.5
≥20	77	25.4
Level of education		
Illiterate	14	4.4
Under diploma	220	72.6
Upper diploma	69	23
Employment status		
Household	189	62
Employed	114	48
Parity		
One	160	52.8
Multiparous	140	47.2
Sex of infant		
Male	163	53.8
Female	140	46.2

## Discussion

The results of this study demonstrated that both training methods had significant positive effects on mothers' awareness and consequently on infants' growth. Compared to other three variations of training in this study, the in-person training by health workers had a greater positive impact on nutritional knowledge of mothers. These results are similar to those of other studies.<sup>[12,13]</sup> Several studies have shown that in-person training education given by a health worker is very effective on mothers' nutritional knowledge and several other studies emphasize the role of Health volunteers.<sup>[12,14]</sup> A similar study showed that the type of education, especially in-person education has an important effect on mothers' awareness.<sup>[15]</sup> However, in contrast to our findings, a study demonstrated that, there was not a significant difference between the written education and the in-person training. The findings of our study showed that the nutritional education has a positive impact on improving the infants' growth rates. This is consistent with a study in China.<sup>[16]</sup> Another research shows that educating mothers can lead to improvement

in infants' nutrition.<sup>[17]</sup> Hoyer et al. argue that there is a relationship between the support and encouragement the health workers give to mothers and the duration of breastfeeding.<sup>[18]</sup> Similarly Hong et al. and Shakespeare et al. found that there is a direct relationship between the support given to mothers by health workers and the mothers' increased nutritional knowledge.<sup>[19]</sup> Nutritional intervention through the primary health care system and literacy education of mothers can improve growth monitoring and reduce infant malnutrition indicators.<sup>[20]</sup> Nutrition education of mothers about complementary feeding had a positive effect on the growth of 5 – 7 months old infants. The improved knowledge of mothers can improve the quality and quantity of food intake of infants, an increase in their height and weight growth and a reduction in their incidental malnutrition.<sup>[21]</sup> One study in India showed that counseling women on optimal feeding behavior can convert awareness into actual practice.<sup>[22]</sup>

In the present study, the educational intervention improved the growth percentile of infants. Similar to the results of this study, some studies also showed that mothers' education could affect child growth percentile.<sup>[23,24]</sup>

Our findings also showed that maternal nutritional education has a positive effect on anthropometric measurements of children. Some studies had similar findings that show maternal education has a positive impact on both the health and growth of infants.<sup>[13]</sup> In other words, mothers who received nutritional education have more likely used preventive health care and most of them tend to take their children to medical centers for check-ups. In addition, Avery et al. showed that compared to the control group, the duration of breastfeeding their babies is longer for trained mothers.<sup>[25]</sup> If the knowledge and information of mothers about the benefits of breastfeeding improves, so does the duration of breastfeeding.<sup>[26]</sup>

## Conclusion and Global Health Implications

The improvement of the in-person nutritional education delivered by health workers can

**Table 2.** Observed Significant Differences in the Knowledge of Mothers, Infants' Weight-For-Age Z-Scores (WAZ) and Infants' Height-For-Age Z-Scores (HAZ) Before and after Intervention Based on the World Health Organization Child Growth Standards

	Before intervention		After intervention		P values
	n	Mean (SD)	N	Mean (SD)	
Knowledge score of mothers with intervention methods					
Mothers who attended non Health Worker-led nutrition education classes	75	14.5 (2.5)	75	15.5 (1.64)	0.04
Mothers who did not attend non Health Worker-led nutrition classes	76	12.0 (2)	76	12.7 (2.5)	0.04
Mothers who attended Health Worker-led nutrition education classes	76	12.8 (2.6)	76	15.2 (2.5)	0.00
Mothers who did not attend Health Worker-led nutrition education classes	76	13.7 (2.5)	76	15.3 (2.1)	0.03
All four intervention methods	303	13.3 (2.65)	303	15.3 (2.34)	0.04
	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	
Infants' weight for age (WAZ) Z scores					
Overweight and obesity	13	4.3	15	5.3	0.03
Normal weight	232	76.5	266	87.8	0.03
Mild malnutrition	43	14.2	17	5.6	0.02
Moderate malnutrition	9	3	4	1.3	0.03
Severe malnutrition	6	2	No	No	0.00
Infants' height for age (HAZ) Z scores					
Normal height	192	63.5	217	71.8	0.04
Mild malnutrition	52	17.2	53	17.5	0.05
Moderate malnutrition	31	10.2	18	5.9	0.04
Severe malnutrition	28	9.2	15	5	0.03
Total	303	100%	303	100%	<0.05

**Table 3.** Comparison of Infants' Height-for-age Z scores (HAZ) and Weight-for age Z Scores (WAZ) percentiles before and after intervention, according to the US National Center for Health Statistics

WHO Percentiles classification	Before intervention		After intervention		P values
	n	Percentiles	n	Percentiles	
HAC					
<3 (severe malnutrition)	59	19.5	35	11.6	0.03
3-97 (moderate malnutrition)	233	76.9	245	80.9	0.04
>97	11	3.6	23	7.6	0.04
WAC					
<3	19	6.3	4	1.3	0.03
3-97	270	92.7	277	91.4	0.05
>97	14	4.6	22	7.3	0.04

improve the infants' growth to a greater extent than the other methods and is therefore strongly recommended. In brief, health workers' educational intervention needs to continue more seriously.

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### Key Messages

- Both health workers and volunteer educational intervention had positive effect on the growth of infants of mothers who participated in the intervention.
- Overall, the nutritional education intervention provided by health workers was more effective than the nutritional education intervention provided by the health volunteers.
- It is important to continue the provision of nutritional education intervention provided by health workers educational intervention and to make these interventions more widely available outside the research environment.

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