The Prevalence Rate of Malnutrition in Children Younger than 5 in Iran in 2018

Abstract

Context: The first stage of Universal Health Coverage (UHC) was founded Iran to achieve better access to needed health services. **Aims:** The aim of present study was to illustrate the prevalence rate of malnutrition's subtypes in under 5-year old children after UHC in comparison with before that. **Settings and Design:** In a cross-sectional study in 2018, anthropometric indices of 970 under 5 years old children in rural and small towns of Isfahan province were gathered from their health files by cluster randomized sampling method. **Methods:** Children whose weight for age, height for age, and weight for height were lower than -2SD based on Z score, were marked as underweight, stunting, and wasting, respectively. Children, whose weight for age was upper than +2SD, were marked as overweight. **Statistical Analysis Used:** The T-test, Chi-square, and logistic regression tests were used for determination of association between malnutrition's subtypes and demographic variables. **Results:** A total of 78 (8.04%) of under 5 years old children were wasting, 74 (7.63%) were underweight, and 82 (8.45%) were stunting. Also, 12 (1.23%) of the children from the same group were overweight. **Conclusions:** The prevalence rate of underweight and stunting in under 5 years old children were less than before UHC implementation period. The prevalence rate of overweight children below 5 in Isfahan province's villages and small towns was low.

Keywords: *Developing countries. Iran, failure to thrive, family physician, stunting, underweight, wasting*

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Introduction

Malnutrition and failure to thrive (FTT) are related to half of child mortality worldwide. Wasting, stunting, and being underweight are three forms of FTT. Approximately, stunting and wasting affected 22.2 percent and 7.5 percent of children who were Below 5 years old globally in 2017, respectively.[1]

Following malnutrition, there is a decrease in growth trajectories beginning with weight, then length or height and in severe circumstances head circumference.[2] Growth deviations in head circumference are not usually related to nutritional intake, except where there is long-term malnutrition. It is more likely due to non-nutritional factors which may have an impact on brain growth.[3]

The main causes of FTT could be divided into three categories: Organic causes (28%), non-organic causes (46%) which could be due to less utilization of health services, and mix causes (26%).[4,5]

Health-system reforms are based on a distinct approach to Universal Health Coverage (UHC), aiming to improve equity in access to health needs by expanding insurance coverage especially for poor citizens. The first phase of this project was established in 2005 in Iran as family physician program, in which all rural and small cities (less than 20 thousand population) inhabitants have been covered by universal governmental health insurance system.[6] The benefit packages focused on every age group containing either preventive or treatment services via active approach by one family physician team per every 4500 inhabitants and supported by specialists in district hospitals via referral approach. All mother and children visited at local health centers are free of charge totally, and patients pay only 30% of drugs and laboratory costs and less than 10% of hospitalization costs. The payment system to family physician team is based on mixed form (mainly on capitation+ fee for service).[7]

The main purpose of the present study is to estimate the prevalence rate of malnutrition in children younger than 5 in rural and small towns in Isfahan province in 2018,

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13 years after establishing UHC in comparison with before that in Iran.

Methods

This is a cross-sectional study that was done in 2018, 1011 participants children less than 5 years old were in the present study from rural areas and cities having fewer than 200000 residents in Isfahan Province. Isfahan province is located in the center of Islamic Republic of Iran and has an area of 107017.6 km^2 with more than 4.5 million populations with a large number of small towns and villages.

This study was approved by the Medical Ethics Committee of Isfahan University of Medical Sciences, (Project number = 193016).

The cases were selected by cluster randomized sampling method.

Inclusion criteria: The children under 5 who stayed with their families for at least one year in villages and small towns in Isfahan province.

Exclusion criteria: The children below the age of 5 that stayed in villages and small towns in Isfahan province for less than one year or immigrated to another province, and/or check lists which were completed less than 10% of necessary data.

Out of 48639 under 5 children in rural areas and 57751 under 5 children in small town, 540 and 430 cases were selected, respectively. Regarding the percentage of rural and urban population (respectively 61% and 39%) 27 urban cluster and 17 rural cluster were determined. The sampling was done by ENA software.

By forming five educated groups, required data including: demographic data such as: age, sex, route of delivery, mothers' job, mothers' literacy, length (for up to 24 months old babies) (cm), height (for 2 to 5 years old babies) (cm), weight (kg), and head circumference for less than 2-month and at 1-year-old infants (cm) were gathered from their health files and were added to checklists. These checklists were tested by supervisors. It needs to be mentioned that standardization of anthropometric measurements was done for 5 questioner teams simultaneously and during two steps. The length in children below two was measured in lying position and in older ones was measured while standing and without shoes. Also, weight was measured by regarding light clothes (minimum). The measuring processes were done by well-trained experts.

Ultimately, data were put into in SPSS 18 software, (version 18, SPSS Inc., Chicago, IL) and $P < 0.05$ was considered as statistically significant. The children up to 24 months whose lengths and between 24 to 60 months whose heights were less than -2SD for their ages according to their genders based on WHO's standards, were considered

as "stunting". The children below 5 whose weights were less than -2SD for their ages and genders based on WHO's standards, were consider as ''Underweight''. The less than 5 years old children whose weight for height at their age and sex were less than -2SD (based on WHO' standards), were considered as ''wasting''. The less than 5 years old children whose weight were above than +2SD for their age and gender based on WHO's standards, were consider as ''over weight''.

We estimated the prevalence rate of malnutrition in children younger than 5 years old via the prevalence rate of wasting, stunting, being underweight, and being overweight in different sexes and in different living areas. We compared the quantitative variables by using the T-test and quantitative variables by Chi-square test. Logistic regression test was used for determination of association between malnutrition's subtypes and demographic variables.

Results

A total of 1011 children below 5 years old were entered in the present study, in which 970 cases fulfilled the inclusion criteria. 495 (51%) were male, and 540 (55.7%) resided in rural areas. There were no statistical differences between gender and living areas of inhabitants (Chi square = 3.712, $P = 0.054$). 36.9% of these children were born via vaginal delivery and 63.1% via cesarean section. In point of view the job of children's mothers, 86.5% of mothers were housewife and 13.5% were worker or employee. The most education level of children's mothers was at primary and junior high school as 42.6%, whereas 37.1% were at high school and 18.7% at university level. 1.6% of mothers were no literacy.

Based on Z score criteria, 78 (8.04%) had lower than -2SD weight for length at their age, 74 (7.63%) had lower than -2SD weight for age, and 82 (8.45%) had lower than -2SD height for age. Also the weight of 12 (1.23%) children under 5 were upper than +2SD based on Z score criteria and were diagnosed as overweight.

A higher number of wasting 63 (81%) was seen in infants in the 0-6 month group ($P < 0.000$), [Table 1]. There was more frequent wasting in small towns significantly ($P < 0.000$) [Table 2].

The frequency of the underweight was seen more among 25 – 36 months old group 24 (32.43%) and more in rural areas 48 (8.89%), but there was not significant ($P > 0.05$) [Tables 1 and 2].

The frequency of stunting was seen more in rural area particularly in 25-36 months old group 21 (25.61%), but there was not significant ($P > 0.05$) [Tables 1 and 2].

Out of 587 under 5 years old children whose head circumferences at birth were gathered from health files, 31 (3.1%) suffered head circumferences lower than -2SD in comparing with Z score [Table 2].

Table 1: The frequency (percent) of wasting, underweight, and stunting between under 5 years old children in Isfahan province in 2018 in time of age groups

Gender	Age groups (months)							P*
	0-6	7-12	13-24	25-36	37-48	49-60	Total	
Wasting								
Female	37 (47.4%)	2 (2.56%)	0 (0%)	2 (2.56%)	1 (1.28%)	0 (0%)	42 (53.89%)	0.000
Male	26 (33.3%)	6 (7.69%)	2 (2.56%)	2 (2.56%)	0 (0%)	0 (0%)	36 (46.11%)	
Total	63 (81%)	8 (10.25%)	2 (2.56%)	4 (5.13%)	1 (1.28%)	0 (0%)	78 (100%)	
Under weight								
Female	5 (6.76%)	1 (1.35%)	1 (1.35%)	10 (13.5%)	6 (8.11%)	8 (10.8%)	31 (41.9%)	0.125
Male	7 (9.46%)	4 (5.4%)	12 (16.22%)	14 (18.92%)	4 (5.4%)	2 (2.7%)	43 (58.1%)	
Total	12 (16.22%)	5 (6.76%)	13 (17.57%)	24 (32.43%)	10 (13.51%)	10 (13.51%)	74 (100%)	
Stunting								
Female	8 (9.76%)	2 (2.44%)	7 (8.54%)	11 (13.41)	6 (7.31%)	6 (7.31%)	40 (48.77%)	0.9
Male	8 (9.76%)	2 (2.44%)	13 (15.85%)	10 (12.2%)	4 (4.88%)	5 (6.1%)	42 (51.23%)	
Total	16 (19.52%)	4 (4.88%)	20 (24.39%)	21 (25.61%)	10 (12.19%)	11 (13.41%)	82 (100%)	
Over weight								
Female	1 (8.3%)	0 (00)	2 (16.7%)	0 (0%)	0 (0%)	0 (0%)	3 (25)	0.148
Male	1 (8.3%)	3 (25%)	3 (25%)	0 (0%)	2 (16.7%)	0 (0%)	9 (75%)	
Total	2 (16.7%)	3 (25%)	5 (41.6%)	0 (0%)	2 (16.7%)	0 (0%)	12 (100%)	

*Using independent - samples *t*-test

Table 2: The frequency (percent) of wasting, underweight, and stunting between under 5 years old children in term of living area and age group in Isfahan province in 2018

Living area	Population	Gender			P*
		Female	Male	Total	
Wasting					
Rural areas	540	15 (2.8%)	13 (2.4%)	28 (5.2%)	0.000
Small town	430	27 (6.28%)	23 (5.35%)	50 (11.63%)	
Total	970	42 (8.84%)	36 (7.27%)	78 (8.04%)	
Under weight					
Rural areas	540	20 (3.7%)	28 (5.19%)	48 (8.89%)	0.138
Small town	430	11 (2.56%)	15 (3.49%)	26 (6.05%)	
Total	970	31 (6.53%)	43 (8.69%)	74 (7.63%)	
Stunting					
Rural areas	540	22 (4.07%)	22 (4.07%)	44 (8.15%)	0.698
Small town	430	18 (4.19%)	20 (4.65%)	38 (8.84%)	
Total	970	40 (8.42%)	42 (8.48%)	82 (8.45%)	
Overweight					
Rural areas	540	2 (0.37%)	2 (0.37%)	4 (0.74%)	0.103
Small town	430	1 (0.23%)	7 (1.63%)	8 (1.86%)	
Total	970	3 (0.63%)	9 (1.82%)	12 (1.24%)	
Lower than -2SD head circumference at birth					
Rural areas	540	6 (1.1%)	7 (1.3%)	13 (2.4%)	0.26
Small town	430	11 (2.56%)	7 (1.63%)	18 (4.19%)	
Total	970	17 (3.58%)	14 (2.83%)	31 (3.2%)	
Lower than -2SD head circumference at one year old					
Rural areas	540	25 (4.63%)	17 (3.15%)	42 (7.78%)	0.271
Small town	430	11 (2.56%)	14 (3.26%)	25 (5.81%)	
Total	970	36 (7.58%)	31 (6.26%)	67 (6.9%)	

*Using Chi-square test

Out of 226 under 5 years old children whose head circumferences at their first year of birth were gathered from health files, 67 (6.6%) suffered head circumferences lower than -2SD in comparison with Z score at 1-year-old [Table 2].

Lower head circumferences at 1-year-old than -2SD were seen more in rural areas ($P > 0.05$), but there was no significant difference between lower head circumferences at birth and their first year with gender and living area.

Comparing through Z score, there were no under 2 month and 1-year-old infants that had lower than -2SD either head circumference, or weigh for age, and or height for age concurrently. There was no statistical difference between wasting, underweight, and stunting with others characteristics, such as delivery route, children mother's literacy, and children mothers' job ($P > 0.05$).

Logistic regression revealed the negative association between age and the frequency of wasting between under 5 years old children ($P < 0.000$) [Table 3]. There was a positive association between age, male gender, and underweight ($P < 0.007$), and a negative association between weight at birth and underweight ($P < 0.02$) [Table 4]. There was also a positive association between age and stunting ($P < 0.007$) and a negative association between weight at birth, height at birth, and stunting ($P < 0.04$) [Table 5].

Discussion

The prevalence rate of malnutrition subtypes in less than 5 year old children in villages and small towns of Isfahan province was as: wasting (8.04%), underweight (7.63%), and stunting (8.45%). Comparing the prevalence rate of stunting and underweight (except wasting) after and before UHC in Isfahan province based on the results of national survey,[8] clarified decreasing in the prevalence rate of stunting and underweight after UHC implementation in comparing with before UHC. These positive effects might be due to better access of families in remote areas to health delivery system and better management of stunting and underweight in under 5 years old children [Table 6].

Following UHC in Argentina, the prevalence rate of stunting reduced from 20.6% to 11.3%, and the prevalence rate of underweight decreased from 4.0% to 2.5%.[9] Lack of health insurance coverage predisposes a higher mortality or morbidity rate than those who have health insurance coverage. Children who have easier access to medical services, in geographical, physical, and economical domains, have used more preventive and treatment services in comparison with uninsured children.[10]

In despite of decreasing in prevalence rate of stunting and underweight in under 5 years old children after UHC, the prevalence rate of wasting in present study raised compared with the era before UHC. As we know, wasting represents side effect of the recent growth problems. Most likely, it

Table 3: The logistic regression analysis of the factors affecting wasting in under 5 years old children in Isfahan province in 2018

	Wald	Sig.	OR	95% C.I. for OR	
				Lower	Upper
Constant	1.217	0.270	45.589		
Location[1]	0.678	0.410	1.342	0.666	2.703
Gender[2]	0.188	0.664	1.151	0.610	2.171
Age (months)	58.494	0.000	0.716	0.657	0.780
Delivery.route[3]	0.049	0.824	1.075	0.569	2.032
Mothers.job[4]	1.271	0.260	1.945	0.612	6.187
Mother.litheracy[5]	0.690	0.406	1.385	0.642	2.988
Height at birth (cm)	0.338	0.561	0.971	0.880	1.072
Weight at birth (kg)	1.238	0.266	0.646	0.299	1.395
Head circumference at birth (cm)	0.025	0.874	0.985	0.817	1.187

Reference group: [1]rural area, [2]female, [3]cesarian, [4]Workers and [5]Diploma and lower

Table 4: The logistic regression analysis of the factors affecting underweight in under 5 years old children in Isfahan province in 2018

	Wald	Sig.	OR	95% C.I. for OR	
				Lower	Upper
Constant	4.751	0.029	1076.678		
Location[1]	0.077	0.781	0.914	0.483	1.728
Gender[2]	4.668	0.031	1.948	1.064	3.567
Age (months)	7.313	0.007	1.026	1.007	1.045
Delivery.route[3]	1.715	0.190	0.660	0.355	1.229
Mothers.job[4]	0.115	0.734	1.238	0.361	4.249
Mother.litheracy[5]	0.187	0.666	1.190	0.541	2.617
Height at birth (cm)	1.112	0.292	0.939	0.836	1.055
Weight at birth (kg)	5.385	0.020	0.416	0.199	0.873
Head circumference at birth (cm)	2.130	0.144	0.877	0.735	1.046

Reference group: [1]rural area, [2]female, [3]cesarian, [4]Workers and [5]Diploma and lower

Table 5: The logistic regression analysis of the factors affecting stunting in under 5 years old children in Isfahan province in 2018

	Wald	Sig.	OR	95% C.I. for OR	
				Lower	Upper
Constant	9.037	0.003	7354.079		
Location[1]	1.050	0.305	1.366	0.752	2.480
Gender[2]	0.714	0.398	1.276	0.725	2.243
Age (months)	7.155	0.007	1.025	1.007	1.044
Delivery.route[3]	2.149	0.143	0.646	0.360	1.159
Mothers.job[4]	0.345	0.557	0.672	0.179	2.527
Mother.litheracy[5]	1.438	0.230	0.662	0.338	1.299
Height at birth (cm)	4.192	0.041	0.894	0.804	0.995
Weight at birth (kg)	4.221	0.040	0.495	0.253	0.968
Head circumference at birth (cm)	2.030	0.154	0.894	0.766	1.043

Reference group: [1]rural area, [2]female, [3]cesarian, [4]Workers and [5]Diploma and lower

Table 6: The comparison of the prevalence rate of wasting, underweight, and stunting in under 5 years old in 2018 and 1997 (8) (before and after Universal Health Coverage) in Isfahan province

Index	1997	2018	P*
Wasting	5.9%	8%	<0.0001
Underweight	8.7%	7.6%	<0.0001
Stunting	11.2%	8.3%	<0.0001

*Using one - sample *t*-test

may be supposed that economic sanction and consequently, price inflation in recent years caused food insecurity for children particularly in low socio-economical regions.

Comparing the prevalence rate of FTT'S subtypes in this study with last survey in Isfahan province, all prevalence rates of stunting, underweight, and wasting are higher in present study.[11] Attention must be paid to this point that the Isfahan province has a population more than 4.5 million and more than 75% of people live in urban areas particularly in big cities. The prevalence rates that were reported in the last study were the mean of FTT in all population in all regions, but our study focused on children that stayed in Isfahan's villages and small towns. With our best research, similar studies that focused on prevalence of FTT's subtypes in less than 5 years old children had never been done or published in Iran and Isfahan province in recent years. Obviously, the prevalence rate of FTT in villages and small towns may be more than in high socio-economic status. This difference is as likely as 48% in Thailand[12] but this difference is not more in Isfahan province.

In our study, 12 (1.23%) under 5 children were overweight. In a recent study on 6-year-old Iranian children, 10.9% were overweight, and 3.4% were obese.[13] As it was mentioned earlier, our study focused on rural and small towns exclusively, it seems that overweight and obesity is more common in urban areas than rural areas.

There were no under 2 month and 1-year-old infant that had Lower than -2SD head circumference, weigh for age,

and height for age concurrently in comparison with Z score. It seems there was no FTT's type that originated from intrauterine period significantly.

There was no statistical difference between frequency of malnutrition's subtypes and demographic variables. Indeed, rural areas and small towns have no more difference in mothers' literacy, mothers' job, and delivery route of under 5 children who suffer malnutrition. However, a higher number of wasting was seen in female in 0-6-month – old group, that was more frequent in small towns significantly. In spite of both villages and small towns are located in low socio-economical areas, but primary health delivery system in Iranian villages is organized well and more primary health cares are delivered actively. It seems better follow-up in rural areas that delivered actively, reduced malnutrition more in villages than small towns.

However, increased wasting frequency in 0-6-month infant, it usually represented the recent malnutrition that related to breastfeeding behavior mainly, and less to low birth weight or intrauterine growth retardation, because there were no under 2- month infant that have lower than -2SD either head circumference, or weight for age, and or height for age, concurrently. This finding was not reported in any past papers being focused on prevalence rate of malnutrition in Iran. In condition that the breastfeeding coverage was satisfied,[14] so it seems that it should be evaluated in future study comprehensively.

In spite of wasting in less than 6 month infants, logistic regression revealed the positive association between age, and underweight, and stunting. Based on health package endorsed for under 5 years' old children in Iranian health delivery system, the more visits delivered to less than 12 month infants (as one visit in every month) and less periodic visit for 24-59 month children (as one visit in every 3 to 6 months). Consequently, the frequency of underweight and stunting was raised with raising age of under 5 years' old children.

Limitation: A comprehensive electronic record for families' data was introduced in Iranians' primary health delivery

system since 2016. However, this system does not have all the data for children under 5 years old (before that system was launched), so we had to refer to paper files.

Despite the fact that the population living in cities with less than 20,000 people are more than the rural area in Isfahan province, the number of clusters in urban areas was less than rural area due to the problem of access to all families' files in small cities.

Conclusions

The prevalence rate of underweight and stunting in less than 5-year-old children in Isfahan's villages and small towns were less than before UHC implementation period, but wasting's prevalence rate was more than before UHC implementation period.

The prevalence rate of overweight in under 5-years children in Isfahan province's villages and small towns was low.

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Conflicts of interest

There is no conflicts of interest.

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