Nutritional status and risk factors of chronic malnutrition in children under five years of age in Aydın, a western city of Turkey

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We aimed to assess the prevalence and risk factors of chronic malnutrition in children under five years old in Aydin province, Turkey. A cross-sectional design was used to study a group of 1,400 children. Multistage sampling, including cluster and random sampling, respectively, was used in the selection of the study group. Stunting, wasting and underweight were used as indicators of nutritional status for children. The prevalence of malnutrition in children under five years was found as 10.9% for stunting, 4.8% for underweight and 8.2% for wasted. Increased risk was found in families without social security by 2.071, with low birth weight by 2.516 and with giving no colostrum by 2.787 in stunted children. Improving social security coverage is essential. Mothers should be informed on the usefulness of breast-feeding at antenatal care services during their pregnancies and taught appropriate breast-feeding practices, including the importance of giving colostrum, at baby-friendly institutions after birth.

Key words: child, child malnutrition, prevalence, undernutrition.

Malnutrition is a major health problem, especially in developing countries[1,2]. It affects almost 800 million people – 20% of all in the developing world. It is associated with about half of all child deaths worldwide. Malnourished children have lowered resistance to infection; they are more likely to die from common childhood ailments like diarrheal diseases and respiratory infections; and for those who survive, frequent illness saps their nutritional status, putting them into a vicious cycle of recurring sickness, faltering growth and diminished learning ability[3-5].

The term "protein-energy malnutrition" is used to describe a broad array of clinical conditions ranging from mild malnutrition manifesting itself in poor growth to the serious type of kwashiorkor and marasmus, which have high fatality rate. Children with mild or moderate malnutrition may not have any clinical signs, but are always shorter or thinner for their age. Such children are at risk of becoming severely malnourished[1,6].

Prevalence rates vary among different continents of the world. More than 70% of children with protein-energy malnutrition live in Asia, 26% in Africa, and 4% in Latin America and the Caribbean[2]. In Turkey, stunting, which refers to chronic undernutrition, is the most common form of malnutrition. A total of 12.2% of children below five years are stunted, while 0.7% are wasted and 3.9% are underweight. The prevalence increases from western to eastern and urban to rural regions[7].

Because of the serious consequences of malnutrition on a child's growth and health, as well as economic consequences for the nation, nutritional status of children should be periodically assessed to monitor the situation, and appropriate action should be taken to combat and prevent malnutrition[6,8]. A multisectoral approach is necessary to determine the reasons and solutions for this disease[8]. Studies on determining the problem may help policy makers to make appropriate interventions towards this health problem.

The objective of the current study was to assess the nutritional status and risk factors of chronic malnutrition in children under five years of age in Aydin, a western city of Turkey.

Material and Methods

This study was conducted in the center of Aydin, a city in the western region of Turkey. The target population in the city center is estimated to be 240,000, of which 12,144 are under five years old. Health measures of the city, like infant mortality rate (20.9‰) or age-specific mortality rate under five years (4.4‰) are better than in other regions of Turkey[7,9].

A cross-sectional design was used to study a group of 1,400 children under five years of age. Multistage sampling, including cluster and random sampling, respectively, was used in the selection of the study group. Health stations-subunits of health centers-each serving 2,500 citizens and staffed by a midwife-were taken as clusters. Two health stations (1 rural and 1 urban) were selected from 10 health centers, for a total of 20 health stations, by using random sampling method. It was aimed to reach all of the children in the selected health stations.

A structured questionnaire on socioeconomic status, breast-feeding, weaning and feeding practices of children was used to interview mothers in person.

Medical students and midwives who attended a standardized education on measurement technique at the beginning of the study performed anthropometric measurements. The children were measured with light-weight clothing. Children aged below 12 months were laid horizontally and measured by children's scale for weight with an exactness of 0.05 kilograms (kg), and tapeline for length with an exactness of 0.01 meters (m). Children aged between 12 to 59 months were measured barefoot and weights were measured with an exactness of 0.5 kg using digital weighing scale. To measure height, the barefoot children were requested to stand straight on a horizontal surface, with heels together and eyes straight forward. The height measuring equipment was a stadiometer with an exactness of 0.01 m.

Nutritional status data were compared with National Center of Health Statistics (NCHS) references and presented as Z scores with a cut-off point of two standard deviations (2 SD) as recommended by the World Health Organization (WHO)[10].

The following definitions were used in the study:

1. Underweight means a low weight for age. This is a weight below -2 SD of the reference population. It refers to acute and chronic nutritional disorder.

2. Stunting means a low length/height for age. This is a length/height below -2 SD of the reference population. It refers to chronic nutritional disorder.

3. Wasting means a low weight for length/height. Children are below -2 SD of the reference weight for length/height. It refers to acute nutritional disorder.

4. Low birth weight means infant birth weight lower than 2500 g.

5. Low income means family income less than 250 million Turkish Liras, which is equivalent to a monthly wage of approximately 200 US$ at the study time.

SPSS 11.5 statistical package program was used for data analysis. The descriptive data was given as mean ± standard deviation (SD). The chi-squared test, Fisher's exact test and Student's t test were used for the analytic assessment. Risk assessment was done by logistic regression. The differences were considered to be statistically significant when the p value obtained was less than 0.05. Significantly related variables, which included educational level and occupation of the father, residence, social security, family income, household size, type of sanitation, birth weight of the child, colostrum usage, and time at which weaning was started, were assessed in a logistic regression model.

Results

All children in the health stations were reached and the response rate was 100%. There were 697 girls (49.8%) and 703 boys (50.2%) in this study. The mean age of children was 25.1±16.7 months, mean birth weight 3281±495 g, and mean birth length 49.7±2.2 cm. The percentage of children born with low birth weight was determined as 4.2%.

Most mothers were married (99.4%) and housewives (88.1%). The mean age of mothers was 28.3±5.4 years. The percentage of mothers

below 19 years of age was 1.5%. Regarding the educational level of mothers, 55.9% had primary school education, 37.5% had secondary or high school education and the rest had little or no education. Approximately one-fifth (21.6%) of all mothers had no social security. Of fathers, 38.9% had an educational level of less than primary school and 5.4% had no job.

There were 1,000 families (71.4%) in urban and 400 families (28.6%) in rural areas. The mean household size was 4.16±1.57. Families with low income accounted for 15.6%. There was no sewage system in 18.7% of all houses.

The anthropometric data were also collected from all children (100.0%). Totally, 10.9% of the children were stunted, 4.8% underweight and 8.2% wasted. Stunting was especially seen between 12-23 months (17.4%). Table I shows the distribution of undernourished children by age groups.

The study revealed that most of the mothers (97.7%) were breast-feeding after birth while others were feeding their babies by cow's milk, baby formula or water. With respect to weaning, 21.4% of babies were introduced to weaning between 0-2 months, 12.7% between 3-4 months, 44.4% between 5-6 months and 21.5% after 6 months.

In univariate analysis, living in rural area, father's education level of primary school or less, father's unemployment, low family income, lack of social security, lack of sewage system, low birth weight, giving no colostrum after birth and early start of weaning were significant risk factors for nutritional stunting. There was no significant relation between stunting and mother's age, education and occupation, whether pregnancy was planned or not, diarrhea in last two weeks, using feeding bottle/spout, mean time of breast-feeding/ exclusive breast-feeding, child sequence or

amount of daily smoking at home by family members. Table II shows the distribution of chronic undernourished children by selected risk factors.

Statistically significant factors were assessed in the final model of multivariate analysis, and it was found that that families without social security had an increased risk of 2.071 (95% confidence interval-CI: 1.324-3.239), low birth weight by 2.516 (95% CI: 1.194-5.300) and giving no colostrum by 2.787 (95% CI: 1.285-6.045) in stunted children. Table III shows the results of multivariate analysis for selected risk factors.

Discussion

In Turkey, malnutrition, especially chronic undernutrition, is a major health problem like in other developing countries[4,7]. The Turkey Demographic and Health Survey (TDHS) held in 2003 estimated stunting to be 12.2%, underweight 3.9% and wasting 0.7% nationwide[7]. Estimates of the same survey for the western region were 5.5% for stunting, 1.9% for underweight and 0.7% for wasting[7]. In the current study, malnutrition prevalence for Aydin was 10.9% for stunting, 4.8% for underweight and 8.2% for wasting. With respect to stunting, the nutritional status of the study population is better than the average of the national results, but worse than observed in the western region. The reason for this might be that the TDHS reflects the averages of 15 cities in the western region and Aydin province is less developed than many of the other cities. Migration from east regions to Aydin has increased recently, resulting in an increase in the rural population near the center. The people living in these areas have many problems including poorer socioeconomic and educational conditions. This study has also demonstrated that the prevalence of

Table I. Distribution of Undernourished Children by Age Groups

Age Groups (months)	Stunted		Underweight		Wasted	
	n	%	n	%	n	%
<12 months (n=399)	35	8.8	11	2.8	49	12.3
12-23 months (n=298)	52	17.4	18	6.0	25	8.4
24-35 months (n=228)	26	11.4	14	6.1	14	6.1
36-47 months (n=255)	23	9.0	9	3.5	13	5.1
48-59 months (n=220)	16	7.3	15	6.8	14	6.4
Total (n=1400)	152	10.9	67	4.8	115	8.2

Table II. Distribution of Chronic Undernourished Children by Selected Risk Factors

Risk Factors		Stunted N (%*)	Not stunted N (%*)	P
MOTHER	Age group (year)			
	< 19	3 (14.3)	18 (85.7)	0.491
	≥ 19	149 (10.8)	1230 (89.2)	
	Education			
	Primary school or less	104 (11.9)	771 (88.1)	0.110
	Secondary/High school	48 (9.1)	477 (90.9)	
	Occupation			
	Housewife	138 (11.2)	1095 (88.8)	0.512
	Paid employed	11 (8.0)	127 (92.0)	
	Self employed	3 (10.3)	26 (89.7)	
FATHER	Educational level			
	Primary school or less	78 (14.3)	467 (85.7)	0.001†
	Secondary/High school	74 (8.7)	781 (91.3)	
	Occupation			
	No	15 (19.7)	61 (80.3)	0.003†
	Paid employed	62 (8.5)	664 (91.5)	
	Self employed	75 (12.5)	523 (87.5)	
FAMILY/HOUSE	Residence			
	Rural	61 (15.2)	339 (84.8)	0.001
	Urban	91 (9.1)	909 (90.9)	
	Social security			
	No	58 (19.2)	224 (80.8)	0.000†
	Yes	94 (8.6)	1004 (91.4)	
	Income			
	Low income	40 (18.3)	179 (81.7)	0.000†
	Moderate or more	112 (9.5)	1069 (90.5)	
	Type of sanitation			
	Sewage system	114 (10.0)	1024 (90.0)	0.035†
	Other	38 (14.5)	224 (85.5)	
	Household size***	4.41±2.18	4.13±1.47	0.036†
	Total number of cigarettes smoked daily at home***	20.89±11.26	19.43±11.17	0.269
PREGNANCY/BIRTH/CHILDHOOD	Pregnancy intent			
	Intended	137 (10.6)	1151 (89.4)	0.368
	Unintended	15 (13.4)	97 (86.6)	
	Child sequence***	2.35±2.03	2.13±1.40	0.089
	Birth weight (grams)			
	< 2500 g	14 (23.7)	45 (76.3)	0.001†
	≥ 2500 g	138 (10.3)	1203 (89.7)	
	Colostrum			
	Yes	135 (11.2)	1073 (88.8)	0.000†
	No	13 (31.7)	28 (68.3)	
	Breast-feeding (months)***	9.61±5.90	8.90±5.80	0.193
	Exclusive breast-feeding (months)***	2.65±2.58	3.02±2.45	0.097
	Time weaning was started (months)***	2.41±1.15	2.73±1.08	0.002†
	Ever using feeding bottle			
	Yes	71 (9.6)	665 (90.4)	0.125
	No	81 (12.2)	583 (87.8)	
	Ever using spout			
	Yes	71 (10.7)	593 (89.3)	0.851
	No	81 (11.0)	655 (89.0)	
	Diarrhea in last 2 weeks			
	Yes	14 (12.1)	102 (87.9)	0.910
	No	134 (11.7)	1010 (88.3)	

*Row percentage. **Baby formula/water/milk. ***Mean±Standard Deviation. †Statistically significant.

Table III: Risk Factors for Malnutrition According to Logistic Regression Analysis, Final Model

		B	SE	d.f.	OR	95% CI
Social security	Present	Reference			1.00	
	Nonexistent	0.728	0.228	1	2.071	1.324-3.239
Birth weight	≥ 2500 g	Reference			1.00	
	< 2500 g	0.923	0.380	1	2.516	1.194-5.300
Colostrum	Given	Reference			1.00	
	Never	1.025	0.395	1	2.787	1.285-6.045
Constant		-2.053	0.407	1	0.128	

wasting and underweight are below the national average. Wasting, which is an indicator of acute nutritional deficiency, is reported to result from a recent illness (especially diarrhea, a febrile sickness, etc.) or due to weight loss related to seasonal differences[7]. However, in this study, these reasons did not affect wasting. Because the study is based on chronic malnutrition, factors related to acute nutritional deficiencies were not adequately queried. Extensive research should be planned on a provincial level to determine the reasons for the high prevalence of wasting and underweight.

Several studies in Turkey have reported different prevalence rates for nutritional disorders. Studies done in Samsun and Manisa, cities in the northern and western regions of Turkey, reported stunting as 11% and 8%, underweight as 0.8% and 2%, and wasting as 1.2% and 11.5%, respectively[11,12]. Manisa is located in the same region as Aydin, and we thus expected similar prevalence rates, but the prevalence of stunted children was higher in Aydin. In Manisa, the study was done in only one urban health center region, but in this study, the study population was selected from both urban and rural areas of 10 health centers. Higher rates for stunting (15.3%) were reported from the rural health centers, where primarily poor families live and sociodemographic characteristics are worse than in urban areas. This finding is consistent with TDHS rural results.

Medline was searched for similar studies conducted in countries neighboring Turkey, but no population-based research on prevalence of malnutrition could be found. In Greece, most of the studies about this subject were hospital-based and thus, no data were found on population-based prevalence rates[13,14]. This study is expected to contribute to regional statistics.

Nutritional studies have been reported more frequently from Africa, where different prevalence rates are observed. Findings from a survey in Nairobi, Kenya revealed stunting as 34.6%, underweight as 26.5% and wasting as 6.2%. Another survey in Kasese district at the Uganda-Congo border confirmed stunting as 49.8%, underweight as 14.7% and wasting as 1.29%[6,15]. In Ecuador, chronic malnutrition was found in 22.8% of children[16]. Another study in that country, which confirmed stunting as 26% in children under five years old, reported living in rural areas as a major risk factor[17]. The very high rates of child malnutrition throughout sub-Saharan Africa are linked to such factors as poor access to education and health services, safe water and sanitation[6,15-18]. The high prevalences in these less developed countries may be expected since Africa has poorer sociodemographic characteristics than our region.

The largest prevalence of chronic malnutrition was found in the 12-23-month-old group. In this region, mean time for breast-feeding was approximately nine months. The high rates of stunting after 11 months are linked to stopping breast-feeding earlier than the suggested 24 months and difficulties in providing adequate and safe food[16].

No association was found between stunting and mother's age or education level, and this was contrary to literature findings. Some studies reported that younger childbearing was identified as a risk factor. It is suggested that adolescent mothers are not ready to take care of a child, whereas older mothers have more experience in child care and are likely to find solutions to their problems[6]. In this study, the percentage of adolescent mothers was very low and may explain why no significant

relation could be found between mother's age and stunting. The fact that children of young mothers are traditionally cared for by their grandmothers in Turkey may be another reason. Studies done in other regions of Turkey and also in Uganda and Nigeria revealed that a mother's educational level is also an important risk factor for chronic malnutrition[11,12,15,19]. Most of the mothers in the study population had similar educational characteristics. If the study population had consisted of mothers of various educational levels, it could have revealed a significant association.

We found that father's education and occupation were important risk factors for chronic malnutrition. In societies where the females' education level is low, male education gains importance. This study reveals that more emphasis should be given to education of both father and mother in developing countries like Turkey.

In this study, living in a rural area was a risk factor for malnutrition. Chronic malnutrition was found as 9.1% in urban areas and 15.2% in rural areas. A research made in Malaysia also reported that the prevalence of underweight and stunting were high among children in poor rural areas[20]. In this study, the reason for the high prevalence of malnutrition in rural areas is mainly the lack of social security. The ratio of mothers without social security was 28.8% in rural and 18.7% in urban areas. Lack of social security causes poor accessibility to education and health services.

Poverty is an important risk factor of malnutrition. In this study, the significant factors identified (low income, unemployment of father, lack of social security, lack of sewage, lower education of father, living in rural area, low birth weight) are all components - causes or results - of poverty. Children under five years old are in a stage of rapid growth and development. At this life period, early intervention strategies must be taken in order to prevent growth failure. Inadequate and inappropriate food intake is related with poverty.

Breast-feeding and giving colostrum are the foundations of good nutrition for infants, and inadequate breast-feeding can jeopardize an infant's health and nutrition, particularly in areas where sanitation and hygiene are poor. Some studies revealed that a bottle-fed baby in a poor community is 14 times more likely

to die from diarrheal diseases and four times more likely to die from pneumonia than a baby that is exclusively breast-fed[8]. A study in Iraq reported that all anthropometric measurements were found lower in children who were bottle-fed compared with those who were breast-fed[21]. In this study, stunting was higher in children fed with bottle/spout; however, the relation was not significant because only 10% of the mothers reported that they had ever used feeding bottle/spout. There was also no association between stunting and mean time of breast-feeding/exclusive breast-feeding.

There was a relation between stunting and age at which weaning was started. Inappropriate timing for introducing some kinds of food supplements to a child may affect his/her nutritional status because his/her digestive and immune systems are not yet mature. Introducing supplements before four months, especially under unhygienic conditions, could be an important cause of malnutrition[6]. A study held in India, where malnutrition prevalence was 60.7%, reported that not exclusively breast-feeding the child until at least four months of age and undesirable practices of discarding the colostrum were related with child malnutrition[22]. Similar findings were found in this study.

Multivariate analysis results showed that lack of social security (Odds ratio-OR=2.071), low birth weight (OR=2.516) and giving no colostrum (OR=2.787) were significant risk factors for stunting in children. Low birth weight may arise from many different causes. Among the most important reasons are mothers' not being informed about risks before/during pregnancy and not receiving antenatal care services sufficient in both quality and quantity. Pregnancies before 19 and over 35 years, birth interval less than two years, and mothers' poor nutritional status may result in low birth weight babies[23-26]. These babies are at risk of malnutrition in the future. A study undertaken in South Africa reported the same finding[18]. In the current study, information related to pregnancies was not adequately collected. This may be considered as a limitation of our research.

In conclusion, prevalence of chronic malnutrition is a public health problem in Aydin, Turkey. In order to prevent this serious problem,

appropriate interventions should be taken by policy makers. Improving social security coverage is essential. Mothers should be informed on the usefulness of breast-feeding at antenatal care services during their pregnancies and taught appropriate breast-feeding practices, including the importance of giving colostrum, at baby-friendly institutions after birth.

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