

**Primary Health Care providers' adherence to child growth monitoring
protocols and prevalence and predictors of stunting, wasting and underweight
among children aged 5-17 months residing in Yerevan**

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by

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LIST OF ABBREVIATIONS

CHSR - Center for Health Services Research and Development

DALY - Disability-Adjusted Life Years

IRB - Institutional Review Board

LBW - Low Birth Weight

ADHS - Armenian Demographic and Health Survey

SES - Socioeconomic Status

WHO - World Health Organization

BCG - “bacilli Calmette-Guerin” vaccine

PHC - Primary Health Care

CDC - Center for Disease Control and Prevention

NCHS - National Center for Health Statistics

DPT - Diphtheria, Pertussis and Tetanus

MCMD - Maternal Common Mental Disorders

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ABSTRACT

Introduction: Malnutrition is defined as deficiency, excess or imbalance in energy, protein or other nutrients which can result from insufficient or poorly balanced food intake, defective digestion or assimilation of food. Both undernutrition and overnutrition are considered as malnutrition leading to numerous health problems: poor cognitive development, restricted growth and even death. The main indicators measuring undernutrition are: stunting, wasting, and underweight. In 2005, stunting, severe wasting, and low birth weight (LBW) were found to be the main reasons of morbidity and mortality among children under five years of age causing 2.1 million deaths and 91.0 million disability-adjusted life years loss (DALYs) worldwide. The prevalence of undernutrition is globally declining; however, it still remains a major public health problem in many low and middle income countries.

Objective: The aims of this study were 1) to identify the proportion of properly recorded child growth screenings and to define the prevalence of undernutrition, and 2) to explore the main risk factors of stunting, wasting, and underweight among 5-17 months old children residing in Yerevan, Armenia.

Method: The study utilized a cross-sectional study design to identify the proportion of properly recorded child growth screenings and the prevalence of stunting, wasting, and underweight. For that purpose the study reviewed the ambulatory charts of 570 children aged 5-17 months. Then, the study utilized a case-control design for identifying the main risk factors of undernutrition defined as a single presence or any combination of stunting, wasting, and underweight. A total of 107 cases were identified during the record review and 107 controls were matched with the cases by age and gender from the same pool of reviewed records. The study performed binary and multiple conditional logistic regression analyses to test the associations between undernutrition and its possible determinants, while controlling for the potential confounders.

Results and discussion: According to the data collected through medical record review, the prevalence of underweight, stunting and wasting in the studied sample were 7.3%, 17.9%, and 3.1%, respectively. These data were comparable with the Armenian Demographic and Health Survey 2010 preliminary findings. The proportion of properly recorded screenings in the age to weight percentiles (to detect underweight) was 60.7%, in the height to age percentiles (to detect stunting) 60% and in the weight to height percentiles (to detect wasting) 26.8%. The study revealed that these percentages could be much higher, because in most cases (91.4%) the screenings were conducted, but the recordings were not done accurately or not done at all.

The study team reached mothers of 89 cases and 89 controls and conducted telephone interviews with them. This study discovered that undernutrition status of children aged 5-17 months in Yerevan was associated with low birth height of the child, low SES of the family, not diverse diet of the child, and short duration of predominant breastfeeding.

Conclusion and recommendations: The study revealed that the proportion of recordings of child growth data in child growth percentiles was low. The reasons for not compliance to the existing protocols need to be explored and addressed in the future.

The study findings suggest that the factors determining the growth patterns of children in Yerevan are mostly environmental. Thus, improvements in social and economic spheres, child nutrition, breastfeeding promotion, and pregnancy management could be power tools improving the health status of children.

INTRODUCTION/LITERATURE REVIEW

Undernutrition/Main Indicators of Measurement

Malnutrition is a global public health problem in many developing countries. It is defined as deficiency, excess or imbalance in energy, protein or other nutrients which can result from insufficient or poorly balanced food intake, defective digestion or assimilation of food (1). Both undernutrition and overnutrition are considered as malnutrition leading to numerous health problems: poor cognitive development, restricted growth and even death(1). Although the prevalence of undernutrition is globally declining, it still remains a major public health problem in many countries. In 2005, stunting, severe wasting, and low birth weight (LBW) were the main reasons of morbidity and mortality causing 2.1 million deaths and 91.0 million disability-adjusted life years loss (DALYs) among children under five years of age worldwide (1). According to the World Health Organization (WHO), the prevalence of underweight and stunting among children under five years of age were estimated to be 16% and 27%, respectively, and around 104 million children under five were underweight in 2010 worldwide (2).

Child's nutritional status is determined by comparing child's weight/height to his/her age on the child growth charts, and identifying whether it is within the upper and lower limits of the growth curves on the chart(1). This approach allows comparing the nutritional status of the child with the nutritional status of other children or an international reference population and assesses the degree of undernutrition or overnutrition (1). The main indicators measuring undernutrition are stunting, wasting, and underweight (see Appendix 1 for details on each indicator).

Predisposing Factors for Undernutrition

The factors affecting nutritional and health status of children are diverse. Different studies confirmed the positive relationship between breastfeeding duration, predominant

breastfeeding until 5-6 months and child growth rate(3-6). According to WHO data, only 35% of infants aged 0-6 months were exclusively breastfed in the world (2010). If all children were exclusively breastfed during the first six months of life and then received nutritious complementary food with continued breastfeeding up to two years of age, the life of an additional 1.5 million children under age five would be saved each year(7). At the same time, malnutrition causes one-third of the 8.8 million deaths annually among children under five and two thirds of these deaths are often associated with inappropriate feeding practices such as bottle-feeding or introduction of untimely and inadequate complementary foods(7).

Larger family size with the number of children greater than three as well as higher number of total and under-five siblings were found to be risk factors for severe malnutrition (3;6;8).

Many studies suggested that poor socioeconomic status and low level of mother's education were risk factors for underweight, stunting, and wasting(3;4;6-12). Children living in urban settlements were at higher risk of undernutrition development compared to children in rural areas (8;10).

Failure to complete immunization, absence of BCG, diphtheria, pertussis and tetanus (DPT)/polio, or measles immunization were significantly associated with severe underweight(6;8;13). Diarrheal disease in a child within a month before the survey was significantly associated with underweight (9).

Existing research suggested a positive association between malnutrition status and the previous birth interval of the child (children with previous birth interval of 0–23 months and 24-47 months had, respectively, 1.55 and 1.36 times higher risk of being stunted compared to children with birth interval of 48 months and above) (11). Babies who had very small or smaller than average size at birth, had respectively 2.08 and 1.79 times higher risk of stunting than those with average or larger size at birth (11;14).

Maternal common mental disorders (MCMD) were found as risk factors for moderate or severe malnutrition among children under five (15). One study suggested that children brought up by a single parent suffered from underweight to a significantly higher level than children living with both parents (4).

Growth disorders at early age may hurt both physiological and neuropsychological development of a child, whereas the reasons for growth disorders are mostly environmental and easily correctable by educating parents, correcting problems related to breastfeeding, correcting diet, and other issues (1). That is why screening and recording of child growth measurements in child growth charts are important for early detection and prevention of growth disorders.

Situation in Armenia

According to the Armenian Demographic and Health Survey (ADHS) 2005, 13% of children under age five were stunted, including 3% severely stunted (16). During the first year of life, stunting increased from 7% (at 6 months) to 12% (at 9-11 months) and reached its peak in the age groups of 12-17 and 18-23 months (about 20%), then it went down to 12% among older children (16). The prevalence of stunting in Yerevan was 17.7% (16). In 2010, the prevalence of stunting among under 5 children in Armenia became 19% (17). The prevalence in Yerevan was 11% (17).

Prevalence of underweight in 2010 was 5% (17). Compared with ADHS 2005 data it increased by 1% and comparing with the expected percentage of underweight in a well-nourished population (2.3%) it still indicates some level of malnutrition among children of Armenia(17). Moreover, the comparison of 2000 and 2005 ADHS data and 2010 preliminary findings showed no improvement, the prevalence of stunting increased from 13% to 19% (from 2000 to 2010). The prevalence of wasting was 2% in 2000 and 4% in 2010 and the prevalence of underweight was 3% and 5%, respectively (16-18).

The comparison with the data for other countries shows that the prevalence of undernutrition in Armenia is more comparable with the prevalence of undernutrition in other middle income countries rather than in high or low income countries (19;20) (see Graphs 1 &2).

Until 2002, Armenia used the “National Center for Health Statistics/World Health Organization (NCHS/WHO) 1977 growth charts” (21) to assess nutritional and health status of children, which were replaced with the “US Center for Disease Control and Prevention (CDC) 2000 charts” (22), then the process of introduction of “WHO new Child Growth Standards” (23) started since 2006 (24).

In Armenia, according to the existing protocols, PHC providers are responsible for monitoring the growth of each served child, but these data are not being monitored, summarized, analyzed and presented to decision makers. The only source of data on malnutrition has been ADHS, which is being conducted once in five years.

The wide variations of some indicators between different regions of Armenia and between 2000, 2005, and 2010 could suggest that ADHS data on undernutrition might not be fully reliable: the percentage of stunting has doubled from 2000-2005 and then declined in 2010 in Yerevan (7.5%-17.7%-11.3%), it declined twice from 2000-2005 and then increased significantly in 2010 in Gegharkunik (32.1%-16.0%-25.3%); the prevalence of wasting in Shirak region increased from 2% in 2000 to 33% in 2005 and decreased to 6.6% in 2010 (17). In Syunik, in 2005 the prevalence of stunting was among the lowest (7.2%) (16) and in 2010 among the highest (36.5%) (17). Therefore, it would be interesting to explore the existing capacity of the country’s healthcare system to become a regular source of information on this important issue.

Aims and Research questions of the Study

This study aimed to explore the prevalence and the main risk factors of stunting, wasting, and underweight among children aged 5-17 months living in Yerevan. The study also assessed

providers' compliance with the child growth screening protocols by checking whether they completed child growth charts as required.

Considering the feasibility issues, we conducted the study only in Yerevan city.

The research questions of the study were:

- What is the proportion of properly recorded child growth screenings among children of 5 to 17 months old served in Yerevan polyclinics?
- What is the prevalence of wasting, stunting, and underweight among children aged 5-17 months based on the data recorded in polyclinic charts of children?
- What are the main risk factors of stunting, wasting, and underweight among children of 5 to 17 months old in Yerevan?

METHODS

Study Design

For addressing the first two of the above-mentioned research questions, a cross-sectional record review was conducted. A case-control study addressed the third research question.

Target Population

The target population included children aged 5 to 17 months living in Yerevan. We included children of this age category, because the prevalence of stunting, wasting and underweight among children was increasing especially starting from 5 months of age(16). At the same time, covering the period till 17 months of age enabled us to use the results of 5 growth screenings to be conducted at 3.5, 6, 9, 12 and 15months of age.

Study Population

The study population included children aged 5 to 17 months living in Yerevan and served by the polyclinics randomly chosen for this study.

Exclusion Criteria

The exclusion criteria for the cross sectional record review were:

- Age of a child less than 5 months or above 17 months
- Residency outside of Yerevan

The exclusion criteria for the case-control study, in addition to the above-mentioned, were:

- Presence of serious abnormalities at birth resulting in secondary malnutrition
- Absence of the recent growth screening data in the ambulatory chart(recent means conducted not earlier than within 3 month from the day of record review)
- Lack of sufficient/correct contact information
- Caregiver other than mother
- Mother's poor knowledge of Armenian.

Definition of cases

The cases were children aged 5 to 17 months living in Yerevan, identified as suffering from stunting, wasting, or underweight. The information on child's age, height and weight were obtained from the ambulatory charts of children. Then the data were put in child growth charts. Children whose height-for-age, weight-for-height and weight-for-age were under two standard deviations from the median of the reference population were identified as suffering from stunting, wasting or underweight, respectively (16).

Definition of Controls

The controls were 5-17 months aged children with normal growth indicators randomly chosen from the record review sample and matched with the cases in terms of age and gender.

Sample Size and Sampling Technique

The sample size calculation for the cross-sectional record review was done through Stata 10 statistical software using middle proportions (0.5 ± 0.05) for the hypothesized frequency of properly recorded growth monitoring data (as no preliminary data on these proportions were available) and using the following formula (25) with a power of 0.8 and alpha error of 0.05:

$$n = \left[\frac{z_{\alpha/2} \sqrt{p_0 q_0} + z_{\beta} \sqrt{p_{\alpha} q_{\alpha}}}{\Delta} \right]^2$$
$$n = \left[\frac{1.96 \sqrt{0.45 * 0.55} + 0.84 \sqrt{0.55 * 0.45}}{0.1} \right]^2 = 195$$

The calculated sample size was 195. To compensate for the cluster effect (as we had 38 clusters with 15 subjects in each), we used a standard design effect coefficient of 2, thus increasing the sample size to 390.

For the cross-sectional record review, multistage cluster sampling was conducted. At the first stage, 5 out of the total 12 districts of Yerevan were randomly selected using systematic random sampling proportionate to the size of population in each district. In each selected district one polyclinic was chosen randomly. From the 5 polyclinics overall 38 doctors (those who were available at the time of our visit) were selected. Then randomly selected fifteen ambulatory charts of 5 to 17 months old children served by each of these doctors were reviewed. Overall, $38 * 15 = 570$ records were reviewed (more than the calculated sample size of 390) to obtain the needed sample size for the cases with undernutrition to be included in the case-control study.

Sample size calculation for the case-control study was done through Stata10 statistical software using the formula for two-sample comparison of proportions (25):

$$n_1 = n_2 = \frac{\left(\frac{z_{\alpha}}{2} \sqrt{2pq} + z_{\beta} \sqrt{p_1q_1 + p_2q_2} \right)^2}{\Delta^2}$$

$$n_1 = n_2 = \frac{\left(1.96\sqrt{2 * 0.08 * 0.92} + 1.64\sqrt{0.01 * 0.99 + 0.15 * 0.85} \right)^2}{0.14^2} = 91$$

To detect a 14% difference in the risk factors between the case and control groups with a power of 0.9; α error of 0.05, and case/control ratio of 1:1, we got 91 cases and 91 controls. We took a 14% difference, because according to the literature review, the difference in the prevalence of breastfeeding (one of the important risk factors of malnutrition) between the case and control groups was 14% (15% of children in the case group were never breastfed compared to <1% of children in the control group) (9). Also considering the rate of refusal from telephone interviews, which was 12% in a study conducted in 2006 in Armenia (26), the sample size was calculated as $n=91+91*0.12=102$.

Study Instruments

For the cross-sectional record review, the study team used a record review checklist to collect data on child's weight and height at his/her last recommended screening, as well as on child's age, contact information, weight and length at birth and whether the child's growth charts were completed by the PHC provider at the time of the last growth screening (see Appendix 3).

The questionnaire for the case-control study included questions adopted from questionnaires used in other studies to investigate risk factors for undernutrition and other health issues (27;28). The final questionnaire consisted of 36 mainly close-ended questions and included the following main domains: socio-demographic characteristics, socio-economic characteristics, health status of the mother and child, weight and height of the child and his/her parents, breastfeeding and child's nutrition practices, mother's knowledge on child care and child's exposure to secondhand smoke (see Appendix 4).

Before starting data collection, the student investigator pre-tested the developed questionnaire through telephone interviews among 6 women who had 5-17 months old children.

Data Collection

The information about child's name, contact information (telephone number) and the results of the last growth screening were obtained from medical records completed by primary healthcare providers. At the same time, the completion of growth charts (whether the last screening results were recorded in the child's growth charts) was checked. Data collection lasted about one month (April-May 2011) and 570 ambulatory charts were reviewed. After identifying the cases and controls, the study team conducted telephone interviews with mothers of children using the interviewer-administered questionnaire. Telephone interviews lasted about 1.5 months (June-August 2011). Overall, 89 mothers of cases and 89 mothers of controls were involved in the telephone interviews. Up to four telephone call attempts were made to contact a respondent. Contact rate was 79.8% (142 from 178). The study team failed to contact 36 subjects because of wrong telephone number, change of apartment and being out of the country.

Study Variables

Cross sectional study

The variables of interest for the cross sectional study included the prevalence of undernutrition and the proportion of properly recorded screenings. Screenings were considered properly recorded if their results were correctly marked in the corresponding child growth charts.

Case-control study

The dependent (outcome) variable of the case-control study was the presence of undernutrition defined as being wasted, stunted, or underweight or having any combination of these three conditions.

Independent variables of the case-control study were grouped into nutritional variables (duration of exclusive, predominant, and overall breastfeeding, mean score of food diversity and separate foods included in diet of the child), information on child characteristics (birth weight, birth length, acute health problems experienced within 30 days prior to the last visit to the polyclinic, existence of inborn abnormalities), information on parents' characteristics (age, educational level of mother, existence of any chronic diseases in mother, mother's smoking status before, during, and after pregnancy, mother's height and weight, father's height and weight, years past from mother's previous delivery), exposure to secondhand smoke variables (number of household members who currently smoke, frequency of people smoking in the same room where child is present), demographic and socioeconomic variables (total number of people living in the household, number of children, number of employed household members, current employment of mothers, being employed during pregnancy, mean SES score of the family) and mother's child caring knowledge score. The score of food diversity was calculated by cumulating the positive answers to questions regarding certain foods/food groups ate by the child during the previous day: "1" point was given for each positive answer and "0" for each negative answer.

SES score of the family was calculated based on the three socio-economic questions. Zero point was given to the lowest level of the questions regarding household spending per month and general standard of living and "4" points were given to the highest level of these questions. We included also the ratio of the total number of household members to the number of employed members of the household in the SES score. This ratio was grouped in

four categories. The lowest category got 4 points and the highest 0 point. Thus, the highest possible SES score was $4+4+4=12$ and the lowest 0.

Ethical Considerations

The Institutional Review Board (IRB) within the College of Health Sciences at the American University of Armenia approved the study protocol. The ethical issues of privacy, confidentiality, consent and justice were taken into account while conducting the study. All mothers included in the study got an oral informed consent (Appendix 2). They were informed about their right to skip any of the questions and stop the interview at any time.

Data Management and Analysis

The student investigator entered the data into SPSS-18 statistical software. Cleaning procedure was done to assure the accuracy of the entered data. For the cross sectional record review, a descriptive analysis was done to identify the prevalence of undernutrition and the proportion of properly recorded child growth screenings.

For the matched case-control study, the study team prepared basic descriptive statistics (frequencies, means and standard deviations). Paired-Samples T-Test was used for comparison of means and Wilcoxon nonparametric test of two related samples for comparison of proportions between the two groups.

The study also utilized univariate and multivariate conditional logistic regression analyses to calculate the odds ratio and 95% confidence interval of the strength of association between independent and dependent variables, and to control for potential confounders (29; 30). Most variables were dichotomous or continuous variables. For the categorical ones dummy variables were created to conduct multivariate analysis. First, univariate conditional logistic regression was conducted to identify variables significantly associated with the undernourished status of children. Then, multivariate conditional logistic regression analyses were utilized to measure the controlled effect of each variable on the outcome. Conditional

logistic regression was used to construct the final model, and all those variables, which were significantly or marginally significantly associated with the outcome variable, were included in it.

RESULTS

Findings of Cross-Sectional study

The study team reviewed 570 ambulatory charts for the cross-sectional study. The prevalence of underweight, stunting and wasting in the sample was 7.3%, 17.9% and 3.1%, respectively (see Table 1). The proportion of properly recorded screenings in the age to weight percentiles (to detect underweight) was 60.7%, in the height to age percentiles (to detect stunting) 60.0% and in the weight to height percentiles (to detect wasting) 26.8% (see Tables 2). Only one of the polyclinics demonstrated high performance of proper recordings of weight to age and height to age percentiles (97.8%). The other four polyclinics demonstrated much lower performance ranging from 41.1%-56.7%. The recordings in weight to height percentiles were low in all five polyclinics ranging from 14.4%-53.3%.

Findings of Case-Control Study

From 570 subjects 49 were excluded while selecting the cases and controls (because of missing information concerning the weight and height of the child at the last recommended screening). From the remaining 521 subjects 107 cases were identified and 107 controls were matched with the identified cases by age and gender. The refusal rate was 0%. However, the study team failed to contact 36 subjects (18 cases and 18 controls) due to different reasons: wrong telephone number, change of address or being out of the country. Thus, the data analysis was based on 89 cases and 89 controls.

Descriptive Statistics

During the telephone interviews with mothers, 89.9% of the mothers of cases and 93.3% of the mothers of controls reported that they took the child to the polyclinic within 3 months

prior to the telephone interview and during that visit both weight and height of 91.0% of cases and 94.4% of controls were measured. This means that $89.9 \times 0.91 = 81.8\%$ of cases and $93.3 \times 0.94 = 88.0\%$ of controls had mothers' confirmation that the children underwent the recent growth screening. However, not confirmed cases were not excluded from the analysis. Tables 3-8 present the descriptive statistics of the study population. The variables were grouped into the following subgroups: children characteristics, parents' characteristics, child nutrition, mother's knowledge, child's exposure to secondhand smoke, and demographic/socio-economic status of households. Descriptive statistics showed that birth weight and birth height of undernourished children were significantly lower compared to the children with normal anthropometric data. The proportion of children with birth weight of $\leq 2,500\text{g}$ was significantly higher among cases than controls.

Durations of breastfeeding, exclusive breastfeeding and predominant breastfeeding were statistically significantly shorter among cases compared to controls. Controls had better complementary feeding practices: controls used more fruits, meat and cheese in their diet than cases and the mean score of food diversity was significantly higher among controls compared to cases.

Cases and controls were also statistically significantly different regarding mother's age and height (mothers of controls were younger and taller), father's weight and height (both higher among controls' fathers), current employment status of mothers (more employed mothers among controls), years past from the previous delivery (more mothers among controls with more than 3 years of inter-birth interval), frequency of people smoking in the same room where the child was present (cases more exposed to secondhand smoke), number of employed household members (more among controls), and the family's SES score (higher among controls).

Univariate conditional logistic regression

During the univariate conditional logistic regression analysis, statistically significant associations with the status of undernutrition were observed regarding to the following variables: child's birth height , child's birth weight, child's low birth weight status, mother's height, father's height, father's weight, child's regular exposure to second-hand smoke, family's SES score, current employment of mother, number of employed household members, and all the nutrition variables (durations of exclusive, predominant and overall breastfeeding, score of food diversity and the three variables regarding the consumption of meat, cheese and fruit) (see Table 9).

Testing for Multicollinearity between Variables

All the predictor variables, which remained significant in univariate conditional logistic regression analysis and included in multivariate conditional logistic regression analysis were tested for correlations using VIF (variance inflation factor) statistics. The analysis revealed that we didn't have an issue of multicollinearity within our grouped variables. Mean VIFs for the parental, child information, nutritional and socioeconomic variables were equal to 1.21, 4.25, 1.01, and 1.19, accordingly.

Multivariate conditional logistic regression

During multivariate conditional logistic regression analysis, different models were constructed to assess the controlled effect of independent variables of interest on the outcome of undernutrition. Family's SES score, child birth height, duration of predominant breastfeeding and the score of food diversity were statistically significantly associated with undernourished status of the child, while father's height was marginally significantly associated with the outcome variable in the final model (see Table 10). The final Model suggested that, 1cm increase in child's birth height was associated with about 43% decreased risk for child's undernutrition (OR=0.57, p=0.019); each "1" point increase in SES score was

associated with about 40% decrease in the probability of child's undernutrition (OR=0.60, p=0.021); each one month increase in predominant breastfeeding was associated with 37% decrease in the probability of child undernutrition (OR=0.63, p=0.021); each "1" point increase in food diversity score (which means an additional type of food included in the child's diet) was associated with 63% decrease in the probability of child undernutrition (OR=0.37, p=0.022); and each 1 cm increase in father's height was associated with 12% decrease in the risk of child's undernutrition (OR=0.88, p=0.089).

DISCUSSION

The aims of the cross-sectional record review were identifying the proportion of properly recorded child growth screenings and the prevalence of stunting, wasting and underweight among 5-17 months old children living in Yerevan city. This study revealed that 91.4% of reviewed 570 ambulatory charts had the recent growth screening data. However, the proportion of properly recorded screenings was rather low in most polyclinics; the weight to height percentiles to detect wasting were in the worst situation.

This finding suggests the need to conduct future studies to investigate potential reasons for poor performance of polyclinics in terms of proper recording growth screening data.

All cases and controls were selected from 521 records with recent growth screening data available.

According to the study findings, the prevalence of stunting in Yerevan among children aged 5- 17 months was 17.9%. The ADHS 2005 and 2010 suggested that the prevalence of stunting in Yerevan among children under 5 years old was 17.7% and 11.3%, respectively. But these data were not fully comparable with the findings of this study; because the age groups in ADHS and in this study were different and the age-distribution of ADHS data was not available for Yerevan (it was available only for the country-wide data). According to the

ADHS 2010, the prevalence of stunting in Armenia among 6-17 months old children was 16.6%, which was comparable to the findings of this study.

The prevalence of wasting and underweight among children aged 5-17 months in Yerevan was 3.1% and 7.3%, respectively. These findings were also rather comparable to the ADHS 2010 data on the prevalence of wasting and underweight among 6-17 months old children in Armenia: 2.9% and 5.3%, respectively. The ADHS 2010 suggested that the prevalence of wasting and underweight in Yerevan among children less than 5 years old were 2.5% and 2.1%, respectively.

The identified prevalence of undernutrition in Yerevan was much higher than that in high income countries. It was comparable with the reported prevalence in some lower middle to upper-middle income countries like Uzbekistan and Serbia, but lower than in some low-income countries (19;20) (see Graphs 1&2).

This study revealed that the main factors associated with undernutrition status of children aged 5-17 months in Yerevan were low birth height of the child, low SES of the family, lack of diversity in child's diet and shorter duration of predominant breastfeeding. Father's low stature was marginally significantly associated with the outcome.

Most of the studies examined the role of mothers' height on the nutritional status of children (31;34;35;38-40) and some studies, similar to the finding of this study, suggested the importance of father's height (38;39).

The observed strong association between low birth height and child undernutrition status was consistent with the literature (31-33).

The impact of poor socioeconomic conditions on the undernutrition status of children was observed in majority of reviewed studies (3;4;6;8-12;33-35). This is an important

predisposing factor of undernutrition, as it can lead to many other negative factors like poor diet for the child and mother, food insecurity, bad household conditions, and infections.

The protective effect of breastfeeding against child malnutrition is also well established in the literature (3-6). The duration of predominant breastfeeding (more than 4 months) was described as being protective for severe underweight (6). The literature emphasizes the importance of some food components (especially some micronutrients like zinc, vitamin A and iron) and food diversity for the adequate growth of children (36). Besides being nutritionally valuable, meat is expensive in Armenia, which is one of the reasons for restricted consumption of meat in poorer families (37).

Strengths and Limitations

Limitations

The study had to rely on the records of pediatricians in polyclinics for defining the cases and controls. Doctors may measure child's height and weight not accurately, which could lead to a problem of misclassification of cases and controls.

During the telephone interviews with mothers, there was a potential for a recall bias.

The student investigator was aware of the children's case and control status which could lead to a potential interviewer bias during the interviews with mothers.

As the proportions of wasted and underweight children among the cases were small, the study did not have enough power for conducting separate analysis of risk factors for each of the undernutrition indicators.

Strengths

As child growth data were not always accurately put in child growth percentiles, the student investigator not only looked at the data on percentiles, but also checked whether they were

put accurately during the medical record reviews; this helped to improve the quality of the collected data.

Random selection of the clusters (polyclinics) and study units (cases and controls) made the results generalizable for Yerevan. The study selected cases and controls from the same pool of children and matching was used to facilitate their comparability.

This was the first study in Armenia investigating PHC providers' adherence to the child growth monitoring protocols and the risk factors for undernutrition among 5-17 months old children in Yerevan.

CONCLUSION/ RECOMMENDATIONS

The study revealed that the proportion of recordings of child growth data in child growth percentiles was much smaller than the proportion of conducted screenings. The reasons of PHC providers' poor compliance to the existing protocols need to be explored and addressed in future studies.

The prevalence of undernutrition in Yerevan among 5-17 months old children was higher compared with that in high income and some middle income countries (19;20) and remains a public health problem.

The study findings suggested that factors determining the growth patterns of children in Yerevan were mostly environmental. Thus, improvements in social and economic spheres, promotion of predominant breastfeeding, diversity in children's diet, and appropriate pregnancy management could be power tools improving the health status of children.

REFERENCE LIST

- (1) World Health Organization Regional Office for the Western Pacific. Integrating poverty and gender into health programmes: a sourcebook for health professionals: Nutrition module. WHO Regional Office for the Western Pacific. Available on <http://www.wpro.who.int/NR/rdonlyres/Nutritionmodule2.pdf>. 4-4-2011.
- (2) World Health Organization. Millennium Development Goals (MDGs). Extreme poverty and hunger. Available on http://www.who.int/topics/millennium_development_goals/hunger/en/. 4-4-2011.
- (3) Solomon Amsalu ZT. Risk factors for severe acute malnutrition in children under the age of five. Ethop. J. Health Dev. 2008.
- (4) Salah EO et al. Factors Affecting Prevalence of Malnutrition Among Children Under Three Years of Age in Botswana. African Journal of Food Agriculture, Nutrition and Development, Volume 6 № 1. 2006.
- (5) Prentice A. Extended breast-feeding and growth in rural China. Nutr Rev 52(4):144-146. 1994.
- (6) Nahar B et al. Risk factors associated with severe underweight among young children reporting to a diarrhoea treatment facility in Bangladesh. J Health Popul Nutr 28(5):476-483. 2010.
- (7) World Health Organization. Breastfeeding key to saving children's lives. Available on http://www.who.int/mediacentre/news/notes/2010/breastfeeding_20100730/en/. 4-4-2011.
- (8) Holakouel NK et al. Risk Factors for Malnutrition in 6-to 30-months old Children Seen at Health Centers in Hormozgan Province. IRANIAN JOURNAL OF EPIDEMIOLOGY 2006; 1(2):27-32.
- (9) Sapkota VP et al. Prevalence and Predictors of Underweight, Stunting and Wasting in Under-Five Children. J Nepal Health Res Council . 2009.
- (10) Janevic T et al. Risk factors for childhood malnutrition in Roma settlements in Serbia. BMC Public Health; 10:509. 2010.
- (11) Rayhan MI, Khan MSH. Factors causing malnutrition among under five children in Bangladesh. Pakistan journal of nutrition 2006; 5(6):558-562.
- (12) Mehata S. A Case Control Study on Risk Factors Associated with Malnutrition in Dolpa District of Nepal. Journal of Food Science and Technology Nepal 2009; 4(0):34-37.
- (13) Owor M et al. Socio-economic risk factors for severe protein energy malnutrition among children in Mulago Hospital, Kampala. East Afr Med J 77(9):471-475. 2000.

- (14) Ergin F et al. Nutritional status and risk factors of chronic malnutrition in children under five years of age in Aydin, a western city of Turkey. *Turk J Pediatr* 49(3):283-289. 2007.
- (15) Santos DS et al. Maternal common mental disorders and malnutrition in children: a case-control study. *Soc Psychiatry Psychiatr Epidemiol* . 2010.
- (16) National Statistical Service (Armenia), Ministry of Health (Armenia), and ORC Macro. Armenia Demographic and Health Survey 2005. Calverton, Maryland: National Statistical Service, Ministry of Health, and ORC Macro. 2006.
- (17) National Statistical Service (Armenia), Ministry of Health (Armenia), and ORC Macro. Armenia Demographic and Health Survey 2010. Calverton, Maryland: National Statistical Service, Ministry of Health, and ORC Macro. Preliminary Report. 2010.
- (18) National Statistical Service (Armenia), Ministry of Health (Armenia), and ORC Macro. Armenia Demographic and Health Survey 2000. Calverton, Maryland: National Statistical Service, Ministry of Health, and ORC Macro. Preliminary Report. 2001 . 2011.
- (19) The world Bank Group.World Health Organization. Global Database on Child Growth and Malnutrition.World Development Indicators. Malnutrition prevalence, weight for age (%) of children under 5. 2011.
- (20) The world Bank Group.World Health Organization. Global Database on Child Growth and Malnutrition. World Development Indicators. Malnutrition prevalence, height for age (%) of children under 5. 2011.
- (21) Binagwaho A, Ratnayake N, Fawzi MCS. Holding multilateral organizations accountable: The failure of WHO in regards to childhood malnutrition. *Health and Human Rights: An International Journal* 2010;(0).
- (22) Ogden CL, Kuczmarski RJ, Flegal KM, Mei Z, Guo S, Wei R et al. Centers for Disease Control and Prevention 2000 growth charts for the United States: improvements to the 1977 National Center for Health Statistics version. *Pediatrics* 2002; 109(1):45.
- (23) World Health Organization. World Health Organization releases new Child Growth Standards. Available on <http://www.who.int/mediacentre/news/releases/2006/pr21/en/index.html>. 4-4-2011.
- (24) Ministry of Health RA, order N 860A. 17-6-2008.
- (25) Josef L.Fleiss. *Statistical Method for Rates and Proportions*. Second Addition. 1981.

- (26) Sahakyan A, Armenian HK, Breitscheidel L, Thompson ME, Yenokyan G. Feeding practices of babies and the development of atopic dermatitis in children after 12 months of age in Armenia: Is there a signal? *European journal of epidemiology* 2006; 21(9):723-725.
- (27) Demirchyan A et al. Household Health Survey: Baseline Evaluation, 2006. USAID Primary Health Care Reform Project, Emerging Markets Group, Ltd; American University of Armenia, Center for Health services Research and Development. 2008.
- (28) Center for Health Services Research and Development. American University of Armenia. Final Survey on Knowledge, Practices, and Coverage (KPC) for the Evaluation of Integrated Management of Childhood Illnesses (IMCI) Project in Gegharkunik, Armenia, Winter 2003/2004. 2004. Yerevan.
- (29) Scott W. Menard. Logistic regression: from introductory to advanced concepts and applications. 2009.
- (30) Conditional logistic regression using COXREG. <https://www-304.ibm.com/support/docview.wss?uid=swg21477360> . 15-11-2010.
- (31) Bordon LG, Fernandez AE. Stunting risk factors in 5-year-old children]. *Revista de la Facultad de Ciencias Medicas (CJrdoba, Argentina)* 1996; 54(1-2):33.
- (32) Amigo H, Bustos P, Leone C, Radrigbn ME. Growth deficits in Chilean school children. *The Journal of nutrition* 2001; 131(2):251.
- (33) Rahman A, Chowdhury S, Karim A, Ahmed S. Factors associated with nutritional status of children in Bangladesh: a multivariate analysis. *Demography India* 2008; 37(1):95-109.
- (34) Zottarelli LK, Sunil TS, Rajaram S. Influence of parental and socioeconomic factors on stunting in children under 5 years in Egypt. *East Mediterr Health J* 2007; 13:1330-1342.
- (35) Sharghi A, Kamran A, Faridan M. Evaluating risk factors for protein-energy malnutrition in children under the age of six years: a case-control study from Iran. *International journal of general medicine* 2011; 4:607.
- (36) Rivera JA, Hotz C, Gonzblez-CossЖo T, Neufeld L, GarcЖa-Guerra A. The effect of micronutrient deficiencies on child growth: a review of results from community-based supplementation trials. *The Journal of nutrition* 2003; 133(11):4010S.
- (37) Grigoryan R MHTNCBPVAS. Healthy Nutrition and Lifestyle Project. American University of Armenia, Center for Health Services Research and Development, Yerevan, Armenia, February 2011. 2011.
- (38) Sichieri R, Taddei JA, Everhart JE. Influence of parental height and sociodemographic factors on adolescent height in Brazil. *Journal of adolescent health* 2000; 26(6):414-419.

- (39) Subramanian SV, Ackerson LK, Davey Smith G, John NA. Association of maternal height with child mortality, anthropometric failure, and anemia in India. *JAMA: the journal of the American Medical Association* 2009; 301(16):1691.
- (40) Report of the Study of Risk Factors Associated with Protein Energy Malnutrition Among Children Less than Three Years Old in Oman. Department of Nutrition, Directorate General of Health Affairs, Ministry of Health, Sultanate of Oman. 2005.

TABLES

Cross-sectional record review

Table 1. Prevalence of stunting, wasting and underweight among 5-17 months old children in Yerevan

	<i>%</i>	<i>n/N*</i>
Child is underweight	7.3%	38/521
Child is stunted	17.9%	93/521
Child is wasted	3.1%	16/521

* n is the numerator for the given percentage, N is the denominator.

Table 2. Proportion of properly recorded child growth screenings among 5-17 months old children in Yerevan

	Polyclinic's ID					Total
	1	2	3	4	5	
	%(n/N*)	%(n/N*)	%(n/N*)	%(n/N*)	%(n/N*)	%(n/N*)
Recorded in weight to age percentiles	56.7% (85/150)	56.0% (84/150)	54.4% (49/90)	44.4% (40/90)	97.9% (88/90)	60.7% (346/570)
Recorded in height to age percentiles	56.0% (84/150)	56.0% (84/150)	54.4% (49/90)	41.1% (37/90)	97.8% (88/90)	60.0% (342/570)
Recorded in weight to length percentiles	19.3% (29/150)	33.3% (50/150)	14.4% (13/90)	14.4% (13/90)	53.3% (48/90)	26.8% (153/570)

* n is the numerator for the given percentage, N is the denominator.

Case – control study

Table 3. Children’s characteristics for cases and controls

Variable name	Cases (n=89)	Controls (n=89)	p-value
Child’s weight at birth (kg) Mean (SD)	2.7 (0.5)	3.1 (0.4)	0.000
Child’s weight at birth ≤2500g	29.2%	2.3%	0.000
>2500g	70.8%	97.8%	
Child’s height at birth (cm) Mean (SD)	47.4 (3.0)	50.1 (1.9)	0.000
Weight measured at the last visit Yes	91.0%	94.4%	0.527
Height measured at the last visit Yes	91.0%	94.4%	0.527
Any acute symptom within 30 days prior to the last visit Yes	16.9%	15.7%	0.853
Existence of inborn abnormalities Yes	3.4%	0.0%	0.083
Months past from the last visit to a policlinic			
>3 months	10.1%	6.7%	0.366
≤3 months	89.9%	93.3%	

Table 4. Parents' characteristics for cases and controls

Variable name	Cases (n=89)	Controls (n=89)	p-value
Mother's age	28.0	27.3	0.004
Mean (SD)	(2.3)	(4.6)	
Mother's weight	58.8	59.0	0.911
Mean (SD)	(11.7)	(9.8)	
Mother's height	160.0	163.3	0.000
Mean (SD)	(6.1)	(4.9)	
Father's weight	73.3	79.9	0.000
Mean (SD)	(10.2)	(12.3)	
Father's height	171.5	175.5	0.000
Mean (SD)	(5.8)	(5.7)	
Mother's level of education			0.189
≤10 years	20.2%	16.9%	
11-13 years	25.8%	16.9%	
>13 years	53.9%	66.3%	
Existence of any health problem during pregnancy in mother			0.480
Yes	20.2%	15.7%	
Years past from the previous delivery			0.034
<3 years	45.9%	26.5%	
≥3 years	54.1%	73.5%	

Table 5. Children's nutrition related characteristics for cases and controls

Variable name	Cases (n=89)	Controls (n=89)	p-value
Months of breastfeeding Mean (SD)	4.8 (4.5)	7.6 (4.4)	0.006
Months of exclusive breastfeeding Mean (SD)	2.1 (2.2)	2.9 (2.2)	0.004
Months of predominant breastfeeding Mean (SD)	3.2 (2.3)	4.6 (2.7)	0.000
Food ate yesterday during the day or at night			
Any infant formula Yes	22.5%	24.7%	0.732
Any bread Yes	91.0%	93.3%	0.593
Any green vegetable Yes	5.6%	4.5%	0.739
Any vegetable Yes	76.4%	85.4%	0.131
Any fruit Yes	82.0%	94.4%	0.012
Any meat Yes	36.0%	60.7%	0.003
Any eggs Yes	15.7%	16.9%	0.835
Beans, peas or lentils Yes	3.4%	2.2%	0.655
Any cheese Yes	66.3%	86.5%	0.001
Food made with oil, butter or fat Yes	96.6%	97.8%	0.655
Score of food diversity Mean (SD)	5.0 (1.2)	5.7 (1.1)	0.000

Table 6. Mothers' knowledge for cases and controls

Variable name	Cases (n=89)	Controls N=(89)	p-value
A baby doesn't need any food or liquid but breast milk for the first 6 months			
Correct	56.2%	67.4%	0.114
Incorrect	43.8%	32.6%	
If a child has diarrhea / less liquids than usually			
Correct	61.8%	73%	0.105
Incorrect	38.2%	27%	
Small amount of alcohol will not negatively affect the fetus			
Correct	53.9%	65.2%	0.123
Incorrect	46.1%	34.8%	
Heavily dressing is a better way to prevent measles than vaccination			
Correct	79.8%	80.9%	0.857
Incorrect	20.2%	19.1%	
The more baby is breastfed the more milk is produced			
Correct	88.8%	88.8%	1.000
Incorrect	11.2%	11.2%	
Playing is not an important part of children's development			
Correct	98.9%	97.8%	0.564
Incorrect	1.1%	2.2%	
At least 3 years of spacing is good for both mother's and child health			
Correct	86.5%	83.1%	0.549
Incorrect	13.5%	16.9%	
Mean knowledge score			
Mean (SD)	5.3 (1.1)	5.6 (1.1)	0.06

Table 7. Children's exposure to secondhand smoke for cases and controls

Variable name	Cases (n=89)	Controls (n=89)	p-value
Numbers of household members who currently smoke	1.1	0.9	0.106
Mean (SD)	(0.7)	(0.9)	
Regular exposure to second-hand smoking			0.000
More than several days a week	55.1%	78.7%	
Less than several days a week	44.9%	21.3%	

Table 8. Demographic/socio-economic characteristics of households for cases and controls

Variable name	Cases (n=89)	Controls (n=89)	p-value
Total number of people living in the household	5.0	4.8	
Mean (SD)	(1.5)	(1.3)	0.504
Number of children	1.6	1.5	
Mean (SD)	(0.9)	(0.7)	0.632
Number of employed household members	1.7	2.0	
Mean (SD)	(0.9)	(1.0)	0.015
Current employment of mothers			
Employed	35.2%	57.3%	
Unemployed	64.8%	42.7%	0.002
Being employed during pregnancy			
Yes	42.7%	52.8%	0.160
SES score	5.6	6.9	
Mean (SD)	(1.9)	(1.9)	0.000

Table 9. Univariate conditional logistic regression analysis (unadjusted associations between undernutrition status of children and parental, social-economic, nutritional, smoking, child information, mother knowledge variables among 5-17 months old children in Yerevan)

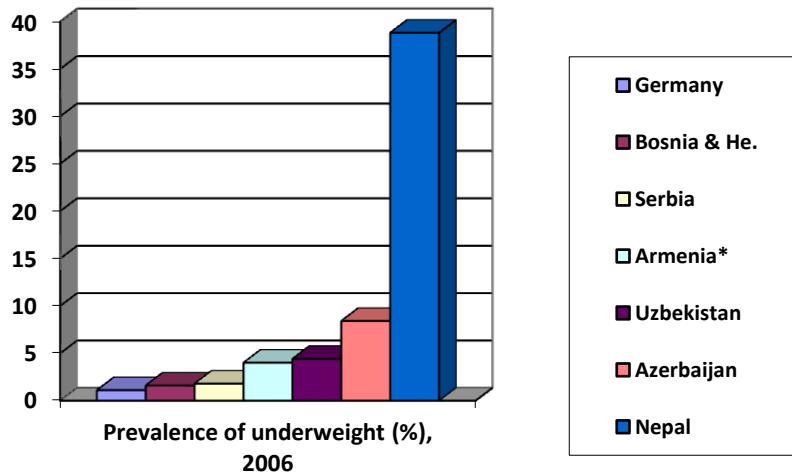
Variable name	OR (CI)	p-value
Information on children		
Child birth height	0.53 (0.39-0.71)	0.000
Child birth weight	0.27 (0.05-0.33)	0.000
Child's low birth weight	12.5 (2.96-52.7)	0.001
Information on parents		
Mother's age	1.03 (0.97-1.10)	0.314
Mother's height	0.88 (0.82-1.95)	0.001
Father's weight	0.94 (0.90-0.97)	0.001
Father's height	0.88 (0.82-0.95)	0.001
Years past from the previous delivery	0.14 (0.02-1.16)	0.069
Child nutrition		
Any fruit	0.27 (0.09-0.80)	0.020
Any meat	0.42 (0.23-0.75)	0.004
Any cheese	0.28 (0.12-0.65)	0.003
Score of food diversity	0.53 (0.37-0.75)	0.000
Months of breastfeeding	0.86 (0.76-0.97)	0.015
Months of exclusive breastfeeding	0.78 (0.65-0.93)	0.007
Months of predominant breastfeeding	0.73 (0.61-0.88)	0.001
Mother's knowledge		
Mean knowledge score	0.76 (0.56-1.02)	0.067
Child exposure to secondhand smoke		
Regular exposure to second-hand smoking	4.50 (1.85-10.9)	0.001
Socio-economic variables		
Number of employed household members	0.62 (0.42-0.93)	0.021
Current employment of mothers	0.32 (0.15-0.68)	0.003
SES score	0.58 (0.45-0.76)	0.000

Table 10. Determinants of undernutrition status of children among 5-17 months old children in Yerevan (final model)

Variable name	OR (CI)	p-value
Father's height	0.88 (0.74-1.01)	0.089
SES score	0.60 (0.29-0.90)	0.021
Birth height	0.57 (0.29-0.92)	0.019
Duration of Predominant Breastfeeding	0.63 (0.39-0.92)	0.021
Score of food diversity	0.37 (0.09-0.81)	0.022

GRAPHS

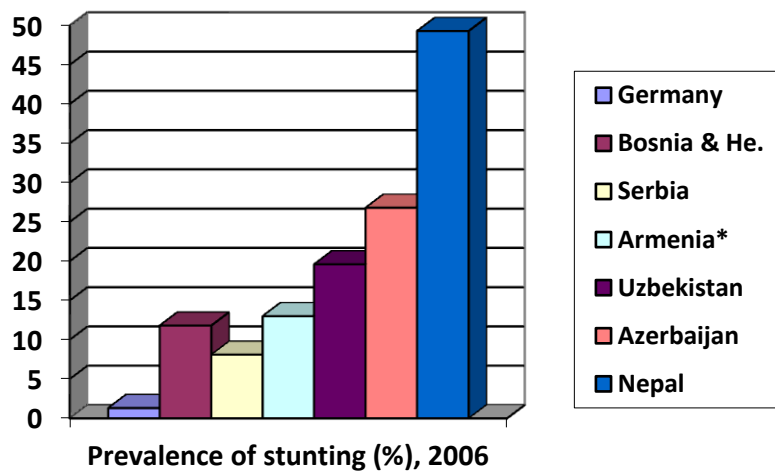
Graph 1. Prevalence of underweight among under five year old children in countries with different economic levels (%), 2006 (19)



* Data for Armenia are provided for 2005

Germany (high income country), Bosnia & Herzegovina, Serbia, Armenia, Uzbekistan, Azerbaijan (low to upper middle income countries), Nepal (low income country).

Graph 2. Prevalence of stunting among under five year old children in countries with different economic levels (%), 2006 (20)



* Data for Armenia are provided for 2005
Germany (high income country), Bosnia & Herzegovina, Serbia, Armenia, Uzbekistan, Azerbaijan (low to upper middle income countries), Nepal (low income country).

APPENDICES

Appendix1

Indicators Measuring Undernutrition

Children whose height-for-age is below minus two standard deviations from the median of the reference population are considered stunted or short for their age (16). Stunting is the outcome of chronic undernutrition (16).

Children whose weight-for-height is below minus two standard deviations from the median of the reference population are considered wasted (or thin) (16). Wasting is the outcome of the acute undernutrition (16).

Children whose weight-for-age is below minus two standard deviations from the median of the reference population are considered underweight (16). This can be an outcome of both acute and chronic undernutrition (16).

By the order N 860-A, 17.06.2008 of the Ministry of Health of Armenia, 18 percentile charts (9 for boys, 9 for girls) were adopted and implemented (20). These are:

- Weight for age for 0-5 years old children (WHO, 2006),
- Weight for age for 5-20 years old children (CDC, 2000),
- Length/height for age for 0-5 years old children (WHO, 2006),
- Height for age for 5-20 years old children (CDC, 2000),
- Weight for length for 0-2 years old children (WHO, 2006),
- Weight for height for 2-5 years old children (WHO, 2006),
- BMI for age for 0-5 years old children (WHO, 2006),
- BMI for age for 5-20 years old children (CDC, 2000),
- Head circumference for age for 0-5 years old children (WHO, 2006) (23).

In the child growth charts, percentiles represent the average weight, height, or head size of normal children (23). In WHO 2006 charts, 3rd, 15th, 50th, 85th and 97th percentiles are determined (23).

Appendix 2

Oral consent form in English

Hello. My name is Lilit Hovhannisyanyan. I am a physician and graduate student in the Master of Public Health Program at the American University of Armenia. The College of Health Sciences at AUA is conducting a research to examine prevalence and predictors of stunting, wasting and underweight among children aged 5-17 months residing in Yerevan. You are asked to participate, because your child is at the age of 5-17 months. The name of your child was selected randomly from the polyclinic's ambulatory charts. You will help us a lot with your participation.

I will ask a set of questions about the main risk factors of stunting, wasting and underweight among the children aged 5 to 17 months.

If you agree to participate in this assessment you will be interviewed for no more than 15 minutes.

Your participation in the interview is voluntary and you can refuse to take part in it. There are no negative consequences for you or your child in case of refusing participation. You may refuse to answer any question in the interview or stop the interview at any time.

The information you provide will be confidential. Your and your child's name will not be mentioned anywhere, only aggregated data will be presented in the final report.

There is no direct benefit from participating in the study, except contributing to Armenian health care system and child health.

In case of any questions about the study you can contact Dr. Anahit Demirchyan, the Senior Researcher of the Center of Health Services Research and Development (CHSR) of AUA calling (010) 512562.

If you feel you have not been treated fairly or think you have been hurt by joining this study, please contact Dr. Hripsime Martirosyan, AUA Human Subjects Administrator at (374 1) 51 25 61. If you consent to participate, we can start.

If you agree to participate, could we continue?

Oral consent form in Armenian

Բանավոր համաձայնագիր

Բարև Ձեզ: Իմ անունը Լիլիթ Հովհաննիսյան է: Ես բժիշկ եմ և հանդիսանում եմ Հայաստանի ամերիկյան համալսարանի հանրային առողջապահության մագիստրատուրայի վերջին կուրսի ուսանող: Հայաստանի ամերիկյան համալսարանի հանրային առողջապահության ֆակուլտետն անցկացնում է հետազոտություն ուսումնասիրելու 5-17 ամսական երեխաների շրջանում ցածրահասակության, հյուծվածության և անբավարար քաշի տարածվածությունը Երևանում: Մենք խնդրում ենք Ձեզ մասնակցել հետազոտությանը, որովհետև Ձեր երեխան 5-17 ամսական է: Ձեր երեխայի անունը պատահականության սկզբունքով ընտրվել է պոլիկլինիկայի ամբուլատոր քարտերից:

Դուք մեզ շատ կօգնեք Ձեր մասնակցությամբ: Մա քննություն չէ, ես պարզապես որոշ հարցեր եմ տալու 5-17 ամսական երեխաների շրջանում ցածրահասակության, հյուծվածության և անբավարար քաշի որոշ պատճառային գործոնների մասին:

Հարցազրույցը կտևի ոչ ավելի քան 15 րոպե:

Ձեր մասնակցությունն այս հետազոտությանը կամավոր է: Դուք կարող եք հրաժարվել մասնակցել այս հարցմանը: Եթե Դուք հրաժարվեք մասնակցել հետազոտությանը, Ձեր կամ Ձեր երեխայի համար ոչ մի բացասական հետևանք չի լինի: Դուք կարող եք հրաժարվել պատասխանել ցանկացած հարցի կամ ցանկացած պահի ընդհատել հարցազրույցը:

Այս հարցազրույցի գաղտնիությունն ապահովված է: Ձեր կամ Ձեր երեխայի անունը հարցաթերթիկում չի նշվի, միայն ընդհանրացված տվյալները կներկայացվեն զեկույցում:

Այս հետազոտությանը մասնակցությունը չի ենթադրում որևէ ռիսկ կամ անձնական շահ: Ձեր մասնակցությամբ դուք կարող եք նպաստել երեխաների առողջության բարելավմանը:

Հետազոտության հետ կապված հետագա հարցերի համար կարող եք զանգահարել Հայաստանի ամերիկյան համալսարանի Հանրային առողջապահական ծառայությունների հետազոտման և զարգացման կենտրոնի ավագ գիտաշխատող Անահիտ Դեմիրճյանին՝ 512562 հեռախոսահամարով, ինչպես նաև, եթե կարծում եք, որ հետազոտության ընթացքում Ձեզ հետ լավ չեն վերաբերվել և/կամ հետազոտությունը Ձեզ վնաս է հասցրել, կարող եք զանգահարել Հայաստանի ամերիկյան համալսարան՝ Հոփսիմե Մարտիրոսյանին, հետևյալ հեռախոսահամարով՝ 512561: Նա հանդիսանում է ՀԱՀ-ի Էթիկայի հանձնաժողովի քարտուղարը:

Եթե համաձայն եք, կարո՞ղ ենք սկսել:

Appendix 3

Record review checklist in English

Date of review (day/month/year): _____ Polyclinic's ID _____

Doctor's ID _____ ID number of the child _____

1) Gender of the child

1. Male _____ 2. Female _____

2) Recorded birth abnormality

1. Yes (specify _____) 2. No

3) Weight at birth _____

4) Length at birth _____

5) Date of birth _____ 5a) Age in months _____

6) Age at the last weighting _____

7) Last recommended screening of weight:

1. Available 2. Not available

7a) Recorded in weight to age percentiles

1. Yes 2. No

8) Child is underweight

1. Yes 2. No 99. Unknown

9) Age at the last measurement of length _____

10) Last recommended screening of length:

1. Available 2. Not available

10a) Recorded in length to age percentiles

1. Yes 2. No

11) Child is stunted

1. Yes 2. No 99. Unknown

12) Recorded in weight to length percentiles

1. Yes 2. No

13) Child is wasted

1. Yes 2. No 99. Unknown

Record review checklist in Armenian

Բժշկական քարտերի վերանայման ձև

Ամսաթիվը(օր/ամիս /տարի) ____/____/____ Պոլիկլինիկայիկողը _____
Բժշկի կողը _____ Երեխայիկողը _____

1) Երեխայի սեռը

1. Արական 2. Իգական

2) Բնածին արատի առկայություն

1. Այո (հստակեցնել _____) 2. Ոչ

3) Քաշը ծնվելիս _____

4) Հասակը ծնվելիս _____

5) Ծննդյան ամսաթիվը _____ 5a) Տարիքը ամիսներով _____

6) Տարիքը քաշի վերջին չափման ժամանակ _____

7) Քաշի նախատեսված վերջին սկրինինգը

1. Առկա է 2. Առկա չէ

7a) Գրանցված է քաշ տարիքային կորագծերում

1. Այո 2. Ոչ

8) Երեխան թերքաշ է

1. Այո 2. Ոչ 99. հայտնի չէ

9) Տարիքը հասակի վերջին չափման ժամանակ _____

10) Հասակի նախատեսված վերջին սկրինինգը

1. Առկա է 2. Առկա չէ

10a) Գրանցված է հասակ տարիքային կորագծերում

1. Այո 2. Ոչ

11) Երեխան ցածրահասակ է

1. Այո 2. Ոչ 99. հայտնի չէ

12) Գրանցված է քաշ հասակային կորագծերում

1. Այո 2. Ոչ

13) Երեխան հյուծված է

1. Այո 2. Ոչ 99. հայտնի չէ

Appendix 4

Questionnaire in English

Polyclinic ID _____

ID number of the child _____

Date of interview _____

Start time _____

Information on child

1) Please, indicate the month of the child's last visit to the polyclinic _____

2) Was the child weighted during that visit?

1. Yes (weight _____ kg)

2. No

3) Was the height of the child measured at that visit?

1. Yes (height _____ cm)

2. No

4) Did (*child's name*) experience any of the following within 30 days prior to the last visit to the polyclinic?

(Circle all that apply)

1. Diarrhea

2. Vomiting

3. Fever

4. Other _____

5) Does the child had any inborn abnormalities?

1. Yes (specify) _____

2. No

6) For how long the child was breastfed?

1. _____ months (*put 0, if less than a month*)

2. Currently on breastfeeding

7) For how long the child received exclusive breastfeeding (*no water, other liquids or foods*)?

1. _____ months (*put 0 if less than a month*)

222. Currently on exclusive breastfeeding (*Go to Q.11*)

8) For how long the child received only breast milk (*including water and other not nutritious liquids*)?

1. _____ months (*put 0 if less than a month*)

222. Currently on predominant breastfeeding (*Go to Q.11*)

9) Now I would like to ask you about liquids, drank by the child yesterday during the day or at night.

(*Circle all that apply*)

1. Plain water?

2. Commercially produced infant formula?

3. Any other milk such as tinned, powdered, or fresh animal milk?

4. Narine?

5. Fruit juice?

6. Tea?

7. Any other liquids? (specify _____)

10) Now I would like to ask you about the food (*name of baby*) ate yesterday during the day or at night, either separately or combined with other foods.

(*Circle all that apply*)

1. Any infant formula (baby food) [CERELAC, HIPP, NAN, VINNY, NESTOGENE]

2. Any bread, rice, noodles, biscuits, cookies, or any other foods made from grains?

3. Any dark green, leafy vegetables like parsley, spinach, or coriander?

4. Any vegetables/ cucumbers, eggplant, onion, tomato, pumpkins, carrots, potatoes?

5. Any fruits/ apricot, apples, strawberry, bananas?

6. Any meat/ beef, pork, lamb, chicken, fish?

7. Any eggs?

8. Any foods made from beans, peas, or lentils?

9. Any cheese, yogurt or cottage cheese?

10. Any food made with oil, fat, or butter?

11. Any other food? (specify? _____)

Information on mother

11) How old were you when (*child's name*) was born _____

12) What is your weight and height? a) _____ kg b) _____ cm

13) What is your husband's weight and height? a) _____ kg b) _____ cm

14) Indicate the highest level of education that you have completed:

1. School (less than 10 years)
2. School (10 years)
3. Professional technical education (10-13 years)
4. Institute/University
5. Postgraduate

15) Are you currently employed?

(*Check all that apply*)

1. Yes
2. Yes, but on maternity/pregnancy leave
3. Student
4. No

16) Were you employed during pregnancy?

1. Yes (months _____)
2. No

17) Please indicate any health problem(s) that you had while being pregnant with this baby
(*Circle all that apply*)

1. Diabetes
2. High blood pressure
3. Heart disease
4. Lung disease (including asthma)
5. Stomac/intestine disease
6. Kidney problems
7. Problems with joints/bones
8. Pregnancy complications (specify _____)
9. Other problems (specify _____)
10. No problems

18) How many children do you have now?

_____ (number), (If 1, go to Q. 20)

19) How long ago did you have your last delivery before getting pregnant with this child?

_____ years (months) ago

Mother's knowledge on caring the child

READ: Now, I will ask you to express your opinion about several statements concerning child health. Please, tell whether you think each of these statements is true or false:

20) A baby does not need any other food, water or liquid but breast milk for the first six months of life.

1. True
2. False
3. Don't know

21) When a child has diarrhea, he/she should be given less liquids than usually.

1. True
2. False
3. Don't know

22) A small amount of alcohol (for example one-two glasses of beer or wine) during pregnancy will not negatively affect the fetus.

1. True
2. False
3. Don't know

23) Heavily dressing a child is a better way to prevent him from getting measles than vaccination.

1. True
2. False
3. Don't know

24) The more frequent a baby is breastfed; the more mother's milk is produced.

1. True
2. False
3. Don't know

25) Playing is not an important part of children's development - it's only a way for them to occupy their time

1. True

2. False
3. Don't know

26) At least three years of spacing between births is good for both mother's and newborn's health?

1. True
2. False
3. Don't know

Exposure to smoking

27) Have you ever smoked cigarettes?

1. Yes
2. No → *Go to Q.31*

28) How often did you smoke when pregnant with this child?

1. Never
2. Once a month or less
3. Several days a month
4. Several days a week
5. Every day

29) Do you currently smoke cigarettes?

1. Yes
2. No → *Go to Q.31*

30) How many cigarettes per day do you smoke? _____ cigarettes

31) How many of your household members currently smoke? _____

32) How often do people smoke in the same room where your child is present?

1. Every day
2. Several days a week
3. Several days a month
4. Once a month or less
5. Never

Household general information

33) What is the total number of people living in your household (including you)? _____

34) How many members of your household (including yourself) are currently employed?

Living standards

35) How would you rate your family's general standard of living?

1. Substantially below average
2. Little below average
3. Average
4. Little above average
5. Substantially above average

36) In average how much does your household spend during a month:

1. Less than 50,000 drams
2. From 50,000 - 100,000 drams
3. From 101,000 – 200,000 drams
4. From 201,000 – 300,000 drams
5. Above 301,000 drams
6. Don't know

Thank you!

End Time: _____

Questionnaire in Armenian

Հարցաշար

Պոլիկլինիկայի կոդը _____

Երեխայի կոդը _____

Ամսաթիվը (օր/ամիս /տարի) ____/____/____

Հարցազրույցը սկսելու ժամը _____:_____

Երեխայի մասին տեղեկություններ

1) Խնդրում եմ նշեք, թե վերջին անգամ (*երեխայի անունը*)-ն ո՞ր ամսին եք պոլիկլինիկա տարել: _____

2) Այդ այցի ընթացքում երեխան կշռվե՞լ է:

1. Այո _____ կգ
2. Ոչ

3) Այդ այցի ընթացքում երեխայի հասակը չափվե՞լ է:

1. Այո _____ սմ
2. Ոչ

4) Պոլիկլինիկա կատարած վերջին այցից առաջ 30 օրերի ընթացքում երեխան ունեցե՞լ է հետեյալ վիճակներից որեէ մեկը կամ մի քանիսը:

1. Փորլուծություն
2. Փսխում
3. Բարձր ջերմություն
4. Այլ _____

5) Արդյոք երեխան ունեցե՞լ է բնածին առողջական խնդիրներ:

1. Այո (հստակեցնել _____)
2. Ոչ

6) Որքա՞ն ժամանակ է երեխան կերակրվել կրծքով:

1. _____ ամիս (եթե մեկ ամսից պակաս է, գրել 0)
2. Մինչև հիմա կերակրվում է կրծքով

7) Որքա՞ն ժամանակ է երեխան կերակրվել միայն կրծքով (ոչ ջուր, ոչ մի այլ հեղուկ և սնունդ):

1. _____ ամիս (եթե մեկ ամսից պակաս է, գրել 0)
2. Մինչև հիմա կերակրվում է միայն կրծքով (անցնել Հ. 11-ին)

8) Որքա՞ն ժամանակ է երեխան կերակրվել միայն կրծքի կաթով (այդ թվում ջուր և ոչ սննդային այլ հեղուկներ):

1. _____ամիս (եթե մեկ ամսից պակաս է, գրել 0)

2. Մինչև հիմա կերակրվում է կրծքի կատով (այդ թվում ջուր և ոչ սննդային այլ հեղուկներ):

9) Այժմ կցանկանայի Ձեզ հարցնել անցյալ օրվա և գիշերվա ընթացքում երեխային տրված հեղուկների վերաբերյալ:

(Նշել բոլոր թվարկվածները)

1. Հասարակ ջուր

2. Արտադրված մանկական կեր

3. Որևէ այլ կաթ՝ պահածոյացված, փռշի, կենդանու թարմ

4. Նարինե

5. Մրգահյութ

6. Թեյ

7. Որևէ այլ հեղուկ

10) Այժմ կցանկանայի Ձեզ հարցնել անցյալ օրվա և գիշերվա ընթացքում երեխային առանձին կամ այլ ուտելիքի հետ համատեղ տրված սննդի վերաբերյալ:

(Նշել բոլոր թվարկվածները)

1. Երեխայի կեր [CERELAC, HIPPI, NAN, VINNY, NESTOGENE],

2. Հաց, լավաշ, բրինձ, մակարոնեղեն, թխվածք, խմորեղեն կամ ցորենից պատրաստված այլ մթերք,

3. Մուգ կանաչ, տերևախիտ բանջարեղեն, մաղադանոս, համեմ, սպանախ և այլ կանաչեղեն

4. Որևէ բանջարեղեն (վարունգ, բադրիջան, սոխ, լոլիկ, դդում, գազար, կարտոֆիլ)

5. Որևէ միրգ (ծիրան, խնձոր, ելակ, բանան, խաղող)

6. Որևէ մսամթերք (տավարի, խոզի, ոչխարի, հավ, ձուկ)

7. Ձու,

8. Ոլոռից, ոսպից կամ սիսեռից պատրաստված կերակուր,

9. Պանիր, մածուն/յոգուրտ կամ կաթնաշոռ

10. Ձեթով, կարագով կամ յուղով պատրաստված որևէ կերակուր,

11. Որևէ այլ կերակուր (հստակեցնել _____)

Մոր մասին տեղեկություններ

11) Քանի՞ տարեկան եք եղել երբ (երեխայի անունը) ծնվել է _____

12) Նշեք, խնդրեմ, Ձեր քաշը և հասակը _____ կգ _____ սմ

13) Նշեք, խնդրեմ, Ձեր ամուսնու քաշը և հասակը _____ կգ _____ սմ

14) Նշեք ամենաբարձր կրթությունը, որ Դուք ստացել եք:

1. Թերի միջնակարգ (դպրոց, 10 տարուց պակաս)

2. Միջնակարգ (դպրոց, 10 տարի)

3. Միջին մասնագիտական (ուսումնարան, 10-13 տարի)
4. Բարձրագույն (ինստիտուտ կամ համալսարան)
5. Հետդիպլոմային (մագիստրատուրա, ասպիրանտուրա, դոկտորանտուրա)

15) Դուք ներկայումս աշխատու՞մ եք:

1. Այո
2. Այո, բայց արձակուրդում եմ հղիության/երեխայի պատճառով
3. Ուսանող եմ
4. Ոչ

16) Իսկ հղիության ընթացքում աշխատե՞լ եք:

1. Այո (ամիսները _____)
2. Ոչ

17) Խնդրում եմ նշեք բոլոր այն առողջական խնդիրները որոնք ունեցել եք հղիության ընթացքում:

(Նշել բոլոր թվարկված տարբերակները)

1. Շաքարախտ
2. Արյան բարձր ճնշում
3. Սրտի հիվանդություն
4. Թոքերի հիվանդություն (ասթմա և այլն)
5. Ստամոքսի կամ աղիքների հիվանդություն
6. Երիկամների հիվանդություն
7. Հոդերի կամ ոսկրերի հիվանդություն
8. Հղիության բարդություններ (նշեք _____)
9. Այլ հիվանդություններ (նկարագրեք) _____
10. Ոչ մի հիվանդություն

18) Ներկայումս քանի՞ երեխա ունեք _____ (եթե 1 անցնել 20-րդ հարցին)

19) Նախքան (երեխայի անունը)ով հղիանալը որքա՞ն ժամանակ առաջ եք ունեցել Ձեր վեջին ծննդաբերությունը: _____ (ամիս, տարի)

Գիտելիքներ մանկան խնամքի մասին

ԿԱՐԴԱՅԵՔ. Հիմա խնդրում եմ, ասեք, Ձեր կարծիքով, ճի՞շտ են, թե՞ սխալ հետյալ պնդումները:

20) Կյանքի առաջին վեց ամիսների ընթացքում երեխան կարիք չունի որևէ այլ սննդի կամ հեղուկի՝ բացի կրծքի կաթից:

1. Ճիշտ է
2. Սխալ է
3. Չգիտեմ

21) Եթե երեխան փորլուծություն ունի, նրան պետք է տալ սովորականից ավելի քիչ հեղուկներ:

1. Ճիշտ է
2. Միսալ է
3. Չգիտեմ

22) Հղիության ժամանակ ակոնոլի փոքր քանակի (օրինակ՝ գարեջրի կամ գինու 1-2 բաժակի) ընդունումը չի վնասի պտղին:

1. Ճիշտ է
2. Միսալ է
3. Չգիտեմ

23) Երեխային տաք հագցնելն ավելի լավ է օգնում կարմրուկի դեմ, քան պատվաստելը:

1. Ճիշտ է
2. Միսալ է
3. Չգիտեմ

24) Որքան հաճախ է երեխան կուրծք ուտում, այնքան շատ կաթ է արտադրվում մոր կրծքում:

1. Ճիշտ է
2. Միսալ է
3. Չգիտեմ

25) Խաղը կարևոր չէ երեխայի համար, դա միայն նրան զբաղեցնելու միջոց է:

1. Ճիշտ է
2. Միսալ է
3. Չգիտեմ

26) Ծննդաբերությունների միջև առնվազն 3 տարվա ընդմիջման պահպանումը լավ է թե՛ մոր, թե՛ նորածնի առողջության համար:

1. Ճիշտ է
2. Միսալ է
3. Չգիտեմ

Ծխելու գործունին ենթարկված լինելը

27) Դուք երբևէ ծխե՞լ եք:

1. Այո
2. Ոչ (անցնել 31-րդ հարցին)

28) Որքա՞ն հաճախ եք ծխել հղիության ընթացքում:

1. Երբեք
2. Ամիսը մեկ կամ պակաս

3. Ամիսը մի քանի անգամ
4. Շաբաթը մի քանի անգամ
5. Ամեն օր

29) Դուք ծխում եք ներկայումս:

1. Այո
2. Ոչ (անցնել 31-րդ հարցին)

30) Քանի՞ գլանակ եք ծխում օրվա ընթացքում: _____ գլանակ

31). Ներկայումս Ձեր ընտանիքի անդամներից քանի՞սն են ծխում: _____ (եթե 0 անցնել 33-րդ հարցին)

32) Որքա՞ն հաճախ են Ձեր ընտանիքի անդամները ծխում երեխաների ներկայությամբ՝ նույն սենյակում:

1. Ամեն օր
2. Շաբաթը մի քանի անգամ
3. Ամիսը մի քանի անգամ
4. Ամիսը մեկ կամ պակաս
5. Երբեք

Ընդհանուր տեղեկություններ ընտանիքի մասին

33) Ինչքա՞ն է Ձեր տանը բնակվող անդամների թիվը (ներառյալ Դուք): _____

34) Ձեր ընտանիքի բոլոր անդամներից (ներառյալ Դուք) քանի՞սն են ներկայումս աշխատում: _____

Նյութական վիճակը

35) Ընդհանուր առմամբ, ինչպե՞ս կրնութե՞ք Ձեր ընտանիքի նյութական վիճակը:

1. Միջինից բավականին ցածր
2. Միջինից մի փոքր ցածր
3. Միջին
4. Միջինից մի փոքր բարձր
5. Միջինից բավականին բարձր

36) Միջինում որքա՞ն գումար է ծախսում Ձեր ընտանիքը մեկ ամսվա ընթացքում:

1. 50 000 դրամից քիչ
2. 50 000 – 100 000 դրամ
3. 101 000 – 200 000 դրամ
4. 201 000 – 300 000 դրամ
5. 301 000 դրամից շատ

6. Չգիտեմ

Շնորհակալություն:

Հարցազրույցի ավարտը _____:_____