

Influence of Demographic, Socioeconomic, and Family Factors on Morbidity in Children under Three Years of Age in Yerevan: A Case-Control Study

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Abstract

Introduction: A number of studies in different countries confirm the importance of demographic, socio-economic, and family factors in determining morbidity in children less than three years of age. However, the impact of such factors on the health status of children under three years of age could vary significantly in different countries and regions because of peculiarities in traditions of children upbringing and the demographic and economic situation in the countries. Further research is, therefore, needed to confirm these associations for children in Yerevan.

Objectives: This study identified the relationships between demographic, socioeconomic and family factors and the morbidity in children less than three years of age in Yerevan.

Design and methods: A case-control study was conducted among children born in 1999 in Yerevan and their mothers. Cases and controls were selected from children attending district polyclinics in Yerevan. Information regarding their morbidity was obtained from medical records, and information about demographic characteristics of the family, socioeconomic conditions and family lifestyle was obtained during interviews with their mothers. Sixty -four cases and 63 controls were studied. Simple logistic regression analysis was used to identify the association between each independent variable and outcome. Unconditional multivariate logistic regression models were used to control for potential confounders.

Results: The study showed a statistically significant association between frequency of illnesses in children under three years of age and such demographic and economic factors as mother's education and household monthly expenditure; a statistically significant association was also found between frequency of illnesses and the health behavior of a family, and mothering skills.

Recommendations: Pediatricians should be trained to differentiate families having children under three years of age based on demographic and family risk factors. Pediatricians in children's polyclinics

should be more attentive to children with demographic risk factors and family risk factors such as parents' risk behavior and poor mothering skills.

Introduction

Background: Morbidity remains highest among children under three years old (early childhood) all over the world (1). Improvement of health and well-being of children, particularly children in early childhood, is an important goal of health care systems, because early childhood is a period when the development of all functions of a child's body takes place, and because the health status of adults generally depends their childhood health status (1).

A large body of literature is available on the biological and medical risk factors for poor health in childhood. The findings of these studies confirm strong relationships between the health of children and such factors as infant characteristics, neonatal health problems, complications of pregnancy and childbirth, gestational age, and multiple gestations (1-5). Early childhood is a period of development and dependency. Children's health and well-being are dependent not only on biological and medical factors, but also, to a considerable extent, on their life within their families and how well the family is able to meet their developmental needs (3).

Family stress, and economic and social circumstances can adversely affect a child's physical, emotional, and social health (1, 3). The importance of families in determining children's health provides a strong argument for undertaking new investigations addressing family factors as an essential component of child health (3). Research on this topic has been conducted in many countries, including the United States (US), the United Kingdom (UK), and Russia. The researchers viewed the whole family as the patient, not just the child, and assessed parental problems and behaviors that could hurt children's health through interviews (1).

Literature review: The existing literature shows that among the socioeconomic and family factors which influence children's health status the most important are: family income and housing conditions, mother's education and social status, mothering skills, and family health risk behavior.

A significant correlation has been found between household income, housing conditions and children's morbidity. Families with high household income and good housing conditions are less likely to have children with frequent and severe diseases during the first years of life than families with low household income and poor housing conditions (6 - 11). Poor children are at higher risk of serious chronic health problems than children who belong to families with greater income (12).

Several researchers confirm that high maternal education has a positive impact on a child's physical development and increases the number of healthy children during the first year of life (1, 6, 9, 13, 14). Most probably, high parental educational level helps parents to better understand the importance of preventive health services and to appropriately carry out a treatment plan in case of children's illnesses, leading to lower morbidity in children and fewer complications during illnesses (3, 13).

Several studies indicate that the size and the structure of a family significantly influence children's health status. For example, children in families headed by a single parent (usually without father) were much more likely to be in poor or fair health than children in two-parent families (15, 16, 18). Compared with children in other households, a higher proportion of children in households with one adult consulted physicians for infections and accidents (16).

Mothering skills have a great impact on the health status of children in early childhood (17, 18). One of the first studies reporting that poor mothering skills could lead to poor child health was the Newcastle Thousand Families study 45 years ago (17). The study showed that children of mothers with "unsatisfactory" skills had significantly higher morbidity. Other studies showed that high mothering skills could even decrease the negative influence of low-income and poor housing conditions of a family, as well as the influence of artificial feeding (17, 19).

Significant relationships have been reported between the health status of children and harmful parental habits like smoking and alcohol abuse (8, 13, 18, 19, 20). Passive smoking is one of the main causes of poor health in children: children who live in households with adult smokers have higher rates

of certain respiratory conditions (13, 18, 19, 20). Alcohol abuse is another harmful parental habit, which has a negative impact on the physical status and health of children (8).

The impact of such factors as demographic, socioeconomic and family characteristics on the health status of children under three years of age could significantly vary in different countries and regions because of peculiarities and traditions of child up-bringing, demographic, economic and other factors in these countries (regions). According to the Ministry of Health of Armenia (MoH), the incidence rate of illnesses in children from 0 to 3 years of age in 2000 was 2385.2 per 1000 children. It is important, therefore, to investigate the relationship between demographic, socioeconomic, and family factors and morbidity in children during the first three years of their lives in Armenia in view of the high morbidity in children less than three years old in Armenia. The goal of improving of child health is more important currently in view of the decrease of birth rate in Armenia during the last decade (21), when the life of each baby presents a greater value.

Description of the study

Objective/ Hypotheses

The study of the impact of the above factors helps to guide the development of effective medical and social recommendations, directed to the improvement of the health status of children in their early years. Taking into consideration the fact that such investigations have not been conducted in Armenia and the fact that the magnitude of morbidity in children less than three years of age remains substantial in Armenia, the following study objective was defined: *to study the relationships between demographic, socioeconomic, and family factors, and morbidity in children under three years old.*

The hypotheses explored by the study were:

1. High demographic and socioeconomic condition of families in Yerevan will be positively associated with better child health.

2. Children in families with healthy behaviors in Yerevan will have lower rates of disease than children in families with unhealthy behavior.

Study design

A case-control study was conducted in order to meet the objective of the study. The case-control study is especially useful when there is a need to study several risk factors, and when a study must be done relatively quickly and inexpensively (22).

The investigation was conducted in two-stages. In the first stage, two groups of children born in 1999 and continuously living in Yerevan, were formed (66 cases and 66 controls). The following definition of “cases” and “controls” were used for the study:

cases: children with frequent illnesses (children with more than three illnesses per year during the first three years of life);

controls: healthy children (children with less than three illnesses per year during the first three years of life).

A retrospective study was undertaken to study the morbidity of the children during the first, second, and third years of life (data about morbidity from 1999 to 2002 were abstracted from medical records for each child).

In the second stage of the investigation interviews were conducted with the mothers of the children in both groups to get information about demographic characteristics of the family, socioeconomic conditions and family lifestyle.

Study Population

The target population of the study was selected based on the objective of the study: children born in 1999 and continuously living in Yerevan and their mothers. Eligibility criteria for the selection of the first target population (children) were the following:

- Being born in 1999 and continuously living in Yerevan
- Having complete medical documents

Eligibility criteria for the selection of the second target population (mothers) were the following:

- Being mothers of children born in 1999 and continuously living in Yerevan
- Being mothers of children involved in the first stage of the study.
- Willingness of mothers to participate in the study

These criteria mirror the target population defined for the study.

Sample Size and Sampling Methodology

The sample size for each group (case and control) was calculated according to the following equation:

$$n = \left[\frac{z_{\alpha} \sqrt{2p_1(1-p_1)} - z_{\beta} \sqrt{p_1(1-p_1) + p_2(1-p_2)}}{p_1 - p_2} \right]^2$$

where $p_1 = 59.9\% = 0.6$, $p_2 = 28.0\%$, $z_{\alpha} = 1.96$, $z_{\beta} = -1.645$. Therefore,

$$n = \left[\frac{1.96 \sqrt{2 \times 0.6 \times 0.4} - (-1.645) \sqrt{0.6 \times 0.4 + (0.28 \times 0.72)}}{0.6 - 0.28} \right]^2 = 59.29, \text{ or } 60$$

children in each group. This sample size did not include allowance for non-respondents. Taking into account the expected response rate of 90% (the response rate was determined during the pre-testing the questionnaire by the author), a sample size of 66 children in each group was required or 132 children altogether.

Multistage sampling technique was used for selection of the study participants. According to the Yerevan Department of Health Care there are eight children's polyclinics in Yerevan. Three polyclinics

located in different districts of the city were randomly selected from the list of these polyclinics.

Districts within each selected polyclinic were selected by convenience based on the availability of pediatricians from these districts at the time of the study. Cases and controls within each district were selected systematically while screening medical records for eligibility. Contact information for interviews with mothers was obtained from medical records including child's name and address.

The sample size for each of the three selected polyclinics was calculated according to the relative proportion of children born in 1999 in each polyclinic. Since 132 children had to be chosen from the total of 2,429 children, registered in these three polyclinics, the sample size was calculated separately for each polyclinic according to the following formula: $n = a_p * x$, where a_p is the total number of children in each polyclinic and $x = 132/2429 = 0.054$. There were 54 children ($1003 * 0.054$) from "Manuk", 43 children ($786 * 0.054$) from the polyclinic in Shengavit district, and 35 children ($640 * 0.054$) from the polyclinic in South-West district. Dividing them into groups, by applying foregoing definitions of cases and controls a total of 27 cases and 27 controls were enrolled from "Manuk" polyclinic in the central district of Yerevan, 22 cases and 21 controls from the polyclinic in Shengavit district, and 17 cases and 18 controls from the polyclinic in South-West district.

Data Collection and Study Instruments

Data collection started on August 17 and ended on September 15, 2003. The data were obtained from medical records in polyclinics, and personal interviews with mothers in their homes. In the first stage of the study data on the health of the children were collected from their medical records (histories of children's development and cards from maternal hospitals). "History of a child development" is a medical document for each child registered in a district polyclinic. The district pediatrician completes the "History of a child development" during each visit while the child is served by the district polyclinic (up to 14 years old) and includes information about child's development, morbidity, and preventive care. "Card from maternal home" is a medical document which the district polyclinic

receives from the maternity home after delivery and includes information about the course of the pregnancy, course of the delivery, time of the delivery, and newborn's health status at birth.

An abstract-form was used to extract information about morbidity of the children under three years of age from medical records (Appendix 1). The abstract-form consisted of three parts. The first part included questions about ante- and perinatal periods of the child's life, and initial data about the newborn including body mass, height, and health status. The second part included information about the child's preventive care (vaccination, periodic preventive check-ups). The third part included questions concerning the frequency of illnesses in each year of the child's life.

In the second stage of the study, an interviewer- administered questionnaire was used to collect information about family characteristics from mothers of children included in the study. The instrument was developed and adapted for use in Armenia by the student-investigator based on existing questionnaires used in previous surveys on similar topics (16,17). The instrument was pre-tested by the student-investigator (ten mothers were interviewed). After pre-testing some changes were made in the wording of the questions.

The interview took approximately 25-30 minutes to administer and consisted of five sections: socioeconomic and demographic characteristics of the family, characteristics of housing conditions, questions concerning parents' health habits, medical knowledge, and attitude towards the medical and preventive recommendations given by pediatricians. Interviews were conducted in Armenian, unless the respondent expressed a preference for Russian.

Ethical Considerations

Prior to study implementation the research proposal was submitted to the Student Project Institutional Review Board/Committee on Human Research within the College of Health Sciences of the American University of Armenia and approval obtained. The proposed study did not possess any risk for participants. Although the topic of the study was not sensitive, there were inconveniences

connected with the interview. In order to address this issue, an oral consent form was provided to participants prior to the interview. The consent form included a description of the nature of the study, the risk and benefits of participation in the study, and explained that participation was voluntary. A unique identifier on the cover page of the questionnaire ensured the anonymity of the participant, and the information provided. Assurance of confidentiality for the participant information and comprehensive explanation of the purpose of the study by the student-investigator, along with conducting interviews in a separate room where the respondent and interviewer were alone, created trust, an important factor for obtaining reliable and accurate data.

Study Variables and Data Analysis

Data were entered into a computer database and analyzed using SPSS 11.5 software. Double entry and subsequent cleaning were used in order to ensure the accuracy of the data entry. The variables that were explored in the study were the following:

The outcome (dependent variable) of the study was the morbidity level (binary: 1= children with frequent illnesses, 0 = healthy children). The covariates (independent variables) were: demographic variables (mother's age, family size, number of children in a family, mother's marital status, mother's education, mother's social status); socioeconomic variables (housing conditions of a family, household monthly expenditure); family variables divided into 4 groups: (psychological characteristics of the family, health behavior of the family, mothering skills, parents' medical activity (use of medical services). Taking into account the findings of related studies (1, 2, 5) the following factors were considered intervening variables of the study: complications during pregnancies, course of the pregnancy, course of delivery, time of delivery, child's health status at birth, child's health status in neonatal period, duration of breastfeeding and birth weight.

Descriptive analysis was used to determine characteristics of cases and controls. Simple logistic regression analysis was used to identify the association between each independent variable and

outcome. Unconditional multivariate logistic regression models were used to control for potential confounders.

Results

The data are presented according to the main areas of interest in the abstract-form, in the questionnaire, and the research questions of the study.

I. Descriptive results.

Initially, 132 children and their mothers were targeted to participate in the study. The total number of records reviewed was 132, but 5 mothers refused to participate in the survey. Altogether 127 children and their mothers were included into the study; the overall response rate was 96%. Thus, the final sample consisted of 64 children and their mothers in the case group and 63 children and their mothers in the control group. Both groups were comparable in regard to demographic characteristics such as child's age, gender, and place of residence because all studied children were born in 1999 in Yerevan and matched by gender. The other variables were not matched.

The majority of all mothers (87.4%) were in the age group from 20 to 34 years old: 87.5% among cases and 85.7% among controls (Table 1). The majority of all mothers were housewives/unemployed or employees: among cases 57.8% were housewives/unemployed and 26.6% were employees, among controls 41.3% were housewives/unemployed and 36.5% were employees. Only 17.1% of mothers in cases and almost 53.9% mothers in controls had high education (Table 1). The majority of mothers in cases and controls were married (85.9% in cases and 93.7% in controls) (Table 1). The distribution of families who had 1, and 2 and more children among cases and controls were the following: among cases-56.3% families had 1 child, and 43.7% -2 and more children, among controls- 47.6% and 52.4% correspondingly (Table 1). The majority of families had good or satisfactory housing conditions: 81.3% among cases and 90.5% among controls (Table 1). Of surveyed

families, about 67.2% among cases and 30.2% among controls had household monthly expenditure less than \$100 (Table 1).

II. Hypotheses testing.

Results for unconditional logistic regression with different variables and corresponding 95% Confidence Intervals (CI) as well as the total number of responses for each item are summarized in the Tables 1- 4. According to the results of simple unconditional logistic regression, statistically significant association was found between morbidity levels in children under 3 years of age and such intervening variables as duration of breastfeeding and presence of diseases in neonatal period. Mothers who breastfed their children up to 7-12 months had one-fourth the risk of frequent illnesses in their children as compared to mothers who breastfed children up to 2 months (OR =3.6; 95% CI 1.0-12.4) (Table 2). Presence of diseases in neonatal period increases the risk of having frequent illnesses during the first three years of life OR=3.1; 95%CI 1.3-7.8) (Table 2).

The results of simple unconditional logistic regression also demonstrated a statistically significant association between the outcome and some independent variables.

Demographic variables

A statistically significant association between the outcome and mother's education was observed. The analysis of the relationship between the outcome and mother's education revealed that mothers with secondary education were 8 times more likely to have a child with frequent illnesses than mothers with high education (OR= 7.9; 95% CI 3.0-20.8). There was no statistically significant effect of mother's age at the moment of child's birth, mother's social status, mother's marital status, family size, and number of children in a family on the frequency of illnesses in the children under three years of age (Table 1).

Socio-economic variables

After estimating the odds of morbidity level as a function of socio-economic study variables, families with low economic status (household monthly expenditure less than \$100) were 5 times (OR= 4.7; 95% CI 2.2-10.0) more likely to have a child with poor health than families with high economic status (household monthly expenditure \$100 and >) (Table 1). There was no statistically significant effect of housing conditions on the frequency of illnesses in the children under three years of age (Table 1).

Family factors

Psychological characteristics of a family

Statistically non-significant association was obtained for psychological characteristics of the families and the morbidity in the children (Table 3).

Health behavior of a family

The separate analysis of the relationship between morbidity level in children and health habits of their parents revealed that families with heavy smokers had 10 times greater risk of having a child with poor health as compared with families where no members smoking (OR = 10.1; 95%CI 3.3-30.8) (Table 3). Families smoking in rooms in the presence of a child were approximately 10 times more likely to have child with poor health than those who did not smoke in the presence of a child (OR= 9.8; 95% CI 2.7-34.8). Mothers assessing the lifestyle of their families as unhealthy were 16 times more likely to have a child with high morbidity as compared with those who assessed the lifestyle of their family as healthy (OR=15.6; 95% CI 4.0- 60.3) (Table 3). There were no statistically significant associations found between morbidity in children and such factors characterizing health behavior of a family as doing physical exercises, applying to a doctor in any case of a disease, time of applying to a doctor in case of a disease, following recommendations and prescriptions of a doctor, visiting doctors for preventive care (Table 3).

Mothering skills

Simple logistic regression analysis revealed that families having occasionally their children in fresh air were more than 2 times more likely to have children with high morbidity as compared with families having their children in fresh air regularly (OR = 2.4; 95% CI 1.2-4.9); mothers doing occasional physical exercise with their children were 9 times more likely to have a child with poor health in comparison with mothers who do regular physical exercises (OR = 8.8; 95% CI 4.0 - 19.7) (Table 4). Non-significant results were obtained for following child's sleeping regimen (Table 4). The data were insufficient to obtain interpretable results from logistic regression for doing procedures strengthening the immunity of a child's body (Table 4). Such results were related to the small sample size and the absence of a sufficient number of responses for this variable.

Parents' medical activity (use of medical services)

The separate analysis investigating the relationship between the morbidity level in children and the parents' medical activity revealed that irregularly visiting the pediatric polyclinic for preventive care increased approximately 6 times the risk of having a child with poor health (OR = 5.6; 95% CI 2.3-13.7); not going to a pediatrician in case of child's illness increased the risk of having child with frequent illnesses 3.5 times (OR=3.5; 95% CI 1.6-7.8)(Table 4). No statistically significant association was observed for time of going to pediatrician in case of child's illness (Table 4).

Multiple logistic regression was used to find the adjusted odds ratios. All the statistically significant variables were included in different multiple logistic regression models. Possible interactions between different statistically significant risk factors were examined. No associations were revealed. Models were tested by Log Likelihood Ratio test to determine the best fitting model. The characteristics of different tested models are summarized in the Table 5.

Forward stepwise logistic regression procedure in SPSS was used to identify the best fitting model, the testing of variables was based on likelihood ratio test. The best fitting model included

variables of regular physical exercise with a child, visiting polyclinic regularly at the time mentioned by pediatrician, not smoking in the presence of a child, duration of breastfeeding, household monthly expenditure, and mother's education. The model was tested with goodness-of-fit test to compare with saturated model. There was no significant difference between selected model and saturated model (Hosmer-Lemeshov chi-square = 5.903; Prob>chi-square = 0.658), which supported the assumption that the model was the best fitting model. According to the model, mothers with secondary education were 5 times more likely to have a child with frequent illnesses than mothers with high education after controlling for other variables (OR= 5.2; 95% CI 1.1-25.3). Families with low economic status (household monthly expenditure less than \$100) had 6 times greater risk of having a child with poor health as compared with families with higher economical status (household monthly expenditure \$100 and >)(OR = 5.7; 95% CI 1.5-21.2). Families smoking in rooms in the presence of a child were 8 times more likely to have a child with poor health than those who did not smoke in the presence of a child after adjusting for other variables (OR= 7.6; 95% CI 1.4-41.9). Doing occasionally physical exercise with a child increased the risk of having a child with poor health 4 times in comparison with doing regular physical exercise (OR= 4.1; 95% CI 1.2-13.9). Mothers irregularly visiting the pediatric polyclinic for preventive care were 14 times more likely to have a child with poor health as compared with mothers visiting pediatric polyclinic regularly (OR = 14.0; 95% CI 3.0-65.8). Mothers who breastfeed their children up to 2 months increased 18 times the risk of frequent illnesses in their children as compared to mothers who breastfed children up to 7-12 months (OR =18.0; CI 3.2-65.126).

Discussion

At the beginning of the study it was hypothesized that high demographic and socioeconomic conditions and family factors are positively associated with morbidity of children under 3 years old in Yerevan. The results of this study showed statistically significant association between child's health and such demographic factor as mother's education. It was found that higher education in mothers had

a protective effect on children's health. The results are consistent with observations of previous studies investigating the relationship between frequency of illnesses in children under three years of age and mother's education and showing that children of mothers with higher education are less likely to have frequent illnesses in comparison with families where mothers have secondary education (1, 9, 13, 14, 18).

The results of the study indicated that high economic status of a family is a protective factor against poor health status of children under 3 years old. The risk of having children with frequent illnesses is 6 times higher for families with household monthly expenditure less than \$100 compared to families with household monthly expenditure \$100 and more. The result is consistent with the previous studies speculating that low economic status of a family is a significant risk factor for the frequent illnesses in children under three years old (6-8, 10-12, 14).

There was a statistically significant association between the morbidity in children under three years old and such family factors as smoking in the presence of a child and doing exercises with a child. Not smoking in rooms in the presence of a child decreased 8 times the risk of high morbidity in children as compared with smoking in the presence of a child. There was a statistically significant association between doing physical exercises with a child and frequency of illnesses in children. It can not be concluded that only doing physical exercises with a child occasionally causes the high morbidity in children, because frequent illnesses in children by themselves could not allow the mothers to do physical exercises with them. The results are consistent with the related studies speculating that smoking in the presence of a child and poor mothering skills are significant risk factors for the frequent illnesses in children under three years old (1, 8, 9, 13, 17). This study could not confirm some of the results of two of the mentioned studies, (13,17) which showed that other mothering skills (doing procedures for strengthening the immunity of child's body, having a child in fresh air every day, following child's sleeping regimen) also have strong protective effect on child's health. However, differences in the study design may have contributed to the different study results.

A statistically significant association was found between morbidity level in children under 3 years old and duration of breastfeeding. Longer duration of breastfeeding was associated with better health in children. These results confirm the results of previous studies showing the protective effect of breastfeeding and its duration on the morbidity in children (1, 3, 18, 19).

One of the most interesting findings of the study is the absence of statistically significant association between the morbidity in children under three years of age and such demographic and socioeconomic factors, as mother's age at the moment of child's birth, family size, number of children in a family, housing conditions. These findings are not consistent with the related studies which indicated strong association between the morbidity in children and the mentioned factors (6, 11, 13, 15). This study also could not confirm the results of previous studies that speculated that there was a statistically significant association between morbidity in children and such family factors as psychological characteristics of a family (3, 18), and medical activity of a family (behavior in a case of child's illness, time of applying to a doctor in a case of child's illness, following recommendations and prescription given by pediatrician) (3, 9). Probably, it can be explained by some specific characteristics of Armenian families and/or the difference in study design, data collection methods, and controlling for different factors.

The main purpose of this research was to study the relationships between demographic, socioeconomic, and family factors and morbidity in children under three years old in Yerevan. This objective was accomplished. However, the need for a more specific targeted survey, which would go more in depth and analyze topics defined in the current study, should be considered.

Limitations of the study

Several limitations of the study should be considered when interpreting the results of the study.

- Recall bias was a possible threat for some questions
- Data regarding some variables were not available for some of the study participants.
- Because of the absence of a sufficient number of responses for different response categories, it was not possible to get interpretable results for some of the variables.
- Other possible confounders not adjusted for during the current study may influence the observed associations.

Recommendations

Based on the results of the study findings, the following recommendations are made:

1. Pediatricians should be trained to differentiate families having children under three years of age based on their demographic and family risk characteristics. Pediatricians in children's polyclinics should be more attentive toward children with demographic and family risk factors. To identify these risk factors, mother's education, health behavior of a family must be included in history of child's development questions.
2. More attention should be paid to questions related to parents' education. Training of mothers, directed to the improvement of mothering skills and parents' health behavior, should be one of the most important components of preventive care in children's polyclinics.

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Table 1. Unadjusted Odds Ratios and 95% Confidence Intervals for Demographic Variables.

Description of variables	Number (%) of		Unadjusted OR(95% CI)
	Cases	Controls	
Mother's age at the moment of child' s birth			
<19 years old (reference)	3 (4.7)	4 (6.3)	1.00
20-34 years old	56 (87.5)	54 (85.7)	2.383 (0.296 - 6.469)
> 35 years old	5 (7.8)	5 (8.0)	1.333 (0.191 - 9.311)
Mother's social status			
Employee (reference)	17 (26.6)	23 (36.5)	1.00
Student	10 (15.6)	14 (22.2)	0.966(0.347-2.695)
Housewife/Unemployed	37 (57.8)	26 (41.3)	1.925 (0.863-4.297)
Mother's marital status			
Married (reference)	55 (85.9)	59 (93.7)	1.00
Single/Divorced	9 (14.1)	4 (6.3)	2.413(0.703-8.285)
Mother's education			
School (8-10)	28 (43.5)	11 (17.5)	7.868(2.971-20.837)**
College	25 (39.1)	18 (28.6)	2.293 (1.727 - 10.672)**
Institution/ University (reference)	11 (17.1)	34 (53.9)	1.00
Family size			
Small family (2-3 people)	13(20.3)	11 (17.5)	1.418 (0.494-4.075)
Middle (4-5 people)	36 (56.3)	34 (54.0)	1.271 (0.554-2.914)
Large family (6 and >) (reference)	15 (23.4)	18 (28.5)	1.00
Number of children in the family			
1 (reference)	36 (56.3)	30 (47.6)	1.00
2 and >	28 (43.7)	33 (52.4)	0.707 (0.352-1.422)
Housing conditions			
Good/ Satisfactory (reference)	52 (81.3)	57 (90.5)	1.00
Unsatisfactory	12 (18.7)	6 (9.5)	2.192 (0.767-6.261)
Household monthly expenditure			
Less than \$100	43 (67.2)	19 (30.2)	4.742(2.241-10.033)**
\$100 and > (reference)	21 (32.8)	44 (69.8)	1.00

Significance level: *P<.05; **P<.005.

Table 2. Unadjusted Odds Ratios and 95% Confidence Intervals for Maternal Factors Variables.

Description of variables	Number (%) of		Unadjusted OR(95% CI)
	Cases	Controls	
Complications ever had during previous pregnancies			
Presence of complications	16 (25.0)	12 (19.0)	1.417 (0.608-3.301)
Absence of all complications (reference)	48 (75.0)	51(81.0)	1.00
Course of the present pregnancy			
Without complications (reference)	35 (54.7)	43 (68.3)	1.00
With complications	29 (45.3)	20 (31.7)	1.781 (0.864-3.673)
Time of the present delivery			
Delivery at term (reference)	63 (98.4)	62 (98.4)	N/A
Premature birth	0 (0)	0 (0)	
Overmature birth	1 (1.6)	1 (1.6)	
Course of the present delivery			
Easy delivery (reference)	40 (62.5)	47 (74.6)	1.00
Delivery with complications	24 (37.5)	16 (25.4)	1.762(0.824-3.769)
Child's health status at birth			
Healthy (reference)	44 (68.8)	50 (79.4)	1.00
Unhealthy	20 (31.2)	13 (20.6)	1.748 (0.780-3.919)
Presence of diseases in neonatal period			
Absence of diseases (reference)	44 (68.8)	55 (87.3)	1.00
Presence of diseases	20 (31.2)	8 (12.7)	3.125 (1.257-7.769)*
Duration of breastfeeding			
0-2 months	9 (14.1)	5 (8.0)	3.600(1.043-12.423)*
3-4 months	13 (20.2)	12 (19.0)	2.167(0.816-5.756)
5-6 months	25 (39.1)	12 (19.0)	4.167(1.691-10.264)**
7-12 months (reference)	17 (26.6)	34 (54.0)	1.00
Newborn's weight at birth			
2,500-3.999 (reference)	57 (89.1)	60 (95.2)	1.00
< 2500 and >= 4,000	7 (10.9)	3 (4.8)	2.455 (0.605-9.957)

Significance level: *P<.05; **P<.005.

Table 3. Unadjusted Odds Ratios and 95% Confidence Intervals for Behavioral Variables-I.

Description of variables	Number (%) of		Unadjusted OR(95% CI)
	Cases	Controls	
Interpersonal relations in a family			
Good (reference)	20 (31.3)	28 (44.4)	1.00
Satisfactory	38 (59.4)	31 (49.2)	1.621(0.770-3.377)
Unsatisfactory	6 (9.4)	4 (6.4)	8.400 (0.937-5.311)
Presence of a child during quarrels			
Yes (reference)			
No	25 (39.1)	16 (25.4)	1.00
	39 (60.9)	47 (74.6)	0.531 (0.249-1.133)
Doing physical exercises			
Regularly/Occasionally (reference)	31(48.8)	37 (58.7)	1.00
Not at all	33 (51.6)	26 (41.3)	1.515 (0.751-3.055)
Assessment of lifestyle of a family			
Healthy (reference)	3(4.7)	27(42.9)	1.00
Unhealthy	26 (406)	15 (23.8)	15.600 (4.038-60.267)**
D/N	35 (54.7)	21 (33.3)	2.820(0.693-11.477)
Applying to a doctor in any case of a disease			
In any case of disease (reference)	13(20.3)	11 (17.5)	1.00
When consider it necessary	38 (59.4)	46 (73.0)	0.699(0.281-1.738)
In case of absolute necessity	13 (20.3)	6 (9.5)	1.833 (0.521-6.443)
Do not apply	0	0	
Time of applying to a doctor in case of a disease			
Immediately (reference)	20 (31.3)	27(42.9)	1.00
When diseases does not allow to continue the work	44 (68.7)	36 (57.1)	1.537 (0.740-3.194)
Do not apply	0	0	
Following recommendations and prescriptions of doctors			
Almost always (reference)	26 (40.6)	29 (46.0)	1.00
When consider it necessary	38 (59.4)	34 (54.0)	0.751 (0.368-1.532)
As a rule, do not follow	0	0	
Visiting doctors for preventive care			
Yes (reference)	1 (1.6)	6 (9.5)	1.00
No	63 (98.4)	57 (90.5)	6.628 (0.775-56.712)
Smoking			
Nobody of family members smokes (reference)	9 (14.1)	27 (42.9)	1.00
Some of the family members smoke	22 (34.4)	33 (52.8)	1.497(0.626-3.582)
Some of the family members are heavy smokers	33 (51.5)	3 (4.3)	10.069 (3.297-30.752)**
Smoking in the presence of a child			
Yes	21(32.8)	3 (15.9)	9.754 (2.737-34.766)**
No (reference)	43 (67.2)	60 (84.1)	1.00

Significance level: *P<.05; **P<.005.

Table 4. Unadjusted Odds Ratios and 95% Confidence Intervals for Behavioral Variables-II.

Description of variables	Number (%) of		Unadjusted OR(95% CI)
	Cases	Controls	
Smoking during pregnancy			
Yes (reference)	4(6.3)	1(1.6)	1.00
No	60 (93.7)	62 (98.4)	0.248 (0.027-2.242)
Use of alcohol during pregnancy			
Yes (reference)	5 (7.8)	3 (4.8)	1.00
No	59 (92.2)	60 (95.2)	0.500 (0.044-5.658)
Having a child in fresh air every day			
Regularly (reference)	28 (43.8)	41(65.1)	1.00
Occasionally	36 (56.2)	22 (34.9)	2.396 (1.171-4.901)**
Following child's sleeping regimen			
Yes (reference)	58 (90.6)	62 (98.4)	1.00
No	6 (9.4)	1 (1.6)	6.410 (0.090)
Doing physical exercises with a child			
Regularly (reference)	17 (26.6)	48 (76.2)	1.00
Occasionally	47 (73.4)	15 (23.8)	8.847 (3.966-19.737)**
Not at all	0	0	
Doing procedures for strengthening immunity of child's body			N/A
Regularly /Occasionally(reference)	0 (0)	16 (26.2)	
Not at all	64 (100)	45 (73.8)	
Visiting policlinic regularly at the time mentioned by pediatrician			
Yes (reference)	8 (12.5)	28 (44.4)	1.00
No	56 (87.5)	35 (55.6)	5.600 (2.295-13.664)**
Behavior in a case of child's illness			
Treatment without applying to a pediatrician	29 (45.3)	12 (19.0)	3.521(1.585-7.826)**
Applying to pediatrician (reference)	35 (54.7)	51 (81.0)	1.00
Time of applying to pediatrician in a case of child illness			
1-st day of the illness (reference)	54 (84.4)	55 (87.3)	1.00
After 2-3 and > days	10 (15.6)	8 (12.7)	1.273(0.467-3.470)

Significance level: *P<.05; **P<.005.

Table 5. Results of Log Likelihood Ratio Test for Alternate Multiple Logistic Regression Models.

	Description of variables	OR	CI	Log Likelihood test
Model 1	Doing physical exercise with a child Regularly (reference) Occasionally	8.847	(3.966-19.737)**	-
Model 2	Doing physical exercise with a child Regularly (reference) Occasionally Visiting polyclinic regularly at the time mentioned by pediatrician Yes (reference) No	8.503 5.259	(3.631-19.913)** (1.929-14.337)**	Chi-square 12.822 p= 0.001 (compared with Model 1)
Model 3	Doing physical exercise with a child Regularly (reference) Occasionally Visiting polyclinic regularly at the time mentioned by pediatrician Yes (reference) No Smoking in the presence of a child Yes (reference) No	7.741 7.048 11.398	(3.136-19.109)** (2.229-22.282)** (2.544-51.065)**	Chi-square 13.919 p= 0.000 (compared with Model 2)
Model 4	Doing physical exercise with a child Regularly (reference) Occasionally Visiting polyclinic regularly at the time mentioned by pediatrician Yes (reference) No Smoking in the presence of a child Yes (reference) No Duration of breastfeeding 0-2 months 3-4 months 5-6 months 7-12 months (reference)	10.171 5.629 9.076 5.887 4.508 7.455	(3.579-28.905)** (1.719-18.433)** (2.198-37.477)** (1.201-28.852)* (1.050-19.354)* (2.150-25.857)**	Chi-square 13.221 p= 0.004 (compared with Model 3)
Model 5	Doing physical exercise with a child Regularly (reference) Occasionally Visiting polyclinic regularly at the time mentioned by pediatrician Yes (reference) No Smoking in the presence of a child Yes (reference) No Duration of breastfeeding 0-2 months 3-4 months 5-6 months 7-12 months (reference) Household monthly expenditure Less than \$100 \$100 and more (reference)	7.529 8.247 7.134 11.702 5.550 12.771 6.890	(2.482-22.537)** (2.195-30.988)** (1.550-32.839)* (2.067-26.020)** (1.153-26.711)* (2.989-54.567)** (2.032-23.367)**	Chi-square 11.206 p= 0.002 (compared with Model 4)

Significance level: *P<.05; **P<.005.

Model 6	Doing physical exercise with a child			Chi-square 8.603
	Regularly (reference)			p= 0.001
	Occasionally	4.144	(1.232-13.936)*	(compared with Model 5)
	Visiting polyclinic regularly at the time mentioned by pediatrician			
	Yes (reference)			
	No	13.987	(2.973-65.800)**	
	Smoking in the presence of a child			
	Yes (reference)			
	No	7.623	(1.389-41.835)*	
	Duration of breastfeeding			
	0-2 months	17.939	(3.221-65.126)**	
	3-4 months	6.606	(1.215-35.925)*	
	5-6 months	13.939	(3.818-74.286)**	
	7-12 months (reference)			
	Household monthly expenditure			
	Less than \$100	5.668	(1.518-21.164)*	
	\$100 and more (reference)			
	Mother's education			
	School (8-10)	5.212	(1.073-25.307)*	
	College	4.908	(1.713-23.517)*	
	Institution/University (reference)			

Significance level: *P<.05; **P<.005.

Appendix 1

American University of Armenia
College of Health Sciences
Master of Public Health Program

Investigation of the potential risk factors associated with the development of atopic dermatitis.

Abstract-form for the study of health status of children under 3 years old

ID # _____

Date of data abstracting (day/month/year) ____ ____ ____

1? Birth date ____/____/____/ (dd/mm/yy)

2? Gender: M (1), F (2)

3? Mother's age to the moment of child's birth: 15-19 years old (1), 20-24 years old (2), 25-29 years old (3), 30-34 years old (4), 35-39 years old (5), 40-44 years old (6), 45-49 years old (7), 50 and > (8)

4? Mother's social status: employee (1), workman (2), student (3), housewife (4), unemployed (5), pensioner (6), other (7) _____

5? Housing conditions: satisfactory (1), unsatisfactory (2)

6? Number of children in the family: 1 (1), 2 (2), 3 (3), 4 and > (4)

7? Complications ever had during pregnancies: presence of: miscarriages (1), induced abortions (2), preterm deliveries (3), stillbirths (4), births of children with anomalies of development (5), neonatal deaths (6), absence of all of the above mentioned (7)

8? Number of the present pregnancy: 1 (1), 2 (2), 3 (3), 4 (4), 5 and > (5)

9? Course of the present pregnancy: without complications (1), with complications: with toxicosis in the first half of pregnancy (2), with toxicosis in the second half of pregnancy (3), with the threatened abortion (4), with anemia (5), with bleeding (6), with vaginal infection (7), other complications (8) _____

10? Number of the present delivery: 1 (1), 2 (2), 3 (3), 4 (4), 5 and > (5)

11? Time of the present delivery: delivery at term (1), premature birth (2) _____ months, overmature birth (3) _____ months

20. Morbidity

32

Appendix 2
American University of Armenia
College of Health Sciences
Master of Public Health Program

Questionnaire
for the investigation of demographic, socio-economic and family risk factors associated with
frequent illnesses in children under 3 years old

ID Number _____

Date of interview (day/ month/year) _____

Socio-Demographic data about family

1. Family size:
 - small family (2-3 people) 1
 - middle (4-5 people) 2
 - large family (6 and >) 3

2. Number of children in family: 1 (1), 2 (2), 3 and >(3)

3. Mother's marital status:
 - married 1
 - single 2
 - divorced 3
 - widowed 4

4. Mother's education
 - school up to 8 –th grade 1
 - school (8-10) 2
 - college 3
 - institution/ university 4

5. Mother's social status:
 - employee 1
 - workman 2
 - student 3
 - housewife 4
 - unemployed 5
 - pensioner 6

Data about the financial status and housing conditions

6. How do you assess your housing conditions (taking into account the toilet facilities: day sighting, ventilation, humidity of the air, public utilities, etc.)?
- good 1
 - satisfactory 2
 - unsatisfactory 3
7. On average how much money does your household spend monthly?
- less than \$ 50 (<25,000 AMD) 1
 - \$ 50 -99 (25,000-50,000 AMD) 2
 - \$ 100-299 (51,000-150,000 AMD) 3
 - \$ 300 and above (>150,000 AMD) 4
 - do not know 5

Psychological characteristics of a family

8. How do you assess the interpersonal relations in your family?
- good (united family) 1
 - satisfactory (infrequent quarrels, lack of attention to each other) 2
 - unsatisfactory (disunited family, frequent quarrels) 3
 - do not know 4
9. Is your baby present during the quarrels in the family?
- yes 1
 - no 2

Health behavior of a family

10. Do you do physical exercises?
- yes, regularly 1
 - occasionally 2
 - no 3
11. Do you consider physical exercises necessary for health?
- yes 1
 - no 2
 - do not know 3
12. Do you consider the lifestyle of your family healthy?
- yes 1
 - no 2
 - do not know 3

13. Does your family apply to a doctor in any case of a disease?
- yes applies, in any case of disease 1
 - applies when consider it necessary 2
 - as a rule applies in cases of absolute necessity 3
 - does not apply 4
14. When do you apply to a doctor in case of a disease?
- immediately 1
 - in a case when the disease does not allow to continue the work 2
 - do not apply, treat by ourselves 3
15. Do family members follow recommendations and prescriptions of doctors?
- follow almost always 1
 - follow when consider it necessary 2
 - as a rule, do not follow 3
16. Do family members visit doctors for preventive care?
- yes 1
 - no 2
17. Do family members smoke?
- nobody of the family members smoke 1
 - some of the family members smoke 2
 - some of the family members are heavy smokers 3
18. Do family members smoke in rooms in the presence of the child?
- yes 1
 - no 2
19. Did you smoke during the pregnancy?
- yes, number of cigarettes per day_____ 1
 - no 2
20. Did you use strong drinks during the pregnancy?
- yes 1
 - no 2

21. If yes, how often?
- once a day 1
 - once a week 2
 - once a month 3
 - do not know 4

Mothering skills

22. Was the child 2-3 hours on fresh wind every day?
- yes, regularly 1
 - occasionally 2
 - no 3

23. Did you follow the child's regimen of sleep and wake?
- yes 1
 - no 2

24. Did you do with your child
- 24.1 physical exercises
- yes, regularly 1
 - occasionally 2
 - no 3
- 24.2. procedures for strengthening his immunity
- yes, regularly 1
 - occasionally 2
 - no 3

25. If not, then why?
- you did not know that it was necessary 1
 - you did not consider it necessary 2
 - you did not know how to do it 3
 - because of the lack of time 4
 - do not know 5

26. In you opinion, do you have sufficient level of knowledge about child care, regimen, nutrition, and prevention of child diseases?
- yes 1
 - no 2
 - do not know 3

27. From what kind of sources did you get information about child care, regimen, nutrition, and prevention of child diseases?
- from relatives, friends 1
 - from newspapers, radio, TV, magazines 2
 - from discussions with doctors and nurses 3
 - from special medical literature 4
 - from other sources _____ 5

Parents' medical activity

28. Did you visit polyclinic regularly at the time mentioned by pediatrician?

- yes 1
- no 2

29. If not, then why?

- you thought that the child developed normally 1
- the child was often ill 2
- you was afraid of infecting the child in the polyclinic 3
- the polyclinic is situated far from you home 4
- because of lack of time 5
- because of unfriendliness of the personnel in the polyclinic 6
- other reason _____ 7

30. In a case of child's illness what was your behavior, if you did not consider that he had severe disease?

- you tried to treat him by yourself without applying to a pediatrician 1
- you applied to pediatrician 2
- you took advices from relatives and friends 3

31. In a case of child's illness

- you applied to pediatrician at the first day of the illness 1
- you applied to pediatrician after 2-3 and > days 2

32. If you marked off the second point of the question 41, then why?

- you thought that you could cope with the disease by yourself 1
- you did not know that the child was ill 2
- you decided to wait a little and took advices from relatives and friends 3

33. Did you follow recommendations and prescriptions given by pediatrician?

- yes, you followed them always and completely 1
- you followed them partially 2
- no, you didn't 3

34. If you marked off the 2-nd or 3-rd points of the question 42, then why?

- you did not consider it necessary 1
- you always followed your own opinion, and using home remedies 2
- you did not consider them convincing, distrusting pediatrician 3
- because lack of time 4
- you could not afford to buy medicines 5
- other reason 6

Appendix 3
American University of Armenia
Department of Public Health

Institutional Review Board/Committee on Human Research

CONSENT FORM TEMPLATE

Title of Research Project: **Influence of demographic, socioeconomic and family factors on morbidity in children under 3 years old in Yerevan**

CHR#

Explanation of Research Project: I am a Master of Public Health student at the AUA. As a part of my course requirement, I am conducting a research project. The purpose of the research project is to understand more about the risk factors for frequent illnesses in children under 3 years old. Children born in 1999 in Yerevan and their mothers will be eligible to participate in the research project. The study protocol includes abstracting information about children illnesses from medical records and the conduction of interview with mothers using questionnaire. The interview will last 20-25 minutes. You have right to ask questions and stop the interview any time you want. We appreciate your participation in this study. The information given by you will be very useful and valuable for this research.

Risks/ Discomforts: There is no special risk involved in being a participant. Investigator has tried not to include sensitive questions in the questionnaire.

Benefits: You and your child will not directly benefit from the participation in this survey. However, it is expected that other children will benefit from the knowledge gained from the study.

Confidentiality: Although this study will collect specific identifiers such as names, telephone numbers, and addresses to manage sample design and collecting data, Interviews will be conducted anonymously without recording any identifying information such as your name, address, or telephone number. This information will be held in a special form strictly separated from the questionnaires. There will be no identifiers on the questionnaires. Once data collection will be done the form with names, telephone numbers and addresses will be destroyed. Your individual responses will only be accessible by the study investigators. After the data will be transferred to the computer files original papers will be kept in a secure area and stored for 3-years. After that time, they will be destroyed. Summary information and grouped responses that do not permit the identification of individuals will be submitted to the Public Health Department of the American University of Armenia and, possibly, can be published in professional journals.

Voluntariness: Your participation in this study is completely voluntary. It is your decision whether or not to participate in the study. You have the right to stop providing information at any time you wish or skip any question you consider inappropriate. Your refusal to participate in the study will not affect the health care your child receives.

Whom to contact: If you have any questions or want to talk to anyone about this research study you may call the person in charge of the study

Yelena Amirkhanyan at phone number: (3741) 512568 and Michael Thompson at phone number: (3741) 512592

