

**PREVALENCE OF THYROID GLAND ENLARGEMENT AMONG 18-  
20 YEAR OLD FEMALE UNIVERSITY AND COLLEGE STUDENTS IN  
YEREVAN, ARMENIA: SCREENING SURVEY**

**Master of Public Health Thesis Project Utilizing Professional Publication Framework**

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## Abstract

**Background:** Iodine Deficiency Disorder (IDD) is a significant public health problem in over 130 countries. In the information bulletin of International Council for Control of IDD (ICCIDD), Armenia is represented as a country with high IDD prevalence. The prevalence of endemic goitre (thyroid gland enlargement), the Total Goitre Rate, is accepted by WHO/ICCIDD as a basic indicator for IDD expressivity.

**Objectives:** Screening of women age 18-20 provides an opportunity to establish the iodine status of a group who are particularly vulnerable. The present study assessed the prevalence of thyroid gland enlargement (TGE) among 18-20 year old female students in Yerevan, and identified the risk factors that contribute to the development of TGE (goitre).

**Methods:** A multistage cluster technique was used to enroll 97 university and college students in a cross-sectional survey. Assessment tools included an interviewer-administered survey and thyroid palpation. Pearson  $\chi^2$  test of association, simple and multiple logistic regressions were applied for the analysis of the associations between variables.

**Results:** The prevalence of TGE among 18-20 year old female students in Yerevan was 21.6%. The odds of TGE were over 13 times higher in students with a family history (FH) of TGE compared to those without a FH of TGE, after adjusting for household monthly expenditure and type of salt used. After adjusting for FH of TGE and type of salt used, the odds of TGE were over 4 times reduced in individuals with high socio-economic status as compared to those with low socio-economic status.

**Recommendations:** A more specific targeted survey for women with a FH of TGE, should be considered. It was recommended to conduct a Knowledge-Attitude-Practice survey in reproductive age women and medical personnel regarding IDD and endemic goitre for further development and conduction of education programs. Salt iodization and effective monitoring of iodine nutrition were recommended as the preferred strategy to control and eliminate IDD.

# 1. Introduction

## *General background*

Iodine Deficiency Disorder (IDD) is a significant public health problem in over 130 countries, affecting a total of 740 million people [1]. Globally, 2.2 billion people (38% of the world's population) live in areas with iodine deficiency and risk its complications [2]. Iodine deficiency is the single most common cause of preventable mental retardation and brain damage in the world [1]. It also decreases child survival, causes goitres, and impairs growth and development. While remarkable measurable progress is being made through universal salt iodization programs, there are nearly 50 million people estimated to still be affected by some degree of IDD-related brain damage [1]. Iodine deficiency, through its effects on the developing brain, has condemned millions of people to a life of few prospects and continued physiological and mental underdevelopment. The mental deficiency has an immediate effect on children's learning capacity, women's health, quality of life of communities, and economic productivity [2].

Iodine deficiency is the world's leading preventable cause of mental retardation, with over one-third of the global population at risk due to a lack of naturally available iodine in the soil [3]. IDD occurs when people do not receive the minimal amount of required iodine in their diets on a regular basis. Iodine shortages are especially damaging for pregnant women and their children, resulting in miscarriages, stillbirths or neonatal deaths [2]. During pregnancy, even milder deficiencies can impair fetal development and result in physical and mental retardation. Other effects of IDD include goitre, abnormal physical development, reproductive loss, and severe mental and physical retardation, an irreversible condition known as cretinism [2]. On the other hand, IDD is among the easiest and least expensive of all disorders to prevent [2]. The addition of a minute, constant amount of iodine to the salt that people consume in their food every day is all that is needed. The elimination of IDD is a

critical development issue, and should be given the highest priority by governments and international agencies [3]. Effective and affordable technology exists to prevent iodine deficiency and the problems it causes. The most important are iodized salt and effective monitoring of iodine nutrition.

In 1994, the World Health Organization (WHO) produced a document in collaboration with UNICEF (United Nations International Children's Fund) and ICCIDD (International Council for Control of Iodine Deficiency Disorders) entitled "Indicators for assessing IDD and their control through salt iodization" to provide guidance concerning the use of surveillance indicators for IDD. The prevalence of endemic goitre, the Total Goitre Rate (TGR) is accepted by WHO/ICCIDD as a basic indicator for IDD expressivity [2].

Endemic goitre is a disease for which the main symptom is the progressive enlargement of the thyroid gland. This gland is situated at the front of the throat, below the Adam's apple (larynx) [4]. The thyroid gland secretes hormones to regulate many metabolic processes, including growth and energy expenditure. The thyroid gland is controlled by the pituitary gland, which is located in the brain. The pituitary prompts the thyroid to make its hormones - including thyroxine (T4) and tri-iodothyronine (T3) - by releasing thyroid-stimulating hormone (TSH) [4]. However, the thyroid cannot manufacture its hormones without sufficient dietary iodine. If a person's diet is low in iodine, the pituitary keeps sending chemical messages to the thyroid, but in vain. The thyroid gland enlarges as it attempts to comply with the pituitary's demands.

The most important cause of endemic goitre is iodine deficiency in foodstuff due to its insufficiency in the soil and water [2,3]. Other risk factors for development of goitre are family history (a susceptibility to thyroid gland enlargement can be inherited), diet, gender (women are more susceptible than men), and high doses of radiation [4]. High prevalence of

endemic goitre (in excess of 10%) is a sufficient argument to intervene in the situation and start processing of salt iodization [2,5,6].

### ***Situational analysis for Armenia***

Located in the southern Caucasus, Armenia, being a mountainous country landlocked from the ocean (the only natural source of iodine), has iodine deficiency in soil and water. In the information bulletin of ICCIDD, Armenia is represented as a country with high IDD prevalence [7]. Research on endemic goitre prevalence in Armenia has been conducted since 1946. An anti-goitre committee was founded at the Ministry of Health (MOH) of the Republic of Armenia (RA) under the guidance of professor A. A. Melik-Adamyan. Broad investigations, were carried out throughout the republic during 1956-1960 with inclusion of 20% of the population [8]. Thyroid gland enlargement to various degrees was revealed in 25% of the examinees. Three cases of cretinism were reported [8]. The results of investigations conducted by the anti-goitre committee revealed that TGR is of endemic character and that there are marked zones of endemism in Armenia ( Appendix 1).

As a result of the Soviet Union break down Armenia suffered from economic deterioration in the 1990s. This caused interruption of many prophylactic programs, including iodine supplementation through iodized salt and by other means. The deficit of iodine in foodstuff, consumed by the population of Armenia and called forth by its geographical position, was compensated in the former Soviet times by importing iodized salt into the country [8]. After the collapse of the Soviet system, during the period of 1992-1995 access of iodized salt was limited due to a number of objective social-economic factors. Meanwhile, non-iodized salt was imported in Armenia from other countries, particularly from Iran and Ukraine, resulting in wide consumption of non-iodized salt by the population. This situation led to increased IDD as a result of chronic deficit of the required continuous amount

of iodine in the diet. Presumably, the increase in the number of patients suffering from IDD observed by the Republican Center of Endocrinology during 1993 was caused by the changes in iodized salt distribution [8]. In regions where the supply of iodine is at its lowest point, any factor increasing the need for iodine may cause goitre [9]. Development of goitre is often determined by Vitamin A deficiency; high consumption of certain foods that neutralize iodine, such as cabbage, broccoli and cauliflower; marked consumption of fat; bad sanitary conditions; infections; and other factors hindering the absorption of iodine or increasing the need for iodine [10].

According to UNICEF survey (1998) carried out with Republican Endocrinology Center of Armenia, goitre was common in women, particularly in the southern regions of Armenia, where more than 40% of the women were positive upon thyroid palpation [11]. The goitre rate in pregnant women (32%) was not different from that of the general population [11]. This figure classifies Armenia in the “severe” prevalence category.

According to the “Armenia Demographic and Health Survey 2000” most (84%) Armenian households have adequately iodized salt [12]. This is an exciting change since 1998, when the figure was 70% [11]. There is, however, considerable variation by region, ranging from a high of 95% of households in Ararat and Armavir *marzes* to 59% of households in Tavush *marz*. This variation in iodine content is greater than expected given that there is only one salt plant in Armenia and the plant is reported to iodize salt and routinely check for adequate iodization [12]. Thus, the continued consumption of cheap and widely available non-iodized salt by the population deepens the problem of iodine deficiency.

Although universal salt iodization is currently carried out mainly at the initiative of the country's single salt producer, detailed salt quality control and monitoring of the impact of salt iodization are requisite [12]. As a consequence of the absence of legislation for reinforcement of mandatory salt iodization and exclusive sales of iodized salt to the

population, the problem of iodine insufficiency in the republic remains to be a priority requiring governmental intervention and urgent solution. Several recently published investigations showed a significant improvement in the iodine supply to the Armenian population [12,13]. However, Armenia is still considered an iodine deficient country [7].

Although statistics concerning goitre prevalence in Armenia are limited and often approximated, possibly one of the major problems related to its prevalence are the complications in the reproductive health of women influenced by the high rate of thyroid dysfunction [8]. As was noted earlier, iodine shortages are especially damaging for pregnant women and their children, resulting in miscarriages, stillbirths or neonatal deaths [3,14]. To avoid possible complications in women's reproductive health, thyroid dysfunction, especially goitre, should be monitored. Thus, early diagnosis and treatment of thyroid gland enlargement may prevent the future consequences in women's reproductive health.

All the abovementioned factors prove that women aged 18-20 and their future children are most vulnerable to these disorders, and are an ideal target for a screening program. Screening in women age 18-20 provides an opportunity to establish the iodine status of a group that is particularly vulnerable because of the susceptibility of the future-developing fetus to iodine deficiency [15,16]. Thus, the goal of this survey was the assessment of thyroid gland enlargement (goitre) among female students aged 18-20 in Yerevan in order to prevent future problems/complications in their reproductive health such as infertility and/or complications during pregnancy due to thyroid dysfunction, and to identify the contributing risk factors that are responsible for the development of goitre.

### ***Objectives of the study***

The present study assessed the prevalence of thyroid gland enlargement (goitre) among 18-20 year old female college and university students in Yerevan and identified contributing risk factors.

#### **The main research questions were the following:**

- What is the prevalence of thyroid gland enlargement (goitre) among 18-20 year old female students in Yerevan?
- What are the risk factors of thyroid gland enlargement (goitre) among female students, age 18-20, in Yerevan?

#### **The following hypotheses were planned to be tested in this study:**

- Use of iodized salt is protective against thyroid gland enlargement (goitre)
- Having family history of thyroid gland enlargement is associated with development of goitre
- The probability of thyroid gland enlargement varies with household monthly expenditure (as a proxy of socio-economic status)
- Thyroid gland enlargement depends on place of permanent residence (endemic zone vs. non-endemic zone)

## **2. Methods and Materials**

### ***Study design***

The cross-sectional survey, a method which is appropriate for looking at the relationships between variables at a single point in time, was used. This method allows the systematic collection of data on the topic under consideration while focusing on a single group representative of the population of interest [17]. Thus, a cross-sectional study design was selected to estimate the prevalence of thyroid gland enlargement (goitre) among 18-20 year old female students in Yerevan, and to reveal possible risk factors of goitre in this population. However, during cross-sectional survey, it was impossible to determine time-cause relationship for each risk factor connected with the outcome.

The study surveyed university- and college-based students through personal interviews using a questionnaire, and inspection/palpation of each participant's thyroid gland.

The cross-sectional quantitative study design was chosen to systematically collect data and generate statistics that would provide an assessment of the need for IDD-related educational programs in the whole population. These data will be used by decision-makers and public health professionals in Armenia to design and implement such programs.

### ***Study population***

The target population of the study included females aged 18-20 from different *marzes* of Armenia currently studying at state and private universities and colleges of Yerevan. As it was impossible to interview all female students who meet the criteria, a sample of the target population was chosen. Eligibility criteria for the selection of study participants were the following:

- Females (college and university students) aged 18 to 20
- Residency in Armenia

- Willingness to participate in the study

Females below the age of 18 and over the age of 20, females who were not students, pregnant women, as well as those declining to participate, were ineligible for the survey. Pregnant women were excluded because thyroid gland enlargement can appear during pregnancy due to physiological hormonal changes and disappear after pregnancy.

### ***Sample size and sampling methodology***

Calculation of the sample size was based on the estimates given by previous population surveys to obtain the expected estimate of the prevalence of thyroid gland enlargement (goitre) among 18-20 year old female students in Yerevan. There was no available information on thyroid gland enlargement prevalence among 18-20 year old females in Yerevan. But, based on previous population survey and literature data, the assumption was made that it was about 30% in reproductive age (15-45 year old) women [11].

In calculating the sample size, the following methodology was used:

For 95% confidence interval (CI) type I error will be  $\alpha = 0.05$ , so  $Z\alpha = 1.96$  (two-sided test).

Thus, the sample size of the study was determined using the following formula:

$$n = Z\alpha^2 \times p \times q / d^2 ,$$

where  $p = 0.3$  (30%),  $q = 0.7$  (70%), and  $d$  was a tolerable error [17].

To obtain a reasonable sample size for feasibility of this survey, we assumed that  $d = 10\%$ , so:

$$n = 1.96^2 \times 0.3 \times 0.7 / 0.1^2 = 81$$

A probability proportional to size multistage cluster sampling technique was used to select the respondents. This process gives every potential respondent an equal probability of being included in the sample while allowing for an efficient enumeration process [17]. The

abovementioned formula for sample size calculation is acceptable for simple random sampling or other unbiased sampling strategies. However, in case of cluster sampling technique, it is possible to have homogeneity within a cluster (individuals within a cluster are more likely to be similar than individuals among different clusters), which can produce design effect and increase sampling error [17]. To offset this bias, considering the design effect of the cluster sampling technique, the sample size was increased by 20%. Thus, sample size was:

$$n = 81 + 81 \times 0.2 = 97$$

According to the National Statistics Service of the Republic of Armenia, there were 66 state- and non-state (private) universities and colleges in Yerevan [18]. The list of 66 universities and colleges was compiled and tabulated in an ordered manner. Each cluster size was 6 (except one which was 7). A cluster size of 6 effectively minimizes heterogeneity bias. Thus, the number of clusters was  $97 / 6 = 16$ . The multistage sampling included the following steps: random selection of 16 universities and colleges from the 66 and the convenience sampling of female students, age 18-20, within the selected university or college. In the first stage a list of the 66 universities and colleges was randomly rearranged and the first 16 from the new list were chosen. Informants within each selected university or college were selected by convenience based on their availability at the time of the survey and their willingness to participate.

### ***Study instruments***

A questionnaire that takes approximately 10-15 minutes to administer was used for the purpose of the present study. The investigator developed the instrument based on previous surveys on the topic [11,13]. It was adapted for use in the universities and colleges, and to the specific objectives of the project. Considering the specific issues involved in the

study, it was more reasonable to use face-to-face interviews for further inspection and palpation of females' thyroid gland. The questionnaire was subject to expert peer-review and several iterations of pre-testing in its Armenian, Russian, and English formats. The questions were translated into Armenian and back into English. Thus, the questionnaire was pre-tested and revised before the implementation of the study.

The final interviewer-administered questionnaire consisted of 31 questions and included information regarding student's sociodemographics, health and dietary habits, family history of thyroid gland enlargement (goitre), symptoms of goitre, reproductive health complications, risk-perception questions, etc. (Appendix 2).

Due to time limitations, analyses of reproductive health complications were considered beyond the scope of this project and were not addresses. A subset of the data, necessary to answer the research questions was used for this report.

In 1994, WHO/ICCIDD recommended replacing the WHO 1960 four-grade goitre classification with a simplified two-grade system, as stages 0;1;2 [19]. Presence of palpable and visible thyroid was assessed according to the simplified WHO criteria as stage 0 ( no palpable or visible goitre), stage1(a mass in the neck that is consistent with an enlarged thyroid that is palpable but not visible when the neck is in the neutral position; it also moves upward in the neck as the subject swallows), or stage 2 (a swelling in the neck that is visible when the neck is in a neutral position and is consistent with an enlarged thyroid when the neck is palpated) [2,19].

### ***Implementation phase***

Data collection started on May 5, 2003 and ended on May 16, 2003. This quantitative study was conducted through personal interview, and physical assessment focusing on inspection and palpation of each females' thyroid gland. The investigator/endocrinologist

conducted the interviews and assessed thyroid size within the 16 selected universities and colleges. All interviews were conducted in separate rooms where the respondent and interviewer were alone during the interview. Interviews were conducted in Armenian unless the respondent expressed a preference for Russian. The interviews took place in the medical cabinet, which was available in every university or college. Direct anthropometric measurement procedures of height and weight were standardized using guidelines published by WHO [20].

Validity and reliability of the method (palpation of thyroid gland) was checked by having another endocrinologist independently palpate a random sample of students (16 students). The percent agreement with the researcher's palpation was 88 per cent. A percent agreement greater than 75 per cent represents excellent agreement [21].

### ***Ethical considerations***

The Institutional Review Board/Committee on Human Research within the College of Health Sciences of the American University of Armenia approved this study. The study possessed minimal risk for participants, as the probability and extent of anticipated harm and discomfort were equal and not greater than that of routine physical and psychological examinations or tests performed in ordinary daily life.

Although the topic of the survey was not sensitive, there were some inconveniences related to the interview. The thyroid gland palpation could create some minor discomfort and thus result in unwillingness to participate in the study. In order to address these issues, an oral consent form was provided to each participant prior to the interview (Appendix 3). The consent included a description of the nature of the research, the risks 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. The expressed confidentiality for the participant information, along with the comprehensive explanation of the purpose of the study by the investigator created trust, an important factor for obtaining reliable and accurate data.

### ***Data analysis***

Data were entered into a computer database and analyzed using STATA 7.0 and SPSS 11.0 software. Double entry and subsequent cleaning were used to ensure the accuracy of the data entry. The statistical analysis estimated the prevalence of thyroid gland enlargement (goitre) among 18-20 year old female students in Yerevan. The outcome (dependent variable) of the study was thyroid gland enlargement (binary: 1 = present, 0 = absent). The covariates (independent variables) were: type of salt used (iodized vs. non-iodized); family history of thyroid gland enlargement (1 = yes, 0 = no); household monthly expenditure as a proxy of socio-economic status (< \$100/month = low SES; > \$100/month = high SES); and place of residence (endemic zone vs. non-endemic zone). The explanatory variables, used in these analyses, included some of the established risk factors for thyroid gland enlargement (goitre) that have been found in previous studies [4,8,11,13].

Pearson  $\chi^2$  test of association was used to identify the association between each independent variable and outcome. In order to assess associations between multiple independent variables and one dependent variable it was necessary to provide multivariable regression analysis [22]. For studying factors affecting thyroid gland enlargement prevalence and answering the question concerning factors predicting the occurrence of the thyroid gland enlargement a logistic regression model was appropriate (due to binary outcome). Simple and multiple logistic regressions were used to analyze and interpret of the associations between dependent and independent variables.

### 3. Results

The data are presented according to main areas of interest/sections in the questionnaire and research questions of the study.

#### *Administrative/General*

Initially, 97 female students were targeted for participation in the survey. Overall, 105 students were contacted for this study, since there were certain cases of non-response, the primary reason for which being the unwillingness of 5 students to participate in the survey, as well as the fact that three of the respondents did not meet the selection criteria. The overall response rate was  $97/102 = 95\%$ . Thus, the final sample consisted of 97 female students aged 18-20, from different *marzes* of Armenia, currently studying in Yerevan.

#### *Descriptive statistics*

The mean age of the respondents was 19.4 years. About 87% of the respondent students were single, 9% were married, and 4% divorced. About 40% had household monthly expenditure of less than \$100 and about 60% more than \$100. Thirty three percent had a family history (FH) of goitre, and about 37% used salt without iodine. The students were residents of different *marzes* of Armenia: 65% were from Yerevan, 35% from 9 other *marzes* of Armenia. As mentioned earlier, there are marked zones of endemism of IDD in Armenia [8]. Out of 97 female students 18.6% were from endemic zones, and 81.4% from non-endemic zones. A complete description of the socio-demographic and geographic characteristics of the students can be found in Table 1.

**Table 1. Characteristics of Study Participants**

Characteristic		Number (n)	Percent (%)
Age	18	10	10,3
	19	41	42,3
	20	46	47,4
	Total	97	100.0
Marital Status	Single	84	86,6
	Married	9	9,3
	Divorced	4	4,1
	Total	97	100,0
Place of residence	Endemic	18	18.6
	Non-endemic	79	81.4
	Total	97	100.0
Monthly expenditure	<\$ 100	37	39.4
	>\$ 100	57	60.6
	Total	94	100.0
Family history of TGE	Yes	32	33.0
	No	65	67.0
	Total	97	100.0
Type of salt used	Iodized	61	62.9
	Non-iodized	36	37.1
	Total	97	100.0

***Prevalence of Thyroid Gland Enlargement (TGE)***

The survey results showed that the prevalence of thyroid gland enlargement (TGE) among 18-20 year old female students in Yerevan was 21.6%.

***Associations between independent variables and outcome (TGE)***

The study demonstrated that there was a statistically significant association between TGE and type of salt used (iodized vs. non-iodized), defined through Pearson  $\chi^2$  test of association (Table 2). Thus, TGE was observed in 33% of students who did not use iodized salt as compared with 15% of individuals using iodized salt (Pearson  $\chi^2$  (1) = 4.6071 Pr = 0.042).

**Table 2. Associations Between Independent Variables and Outcome (TGE)  
(Pearson  $\chi^2$  test of association)**

<b>Independent Predictor Variable</b>		<b>No TGE n= 76 n(%)</b>	<b>TGE n= 21 n(%)</b>	<b>Pearson chi2 (p-value)</b>
Type of salt used	iodized n=61	52(85.3)	9(14.8)	4.61 (0.042)
	non-iodized n=36	24(66.7)	12(33.3)	
Family history of TGE	Yes n=32	16(50.0)	16(50.0)	22.63 (0.000)
	No n=65	60(92.3)	5(7.8)	
Household monthly expenditure	<\$100 n=37	24(64.9)	13(35.1)	5.76 (0.016)
	>\$100 n=57	49(86.0)	8(14.0)	
Place of residence	endemic n=18	11(61.1)	7(38.9)	3.87 (0.062)
	non-endemic n=79	65(82.3)	14(17.7)	

After estimating the odds of TGE as a function of the type of salt used through simple logistic regression analysis, it was found that students who did not use iodized salt were 2.9 times more likely to have TGE when compared with those who used iodized salt (OR = 2.9;  $p < 0.05$ , 95% CI: 1.07-7.78) (Table 3).

Pearson  $\chi^2$  test of association between TGE and family history (FH) of TGE showed a statistically significant difference: TGE was present in 50% of students with FH of TGE as compared with 8% of students without FH of TGE (Pearson chi2 (1) = 22.6277 Pr = 0.000) (Table 2).

After estimating the odds of TGE as a function of FH of TGE through simple logistic regression, the analysis found statistically significant relationship between FH of TGE and

TGE. The odds of TGE was estimated to be 12 times higher among students with FH of TGE as compared to those without FH (OR = 12,  $p < 0.05$ , 95% CI: 3.8, 37.7) (Table 3).

**Table 3. Associations Between TGE and Independent Predictor Variables (Simple logistic regression)**

<b>Independent Predictor Variable</b>	<b>OR* (95%CI)</b>	<b>p-value</b>
Type of salt used	2.9 (1.07-7.78)	0.036
Family history of TGE	12 (3.82-37.73)	0.000
Household monthly expenditure	3.3 (1.21-9.08)	0.020
Place of residence	2.9 (0.97-8.96)	0.056

\* OR – unadjusted odds of TGE

The study also revealed a statistically significant association between TGE and household monthly expenditure (as a proxy of socio-economic status) of students (Table 2). TGE was observed in 35% of students with low socio-economic status (household monthly expenditure < \$100) as compared with 14% of individuals with high socio-economic status (> \$100), Pearson  $\chi^2(1) = 5.7574$  Pr = 0.016.

After estimating the odds of TGE as a function of household monthly expenditure through simple logistic regression, analysis found that a student with low socio-economic status was 3.3 times more likely to have TGE as compared with one with high socio-economic status (OR = 3.32,  $p < 0.05$ , 95% CI: 1.21-9.08) (Table 3).

The risk for TGE among students from endemic zones was 2.9 times higher than among those who had non-endemic place of residence. Note that the statistical significance was marginal, and the interval contained the value 1 (OR = 2.9,  $p = 0.056$ , 95% CI: 0.97-8.96);

therefore, the sample of female students does not provide evidence that the probability of developing TGE is different depending on the place of residence of a student (Table 3).

By examining the sign of an explanatory variable's parameter estimate, it is possible to determine the effect of that variable on the probability of a TGE. A positive parameter estimate indicated that the independent variable increased the probability of TGE, assuming that other variables in the model were held constant. Besides the positive or negative effect of the explanatory variable on the TGE, it was also very important to determine whether the effect was statistically significant. Both the t-test statistics and the odds ratio determined the statistical significance for that variable. When the t value of a variable was greater than 1.96, based on 95% confidence interval, one could conclude that the variable had a statistically significant effect on the TGE.

After investigating the odds of TGE in relation to two variables through multiple logistic regression, the results showed that only two variables, family history of TGE and household monthly expenditure, were statistically significant. Thus, a model could have these two variables, but it is necessary to justify the selection of the choice of the other combination of variables. The evidence of confounding was observed in the relationship between type of salt used and TGE. Controlling for potential confounding of household monthly expenditure, the odds ratio of type of salt used was changed. The correlation coefficient of these two covariates, defined through Pearson chi<sup>2</sup> was equal to 9.9, with p-value = 0.002. Since, household monthly expenditure is associated both with type of salt used and TGE, this is a confounder in the relationship between these two variables. The analyses did not revealed any statistically significant interactions between all covariates.

After obtaining the multiple logistic regression of weight on all four predictor variables, the logistic regression model estimates were determined. Due to positive

parameter estimates, type of salt used; family history of TGE; household monthly expenditure; and place of residency all contributed to a higher probability of TGE (Table 4).

**Table 4. Independent Variables and Summary Statistics (Multiple logistic regression)**

TGE	OR* (95% CI)	p-value
Type of salt used	1.4 (0.42 - 4.94)	0.569
Family history of TGE	13.2 (3.67 - 47.68)	0.000
Household monthly expenditure	4.1 (1.11 - 15.19)	0.035
Place of residence	1.2 (0.27 - 5.28)	0.810

\* OR – adjusted odds of TGE

By fitting the model, study found that the odds of TGE were over 13 times higher in students with FH of TGE compared to those without FH of TGE (95% CI: 3.67, 47.68 does not contain the value 1, and  $p = 0.000$ ) after adjusting for place of residence, household monthly expenditure, and type of salt used. Based on the model, controlling for all variables, the odds of TGE increased more than 4 times in individuals with low socio-economic status as compared to those with high socio-economic status (95% CI: 1.1 - 15.2;  $p = 0.035$ ). Although two covariates (place of residence and type of used salt) were not statistically significant, they appeared to be associated with TGE and may be easier to record and measure than the variable of FH of TGE and household monthly expenditure. Thus, the evidences in these data were insufficient to conclude that place of residence and type of salt used have an independent effect on TGE beyond that of remaining variables.

After obtaining the multiple logistic regression of weight on two, three, and four variables, the best model was determined (Table 5), which was a good fit for the present data.

The choice of the model was supported by the Hosmer-Lemeshow goodness-of-fit test by dividing the predicted probabilities into 8 roughly equal groups for calculation of the chi-square comparing observed and expected events across the groups [22]. Small p-values indicate poor fit, i.e., poor agreement between observed and expected counts. In our particular case  $\text{Prob} > \chi^2 = 0.62$ , which indicated a good fit for the present data, and agreement between observed and expected counts. This finding was confirmed by the likelihood-ratio test.

**Table 5. Multiple Logistic Regression Model of Weight on Three Variables (The best model)**

TGE	OR (95% CI)	p - value
Household monthly expenditure	4.3 (1.19 - 15.3)	0.026
Type of salt used	1.5 (0.44 - 4.9)	0.529
Family history of TGE	13.6 (3.8 - 48.4)	0.000
Hosmer-Lemeshow	Prob > $\chi^2 = 0.6186$	
Likelihood-ratio test	Prob > $\chi^2 = 0.8106$	

The best model had odds of TGE over 13 times higher in individuals with FH of TGE compared to those without FH of TGE (95% CI: 3.8 - 48.4 does not contain the value 1, and  $p = 0.000$ ), after adjusting for household monthly expenditure and type of salt used. There was a statistically significant relationship between TGE and FH of TGE after adjusting for household monthly expenditure and type of salt used. Thus, the students with FH of TGE were at higher risk of TGE compared to those without FH of TGE, controlling for household monthly expenditure and type of salt used.

Based on the best model, after adjusting for FH of TGE and type of salt used, the individuals with high socio-economic status were at lower risk of TGE compared to those

with low socio-economic status (OR = 4.3, 95% CI: 1.19 - 15.3, which does not contain the value 1, and  $p = 0.012$ ). Thus, there was a statistically significant relationship between TGE and household monthly expenditure.

Although the findings of the study show that the type of salt used was not statistically significant, there may be practical significance associated with it. The existing literature shows that use of iodized salt is protective against thyroid gland enlargement (goitre), and there is a tendency towards goitre reduction with consumption of iodized salt [23,24].

#### **4. Discussion**

One of the objectives of the study was to assess the prevalence of thyroid gland enlargement (goitre) among 18-20 year old female students in Yerevan. As mentioned in the “Results” section, the proportion of 18-20 year old female students in Yerevan with TGE reached 0.22. The prevalence of TGE found in this study (21.6%) can be compared to previous studies that reported a prevalence of goitre of approximately 30% in reproductive age women [8,11,13].

At the beginning of the study the researcher hypothesized that having a family history of thyroid gland enlargement is associated with development of goitre. It was interesting to observe that out of the total number of surveyed students, 33% had a family history of goitre (Table 2). This study showed a statistically significant association between family history of TGE and TGE, which is consistent with evidence from the literature. Students with a family history of goitre were significantly more likely to have a TGE, than students without a family history of goitre (OR= 13.6). This finding persisted after adjustment for other variables. The majority of the studies have proved that family history of TGE is an important factor determining the development of goitre, and predicting TGE [25,26].

One of the most interesting findings of the study was the statistically significant association revealed between the household monthly expenditure of the students (as a proxy of socio-economic status) and TGE. Analyses displayed that the lower the monthly expenditure, the higher the odds of TGE. Thus, belonging to a low-income category multiplies the odds of TGE by 4.3, after adjusting for FH of TGE and type of salt used. Nevertheless, it is difficult to interpret these results. One possible explanation can be that students who belonged to low-income category consumed the non-iodized salt, which is cheaper than the “Extra” iodized one. The researcher has not come across such an association in other studies. It could be explained by some specific characteristics of Armenian families, especially in rural regions, where the use of cheap and imported foodstuffs is preferred.

As was mentioned earlier, endemic goitre is among the easiest and cheapest of all disorders to prevent [2]. The addition of a minute, constant amount of iodine to the salt that people consume in their everyday food is all that is needed. At the beginning of the study, the researcher addressed the hypothesis that usage of iodized salt is protective of goitre. As was stated in the “Results” section, the findings indicate a statistically significant association between TGE among 18-20 year old female students and type of salt used (iodized vs. non-iodized). Thus, TGE was observed in 33% of students who did not use iodized salt as compared with 15% of individuals using iodized salt (Table 2). The students not using iodized salt were 2.9 times more likely to have TGE as compared with those who used iodized salt (Table 3). These results support the study hypothesis and confirm that the use of iodized salt is protective of goitre. These findings agree with those found in the literature. The results from other investigations on this topic suggest that iodized salt is an effective means of improving iodine status [23]. There is a tendency towards goitre reduction with iodized salt. However, evidence of confounding was observed in the relationship between

type of salt used and TGE. Controlling for potential confounding of household monthly expenditure, the odds ratio of type of salt used was changed. Since household monthly expenditure is associated both with type of salt used and TGE, it is a confounder in the relationship between these two variables. Moreover, after obtaining the multiple logistic regression of weight on three covariates (best model), it was revealed that type of salt used was not statistically significant. Hence, the evidence in these data was insufficient to conclude that type of salt had an independent effect on TGE beyond that of remaining variables. To explain this result, it is worth mentioning that the measurement of type of salt consumed was not perfect. Possibly, the study participants did not remember the type of salt they used or they reported the type of salt they were using at the time of study. Iodized salt consumption is effective in case of long-term use. Although the type of salt used was not statistically significant, for practical purposes its use is indicated.

It is well known that there are marked zones of endemism of TGE in Armenia [8]. At the beginning of the study the researcher hypothesized that TGE depended on the place of permanent residence of the students (endemic zone vs. non-endemic zone). It should be emphasized that the relationship of this variable with outcome (TGE) was also found in studies carried out in other population of women, enabling to make appropriate comparisons between this research and other investigations of this topic [8,11,13]. Although the risk for TGE among students from endemic zones was 2.9 times higher than among those having a non-endemic place of residence, the mentioned variable was not significantly linked to TGE (Table 3). It is difficult to interpret this result. One possible explanation could be the imperfect definition of the students' place of living. They, probably, lived in an endemic zone for many years, but later changed their residence to a non-endemic zone, which they recorded in questionnaire. Another suggested explanation is that the majority of female students (81%) were from non-endemic zones, and only 18% were from endemic zones.

Still, because the main purpose of this research was to assess the prevalence of thyroid gland enlargement (goitre) among 18-20 year old female students in Yerevan, and identify the contributing risk factors responsible for the development of goitre, it can be considered that the objectives set at the beginning of this paper were achieved. However, the need for a more specific and in-depth survey and more detailed analyses targeted at the factors defined in the current study should be considered.

### ***Study limitations***

The validity and reliability of the study could be affected by several factors. The main limitation of the study was the smaller sample size, determined by time and money constraints, than was required for multivariate analysis. For feasibility of this survey, it was assumed during sample size calculation that a tolerable error (d) was 10%.

The findings of this study cannot be generalized to cover the entire female population of Armenia, and cannot even be generalized to women 18 to 20 year old in Yerevan, since the sample of the present study included only 18-20 year old female students in Yerevan.

The methods of data collection were the questionnaire, and inspection/palpation of the thyroid gland for assessing thyroid size. This was the most feasible way of obtaining information about thyroid gland enlargement (goitre) in this particular study population. The researcher did not use the thyroid ultrasound method, because it was costly (3,000-5,000 AMD), therefore not suitable for the present survey. However, in geographical areas of moderate to severe IDD such as Armenia, goitre screening by palpation may be an acceptable alternative to thyroid ultrasound [19].

The type of information bias, which may have occurred in the study, was the interviewer bias, since one researcher personally interviewed all the subjects.

Any data collection method that relies on self-report is subject to recall bias. Some responses to the questions in the questionnaire may suffer from a recall bias, and there is no way to validate them. Examples are responses to the questions regarding diet, salt consumption, household monthly expenditure, and family history of goitre.

### ***Conclusions and recommendations***

As previously mentioned, a more comprehensive survey, especially for women with a family history of TGE, which would address the factors defined in the current study, should be considered.

It is also necessary to conduct a Knowledge-Attitude-Practice survey in reproductive age women and medical personnel concerning IDD and endemic goitre, for further development and implementation of education programs pertaining to this public health problem. Similar programs could be presented to all strata of the population of women, with no diversity in their design and implementation. It is recommended that IDD screening program be implemented not as a one-time intervention, but designed in a way that emphasizes long-term education. Further, it is recommended that these education programs be consistently implemented, to allow the medical staff (nurses, general practitioners and doctors of family medicine, pediatricians and gynecologists), educated through these programs, to pass the obtained information on the importance of iodine for good health to their patients.

Education of whole population regarding the importance of iodine for nutrition, and the method of controlling the quality of salt in terms of iodine content, is also an important step in the implementation of such a program. It is suggested to use TV as the transmitter of general information about IDD, to evoke and keep interest and awareness of the public, as

well as to encourage women to get additional information regarding this important issue for their health.

Another factor, which needs to be considered in the planning of an effective IDD intervention, concerns women's susceptibility to information about TGE present in their immediate environment. This supports the idea that more information regarding not only IDD, but also regarding the rates of endemic goitre in Armenia, the risk factors for goitre, and treatment methods, be delivered through the mass media, so that women have sufficient understanding of their risk and the availability of means to fight this disease.

As already stated, effective and affordable technology exists to prevent iodine deficiency and the problems it causes. The most important are iodized salt and effective monitoring of iodine nutrition [2]. It is necessary to conclude from this survey, that salt iodization remains a priority issue for health care managers in Armenia. This priority is based on history as well as evidence of high goitre rates and the presence of a proportion of children that still have a low iodine excretion [7,8,11,13]. As a consequence of the absence of legislation for reinforcement of mandatory salt iodization and exclusive sales of iodized salt to the population, the problem of iodine insufficiency in the republic remains to be a priority requiring governmental intervention and urgent solution. Salt iodization is recommended as the preferred strategy to control and eliminate IDD. It is recommended that an initiative should be launched for education of the general public regarding the use of food items rich in iodine and the proper manner of keeping and using iodized salt. Public education on IDD related diseases by public health officials through TV; mass media or brochures needs to emphasize that salt import for human and animal use should be regulated, establishing that all salt should contain 50 mg iodine/kg [2,5].

To be fully effective in correcting iodine deficiency, however, iodized salt must reach the entire population – in particular those groups that are the most susceptible, including

pregnant women and young children, especially with low socio-economic status. This process requires establishment of mechanisms to ensure that iodine levels in salt are continuously checked along the food chain, from the iodization site to the household, regardless of whether the salt was produced in Armenia or imported. It is essential to introduce a system for regular monitoring of salt iodization at the points of production, import, trade, and of household use. Such monitoring necessarily involves both government and salt industry, with close collaboration between the public and private sectors. The control should be based on law and be consistent. Finally, it is also necessary to mobilize and collaborate with international and humanitarian agencies, nongovernmental organizations, and the private sector in support of an efficient and effective salt iodization program for Armenia.

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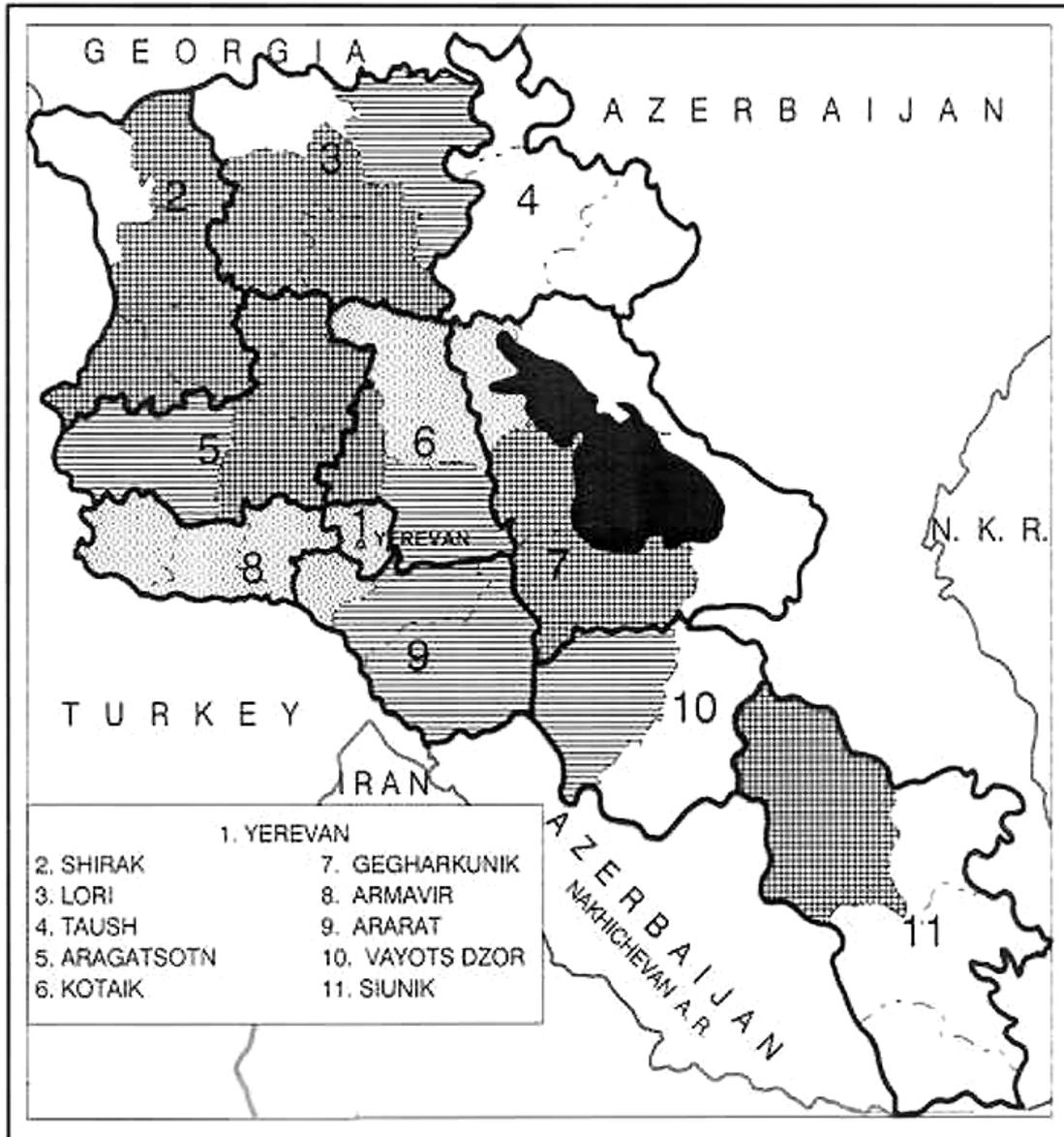
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## Appendices

### Appendix 1

#### Prevalence of goitre in women 15-45 years in different Marz of Armenia\*



□ N/A

▨ Mild TGR 5-19.9%

▨ Moderate TGR 20-29.9%

▨ Severe TGR >30%

\* Toromanian EN, Narimanian MZ. Prevalence of IDD in Republic of Armenia. AMPHR. Vol 4:2; Yerevan; February 1996.

**American University of Armenia  
College of Health Sciences**

***Questionnaire for***

**Prevalence of Thyroid Gland Enlargement Among 18-20 Year Old Female  
University and College Students in Yerevan: Screening Survey**

*\*The coding for ID number:*

Digit 1-2	Cluster number
Digit 3-4	Code of respondent

**ID** \_ \_ \_ \_ \_

**Date of Interview (day/month/year)** \_ \_ \_ \_ \_

**Interview start-time** \_\_\_\_\_: \_\_\_\_\_

**Socio-Demographics**

1. **Birth Date:** \_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_ (dd/mm/yy)
2. **Birthplace:**  /Yerevan/,  /Other/, Specify\_\_\_\_\_
3. **City of Permanent Residence:**  /Yerevan/,  /Other/, Specify\_\_\_\_\_
4. **Marital Status:** 1.  /Single/, 2.  /Married/, 3.  /Divorced/, 4.  /Widowed/
5. **How many live-born children do you have?**
  1.  /one/
  2.  /two/
  3.  /three/
  4.  /do not have/
6. **On average how much money does your household spend monthly?**
  1.  /less than \$ 50 (<25,000 AMD)/
  2.  /\$ 50-99 (25,000-50,000 AMD)/
  3.  /\$ 100-299 (51,000-150,000 AMD)/
  4.  /\$ 300 and above (>150,000 AMD)/
  88.  /Do not know /

## Dietary Habits

### 7. How would you rate your consumption of salt?

1.  / I avoid foods rich in salt/
2.  / I do not pay attention to the amount of salt in my food/
3.  / I eat a lot of salt/

### 8. What type of salt do you usually add to food for preparing? *(show the packages of salt)*

1.  /"Big" salt made in Armenia/
2.  /From Ukraine /
3.  / From Iran /
4.  /"Extra" salt made in Armenia/
88.  /Do not know/

### 9. What type of salt do you usually use as a table salt? *(show the packages of salt)*

1.  /"Big" salt made in Armenia/
2.  /From Ukraine /
3.  / From Iran /
4.  /"Extra" salt made in Armenia/
88.  /Do not know/

## Health Status and Clinical Information

10. Age of first menstruation \_\_\_\_\_ years **or**
1.  /less than 9 year old/
  2.  /9-11 year old/
  3.  /12-14 year old/
  4.  /15 year old and over/

11. Do you have menstrual disorders?  /Yes/,  /No/ **Go to 13<sup>th</sup> question**

### 12. If "Yes" check all that apply:

1.  /**Amenorrhea**: absence of menstruation for at least three cycles/
2.  /**Oligomenorrhea**: light or infrequent menstruation/
3.  /**Menorrhagia**: heavy bleeding/
4.  /**Dysmenorrhea**: severe menstrual cramps/

**13. Have you ever been pregnant?**  /Yes/,  /No/ *Go to 16<sup>th</sup> question*

**14. Have you ever had complications during pregnancy?**

/Yes/,  /No/ *Go to 16<sup>th</sup> question*

**15. If “Yes” check all that apply:**

1.  /Miscarriage/
2.  /Induced abortion/
3.  /Neonatal death/
4.  /Stillbirth/
5.  /Preterm delivery/

**16. Have you ever been treated for infertility?**  /Yes/,  /No/

**17. Have you ever been told by doctor that you have thyroid gland enlargement?**

/Yes/,  /No/ *Go to 19<sup>th</sup> question*

**18. Have you ever been treated for thyroid gland enlargement?**

/Yes/,  /No/

**19. Does any member of your family suffer from enlarged thyroid gland? (Check all that apply)**

1.  /Mother/
2.  /Father/
3.  /Sister/
4.  /Brother/
5.  /Other/, Specify \_\_\_\_\_
6.  /Nobody/ *Go to 21<sup>st</sup> question*

**20. Did he/she receive any treatment?**  /Yes/,  /No/

**Anthropometrical Measurement**

21. Weight \_\_\_\_\_kilos

22. Height \_\_\_\_\_cm

23. BMI \_\_\_\_\_kg/m<sup>2</sup>

**Physical Examinations by Endocrinologist**

24. Enlarged thyroid gland (0-2):  /0/,  /1/,  /2/  
(by palpation)

25. Hirsutism:  /Yes/,  /No/

26. Exophthalmus (protruding eyes):  /Yes/,  /No/

27. Moist skin (tegument):  /Yes/,  /No/

28. Dry skin:  /Yes/,  /No/

29. Tremor of extremities:  /Yes/,  /No/

30. Bradycardia:  /Yes/,  /No/

31. Tachycardia:  /Yes/,  /No/

***Thank you very much for your participation!***

***Interview end-time*** \_\_\_\_\_: \_\_\_\_\_

**Data entry # 1** \_\_\_\_\_

**Data entry # 2** \_\_\_\_\_

Հայաստանի Ամերիկյան Համալսարան  
Հասարակական Առողջապահության Բաժին

ՀԱՐՑԱԹԵՐԹԻՎ

Վահանագեղձի գերանի (խալիպի)  
տարածվածությունը Երևանի ԲՈՒՀ-երի 18-20 տարեկան  
ուսանողուհիների շրջանում

*\*Տարբերակման համարի կողակորում.*

Թվանիշ 1-2	խմբակի համարը
Թվանիշ 3-4	Պատասխանողի կողը

Տարբերակիչ համարը. \_ \_ \_ \_ \_

Հարցազրույցի անցկացման ամսաթիվը (օրը/ամիսը/տարին) \_ \_ \_ \_ \_

Հարցազրույցն սկսվել է՝ \_\_\_\_\_ : \_\_\_\_\_

Սոցիալ - դեմոգրաֆիական տվյալներ

1. Ծննդյան ամսաթիվը \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_ (օրը/ամիսը/տարին)
2. Ծննդյան վայրը  /Երևան/,  /Այլ/ Նշել \_\_\_\_\_
3. Մշտական բնակության վայրը  /Երևան/,  /Այլ/ Նշել \_\_\_\_\_
4. Ընտանեկան վիճակը 1.  /Չամուսնացած/ 3.  /Ամուսնալուծված/  
2.  /Ամուսնացած/ 4.  /Այրի/
5. Քանի՞ ողջ ծնված երեխա ունեք  
1.  /մեկ/ 3.  /երեք/  
2.  /երկու/ 4.  /չունենմ/

**6. Որքա՞ն է ձեր ընտանիքի միջին ամսեկան ծախսը**

1.  /< \$ 50 (25,000 դրամ-ից պակաս)/
2.  /\$ 50-99 (25,000-50,000 դրամ)/
3.  /\$ 100-299 (51,000-150,000 դրամ)/
4.  /> \$ 300 (150,000 դրամ և ավելի)/
88.  /Չգիտեմ/

**Սննդի առանձնահատկությունները**

**7. Որքա՞ն աղ եք օգտագործում ձեր սննդի մեջ**

1.  /Ես խուսափում եմ աղով հարուստ սննդից/
2.  /Ես ուշադրություն չեմ դարձնում աղի քանակությանը իմ սննդի մեջ/
3.  / Ես շատ աղ եմ օգտագործում/

**8. Ի՞նչպիսի աղ եք օգտագործում կերակուր պատրաստելիս**

1.  /Հայաստանում արտադրված «Խոշոր» աղ/
2.  /Ուկրաինայից ներմուծված աղ/
3.  /Իրանից ներմուծված աղ/
4.  /Հայաստանում արտադրված «Էքստրա» աղ/
88.  /Չգիտեմ/

**9. Ի՞նչպիսի աղ եք օգտագործում որպես սեղանի աղ**

1.  /Հայաստանում արտադրված «Խոշոր» աղ/
2.  /Ուկրաինայից ներմուծված աղ/
3.  /Իրանից ներմուծված աղ/
4.  /Հայաստանում արտադրված «Էքստրա» աղ/
88.  /Չգիտեմ/

**Առողջական վիճակը և կյիմիկական տեղեկություններ**

10. Առաջին դաշտանի տարիքը. \_\_\_\_\_ տարեկանում **կամ**

1.  / մինչև 9 տարեկան/
2.  / 9-11 տարեկանում/
3.  /12-14 տարեկանում/
4.  /15-ից ավելի բարձր տարիքում/

11. Դուք ունենո՞ւմ եք դաշտանային խախտումներ

/Այո/,  /Ոչ/ **Անցեք 13-րդ հարցին**

12. Եթե Այո նշել բոլոր համապատասխան տեղերում

1.  /Ամենորեա - դաշտանի բացակայություն առնվազն երեք ցիկլ/
2.  /Օլիգոմենորեա - թեթև կամ ոչ հաճախ տեղի ունեցող դաշտան/
3.  /Մենորագիա - առատ արյունահոսություն/
4.  /Դիսամենորեա - ուժեղ դաշտանային ցավեր/

13. Դուք երբևէ ունեցե՞լ եք հղիություն  /Այո/,  /Ոչ/ **Անցեք 16-րդ հարցին**

14. Դուք երբևէ ունեցե՞լ եք բարդություններ հղիության ընթացքում

/Այո/,  /Ոչ/ **Անցեք 16-րդ հարցին**

15. Եթե Այո նշել բոլոր համապատասխան տեղերում

1.  /Վիժում/
2.  /Հղիության ընդհատում (աբորտ)/
3.  /Նորածնային մահացություն/
4.  /Մեռելաձին պտուղ/
5.  /Վաղարժամ ծննդաբերություն/

16. Դուք երբևէ անպտղության դեմ բուժում ընդունե՞լ եք  /Այո/,  / Ոչ/

17. Բժիշկը Ձեզ երբևէ հայտնե՞լ է, որ վահանագեղձի գերած ունեք

/Այո/,  /Ոչ/ *Անցեք 19-րդ հարցին*

18. Դուք երբևէ վահանագեղձի գեհաճի դեմ բուժում ընդունե՞լ եք

/Այո/,  /Ոչ/

19. Ձեր ընտանիքի անդամներից որևէ մեկն ունեցե՞լ է վահանագեղձի գերած (նշել բոլոր համապատասխան տեղերում)

1.  /Մայրը/
2.  /Հայրը/
3.  /Քույրը/
4.  /Եղբայրը/
5.  /Այլ անդամ/, Նշել \_\_\_\_\_
6.  /Ոչ ոք/ *Անցեք 21-րդ հարցին*

20. Նա որևէ բուժում ընդունե՞լ է  /Այո/,  /Ոչ/

#### Անտրոպոմետրիկ չափումներ

21. Կշիռը \_\_\_\_\_ կգ

22. Հասակը \_\_\_\_\_ սմ

23. ՄՁՑ\_ \_\_\_\_\_ կգ / ս<sup>2</sup>

#### Էնդոկրինոլոգի կողմից կատարված ֆիզիկական քննություններ

24. Վահանագեղձի գերած (0-2).  /0/,  /1/,  /2/  
(շոշափման միջոցով)

25. Հիրատիզմ (Մազակալություն).  /Այո/,  /Ոչ/

26. Էկոֆտալմ (Ակնագնդերի արտանկում).  /Այո/,  /Ոչ/

27. Խոնավ մաշկ.  /Այո/,  /Ոչ/

28. Չոր մաշկ.  /Այո/,  /Ոչ/

29. Վերջույթների դող.  /Այո/,  /Ոչ/

30. Բրադիկարդիա.  /Այո/,  /Ոչ/

31. Տախիկարդիա.  /Այո/,  /Ոչ/

***Շատ շնորհակալ եմ Ձեր մասնակցության համար***

Հարցազրույցն ավարտվել է՝ \_\_\_\_\_ :

Մուտքագրող # 1 \_\_\_\_\_

Մուտքագրող # 2 \_\_\_\_\_

**American University of Armenia**  
**Department of Public Health**  
*Institutional Review Board/Committee on Human Research*

**CONSENT FORM TEMPLATE**

**Prevalence of Thyroid Gland Enlargement Among 18-20 Year Old Female  
University and College Students in Yerevan: Screening Survey**

**Explanation of Research Project:** Good morning/afternoon. My name is *Hasmik Manukyan*. I am an endocrinologist and the second year student of the American University of Armenia, department of Public Health. As a part of my course requirement, I am conducting a research project. The purpose of the research project is to assess the prevalence of thyroid gland enlargement (goitre) among 18-20 year old female students in Yerevan. Female university and college students aged from 18 to 20 will be eligible to participate in the research project. The study protocol includes the conduction of interview using the questionnaire and assessment of thyroid size by inspection and palpation. The interview will take place only once and last 15-20 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 known risk for the participants of the study. There is some discomfort associated with thyroid gl.and palpation. Otherwise the research possesses risk and inconveniences the same as encountered in your daily life.

**Benefits:** You will not directly benefit from the participation in this survey. However, the individual information provided by you might help to evaluate the current situation with thyroid gland enlargement in Yerevan, and prevent the complications associated with it.

**Confidentiality:** Interviews will be conducted anonymously without recording any identifying information such as your name, address, or telephone number. Your individual responses will only be accessible by the Public Health Department of the American University of Armenia. Summary information and grouped responses that do not permit the identification of individuals may be submitted to the Ministry of Health of Armenia. However, your confidentiality and anonymity will be protected.

**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 or your decision to withdraw from the study at any time will not affect your job.

**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; phone number: (3741) 512568, or Dr. Michael Thompson; phone number: (3741) 512592.

## Հայաստանի Ամերիկյան Համալսարան

### Հասարակական Առողջապահության Բաժին

#### Համաձայնություն

### Վահանագեղձի գերաճի (խալիայի) տարածվածությունը Երևանի ԲՈՒՀ-երի 18-20 տարեկան ուսանողուհիների շրջանում

Բարև Ձեզ: Իմ անունն է Հասմիկ Մանուկյան: Ես էնդոկրինոլոգ եմ և ուսանում եմ Հայաստանի ամերիկյան համալսարանի հասարակական առողջապահության մագիստրոսի ծրագրում: Որպես իմ կուրսային հանձնարարության մաս ես իրականացնում եմ հետազոտություն: Այս հետազոտության նպատակն է գնահատել վահանագեղձի գերաճի (խալիայի) տարածվածությունը Երևանի համալսարանների և քոլեջների 18-20 տարեկան ուսանողուհիների շրջանում: Հետազոտությանը կարող են մասնակցել 18-20 տարեկան ուսանողուհիները: Ուսումնասիրությունը ներառում է հարցազրույցի անցկացում՝ հարցաթերթիկների օգտագործմամբ, ինչպես նաև վահանագեղձի չափի որոշում զննման և շոշափման միջոցով: Հարցազրույցը կանցկացվի միայն մեկ անգամ և կտևի 15-20 րոպե: Դուք ցանկացած պահի կարող եք հարցեր տալ կամ ընդհատել հարցազրույցը: Ես երախտապարտ կլինեմ այս ուսումնասիրության մեջ Ձեր մասնակցության համար: Ձեր կողմից տրամադրված տեղեկությունները շատ օգտակար կլինեն ու արժեքավոր նշանակություն կունենան տվյալ հետազոտության համար:

**Վտանգ/Անհարմարություն.** Մասնակիցների համար չկա որոշակի վտանգ, սակայն կարող է լինել վահանագեղձի շոշափման հետ կապված որոշ անհարմարություն: Այլ առումներով, հետազոտությունը չի պատճառի ավելի մեծ վտանգ և անհամարություն, քան Դուք կարող եք ունենալ Ձեր առօրյա կյանքում:

**Շահ.** Հետազոտության ընթացքում Դուք ուղղակի շահ չեք ունենալու: Սակայն Ձեր տրամադրած տեղեկատվությունը կարող է նպաստել Երևանում վահանագեղձի գերաճի (խալիայի) հետ կապված ներկա իրավիճակի գնահատմանը և դրա հետ առնչվող բարդությունների կանխարգելմանը:

**Գաղտնիություն.** Հարցազրույցի ժամանակ Ձեր անձը չի բացահայտվի, և գրանցումներից ոչ մեկում չի նշվի Ձեր անունը, հասցեն կամ հեռախոսահամարը: Ձեր պատասխաններն օգտագործվելու են միայն Հայաստանի ամերիկյան համալսարանի հասարակական առողջապահության բաժնի կողմից: Հայաստանի առողջապահության նախարարությանը կարող են ներկայացվել ամփոփ տեղեկություններ և խմբավորված պատասխաններ, որոնք թույլ չեն տա, որ հետազոտության մասնակիցների անձը բացահայտվի: Այնուամենայնիվ, Ձեր անձի և Ձեզ վերաբերող տեղեկությունների գաղտնիությունը կպահպանվի:

**Կամավորություն.** Ձեր մասնակցությունը այս հետազոտությանը լիովին կամավոր է և կախված է Ձեր ընտրությունից: Դուք կարող եք ցանկացած պահի հրաժարվել տեղեկություններ տրամադրելուց և խուսափել ցանկացած հարցի պատասխանելուց: Դուք ցանկացած պահի կարող եք ընդհատել հարցաթերթիկներին պատասխանելը և դուրս գալ այս նախագծից՝ առանց որևէ բացասական հետևանքների:

**Ում դիմել.** Եթե Դուք ինչ-որ հարցեր ունեք կամ ցանկանում եք հետազոտության վերաբերյալ խոսել որևէ մեկի հետ, կարող եք դիմել հետազոտության պատասխանատու անձ Յելենա Ամիրխանյանին. [Հեռ. (3741) 512568], կամ Մայքլ Թոմփսոնին. [Հեռ. (3741) 512592]:

## **List of appropriate journals where this study might be published**

American Journal of Public Health

Journal of Clinical Endocrinology & Metabolism

Thyroid (Journal of the American Thyroid Association)