MINISTRY OF HEALTH AND MEDICAL INDUSTRY OF TURKMENISTAN
Research and Clinical Center for Mother's and Child's Heath (MCH Center) named after Gurbansolan-edghe

UNICEF
Representative Office in Turkmenistan

REPORT

ON RESULTS OF NATIONAL REPRESENTATIVE SURVEY OF PROGRESS IN ELIMINATION OF IODINE DEFICIENCY IN TURKMENISTAN THROUGH UNIVERSAL SALT IODIZATION

Ashgabat 2004

CONTENT

ABSTRACT

In January-March 2004 a national epidemiological representative 30 cluster, school-based survey of 879 schoolchildren aged 8-10 was carried out covering all administrative districts of the country (velajat). The survey was performed based on UNICEF. WHO, ICCIDD guidelines: "Assessment of iodine deficiency disorders and monitoring their elimination" (2001). The objective of this survey was to evaluate the progress in elimination of iodine deficiency in Turkmenistan through universal salt iodization. Results of this survey confirmed adequate level of iodine nutrition of Turkmenistan population on the entire territory of the country. This was achieved by universal availability of quality iodized salt that was found in 100% of the surveyed households. Median urinary iodine level (170 mcg/l) for the national sample was in the safe range (100-300 mcg/l) recommended by WHO, UNICEF and ICCIDD, and proportion of samples with iodine levels below 100 and 50 mcg/l were significantly below recommended thresholds.

This report has been prepared by the staff of Research and Clinical Center for Mother's and Child's Health (MCH Center) named after Gurbansolan-edghe (Director – Ch. Nazarov) of the Ministry of Health and State Sanitary Epidemiological Inspection of the Ministry of Health (Head – A. Orazov) with support of UNICEF international consultants – Prof. G. Gerasimov (Russia) and Dr. L. Ivanova (Bulgaria).

Financial and organizational support for this survey was provided by UNICEF Office in Turkmenistan.

1. Introduction

This report is based on the results of national representative survey of progress in elimination of iodine deficiency in Turkmenistan population through universal salt iodization (USI) in the framework of program that is place in this country since 1996.

Iodine Deficiency Disorders (IDD) are one the most prevalent non-infection diseases in the world. Iodine is an essential micronutrient and daily requirements for iodine is 100-200 mcg. While the consequences of iodine deficiency are know for ages, elimination of iodine deficiency became a global priority during last two decades. USI is the most reliable, cheap and safe method of IDD prevention and elimination if more than 90% of households consume quality iodized salt.

Starting from 1994, the Turkmenistan government is working towards prevention and elimination of iodine deficiency. First epidemiological IDD survey in Turkmenistan was performed in 1994 and showed mild and moderate level of iodine deficiency. Medial urinary iodine (UI) level of schoolchildren in Ashgabat was 75 mcg/l and 37 mcg/l in Dashgovuz city while goiter prevalence in schoolchildren was 20% in Ashgabat and 64% in Dashgovuz. Based on these data, President of Turkmenistan in 1996 passed a Decree and established universal mandatory iodization of all salt for human consumption with potassium iodate.

Epidemiological IDD surveys were carried out in Turkmenistan in 1990 and 2000 and showed, that in spite of USI in place, median UI remained at levels below 100mcg/l indicating the persistence of iodine deficiency. Based on these results, the Ministry of Health in 2002 passed a Resolution to increase level of salt iodization from 23+/-11 to 40+/-15 ppm from January 1, 2003. This increase of iodine content in salt helped to optimize iodine nutrition and subsequently eliminate iodine deficiency.

Table №1 present epidemiological criteria for assessing the severity of iodine deficiency based median UI level.

Table №1. Epidemiological criteria for iodine deficiency

Indicator	Severity of iodine deficiency as public health problem		
	mild	**moderate**	**Severe**
Median urinary iodine level (mcg/l)	50-99.9	20-49.9	< 20

The objective of IDD elimination program is normalization of iodine consumption with food for the entire population of the country. When iodine consumption is adequate, median UI levels are at the level of 100 to 300 mcg/l. Table 2 presents indicators for IDD elimination through USI.

Table №2. Indicators of elimination of iodine deficiency

Indicator	**Objective**
Urinary iodine level: • Median (mcg/l) • Proportion of samples with UI levels below 100 mcg/l • Proportion of samples with UI levels below 50 mcg/l	 • 100-300 • < 50% • < 20%
Salt iodization: • proportion of households consuming quality iodized salt	 • > 90%

2. Materials and Methods

In January-March 2004 a national epidemiological representative 30 cluster, school-based survey of 879 schoolchildren aged 8-10 was carried out covering all administrative districts of the country (velajat). The survey performed based on UNICEF. WHO, ICCIDD guidelines: "Assessment of iodine deficiency disorders and monitoring their elimination" (2001)[1].

Iodine deficiency has most harmful effects on women of childbearing age and infants and household-based surveys are needed to reach this target group. However, from epidemiological point of view school-based surveys are more easy and efficient way to assess iodine nutrition of population. In Turkmenistan all children are attending schools irrespective of their social and income status. In this case, iodine nutrition of young schoolchildren representatively reflects iodine nutrition of the whole population because schoolchildren in Turkmenistan do not receive any special iodine supplements.

In order to get representative results that would reflect iodine nutrition of entire population, selection of survey sites (schools) were conducting with two steps random PPS sampling.

On the preparation stage, the Ministry of Education supplied research group with listing of 1701 schools and their respective enrolments with subdivision for velajats (provinces) and etraps (counties). Selection of schools was performed in 2 stages.

On the fist stage, based on Ministry of Education listing the research group selected **etraps** where epidemiological assessment was conducted. Listing of etraps with clusters is presented in table №3.

Steps to select communities (etraps) to be included in the survey:

- Calculation of the sampling interval (***k***) by dividing the total number of schoolchildren in Turkmenistan (1,029,149) by cluster number - 30.

  1029149 : 30 = 34304
- Choosing the random starting point between 1 and 34,304 by using random number table. The random point was - 9948.
- The first cluster was in etrap Azatlyk where the 34,304 schoolchild was found, based on cumulative population column. Next clusters were assigned by adding 34,304

[1] Assessment of iodine deficiency disorders and monitoring their elimination. A guide for program managers. Second Edition. ICCIDD/UNICEF/WHO, 2001.

cumulatively. For example, second cluster was assigned to etrap Kopetdag where the value 44,252 (9948 + 34304 = 44,252) was located and so on.

Table №3. Selection of communities (etraps) in Turkmenistan using PPS method.

Name (number of schools)	Number of schoolchildren	Cumulative population	Cluster
Ashgabat			
Azatlyk (32)	30677	30677	1
Kopetdag (27)	30693	61370	2
S.A.Nyyazov (18)	19534	80904	3
Arcabil	709	81613	
Candybil	4374	85987	
Akhal vel.			
Abadan	9434	95421	
Baharly (28)	17933	113354	4
Gokdepe	18311	131665	
Ruhabat	28029	159694	5
Ak bugday	15357	175051	
Kaka (21)	13313	188364	6
Tejen	26134	214498	
Altyn Asyк (9)	5952	220450	7
Babadayhan	15053	235503	
Sarahs	11802	247305	
Balkan vel.			
Balkanabat (21)	20550	267855	8
Gumbag	4453	272308	
Hazar	1843	274151	
Turkmenbasy Sah	9205	283356	
Etrek (7)	4351	287707	9
Esenguly	6129	293836	
Garrygala	5533	299369	
Serdar	11452	310821	
Bereket	6878	317699	
Turkmenbasy (19)	3867	321566	10
Dashoguz vel.			
Dasoguz	30318	351884	
S.A.Nyyazov (57)	30731	382615	11
Gorogly (65)	22957	405572	12
Yilanly (61)	28780	434352	13
Akdepe	20466	454818	
Boldumsaz (31)	14877	469695	14
Gubadag (56)	23005	492700	15
Koneurgenc	25298	517988	
S.Turkmenbasy (89)	26389	544387	16
Lebap vel.			
Atamyrat (36)	22148	566535	17

Birata	9593	576128	
Galkynys	9445	585573	
Nyyazov (29)	16608	602181	18
Garassyzlyk	10025	612206	
Serdarabat (37)	24616	636822	19
Farap	12878	649700	
Sakar (15)	7956	657656	20
Sayat	11940	669560	
Garabekewut	10341	679901	
Hojambaz	13534	693435	
Koytendag (24)	11136	704571	21
Magdanly	7706	712277	
Seydi	4878	717155	
Halac (28)	23510	740665	22
Turkmenabat (43)	34158	774823	23
Mary vel.			
Mary saheri	23343	798166	
Bayramaly saheri (28)	10654	808820	24
Mary etraby (37)	29417	838237	25
Bayramaly etraby	26074	864311	
Wekilbazar (34)	27630	891941	26
Sakarcage (33)	27428	919369	27
Murgap (33)	27442	945811	28
Garagum	9483	956294	
Turkmengala (32)	20089	976383	29
Yoloten	22705	999088	
Tagbazar (22)	15851	1014939	30
Serhetabat	5686	1020625	
Oguzhan	8524	1029149	

On the second stage systematic random selection of schools in all pre-selected etraps was performed. In each etrap only one school could be randomly selected. Departments of education from each velajat supplied research group with listings of schools in pre-selected etraps. For example from S.A.Nyyazov etrap in Dashgovus velajat the group received listing of 57 schools, from 1 to 57. Using random number table we found random number (in our case - 23) that corresponded with the number of school in the listing. Such procedure was used for random selection of other 29 schools in other communities.

Finally, in each of 30 schools (clusters) using systematic sampling and random number table we selected 30 schoolchildren aged 8-10 years for the assessment.

During the survey urinary samples were collected into individual vials from all children. Samples of urine (2.0 ml) were transferred to small containers and were kept frozen until iodine assay.

Samples of salt from schoolchildren's households were tested qualitatively for iodine using rapid testers. All samples of salt with positive (pink) staining were considered as iodized. Additionally from 25 to 50% salt samples were tested for iodine content by titration method in laboratories of velajat's Sanitary Epidemiological Inspections.

UI determinations were carried out in random urine portions collected during the survey with ceric-arsenite method (modified by J. Dunn, 1993) after mineralization with ammonium

persulfate. The analytical parameters of this method are: sensitivity threshold - 5 mcg/L, relative standard precision, CV – 13.6%, analytical recovery – 80 – 104%. The external laboratory quality control was performed by analytical laboratory of National center for hygiene, medical ecology and nutrition (Sofia, Bulgaria). This laboratory is a member IRLI network and Dr. L. Ivanova from this Center assisted MCH Center in establishing of UI laboratory and trained its staff.

For the purpose of internal quality control (QC), urinary sample with a mean iodine concentration of 148 mcg/L was tested with every assay. The QC sample was validated in the Reference Laboratory in Sofia. A good correlation was identified between results from the Laboratory at MHC Center in Ashgabat and in Sofia. The results were in the acceptable analytical range.

Results of UI assays are presented as medians with minimal and maximal values for the entire group and for sub-groups divided by regions (velajats). Frequency distribution is calculated according to discriminating criteria of ICCIDD/UNICEF/WHO. Discriminating criteria were: <100 mcg/L, <50 mcg/L and > 300 mcg/L were used to assess the level of iodine nutrition.

All information about the surveyed children was filled in Registration forms for each cluster (**Annex 1)**. Information on the amount of laboratory work is presented in table 4.

Table №4. Amount of laboratory tests

Velajats	Amount of clusters	Amount of samples tested for urinary iodine	Amount of salt samples tested with rapid testers	Amount of salt samples tested by titration
Balkan	3	91	90	30
Akhal and Ashgabat city	7	208	210	70
Mary	7	206	210	105
Lebap	7	205	210	105
Dashoguz	6	169	180	90
Total for Turkmenistan	30	879	900	400

All field assessment was carried by research teams from MCH Center (responsible for collections of urinary samples) and sanitary inspectors from local SEIs (responsible for collection of salt samples).

3. Results and Discussion

During the survey total 879 schoolchildren were selected using PPS sampling method in all velajats that provides reliable information on status of iodine nutrition of entire Turkmenistan population.

Table №5 provides median UI values for all surveyed velajats and for the entire Turkmenistan group. These data confirm adequate level of iodine nutrition for Turkmenistan population in general and for all regions of the country.

Table №5. Median urinary iodine (UI) levels for Turkmenistan population.

Velajats	Number of clusters	Amount of urinary iodine tests	Median UI levels	Minimal UI value	Maximal UI value
Balkan	3	91	232	32	490
Akhal and Ashgabat city	7	208	194	37	430
Mary	7	206	168	18	560
Lebap	7	205	160	20	380
Dashoguz	6	169	156,5	10	460
Total for Turkmenistan	30	879	170	10	560

From the nutritional point of view, optimal UI levels should be between 100 and 300 mcg/l. For the whole Turkmenistan population the median UI value was 170 mcg/l, confirming adequate level of iodine nutrition.

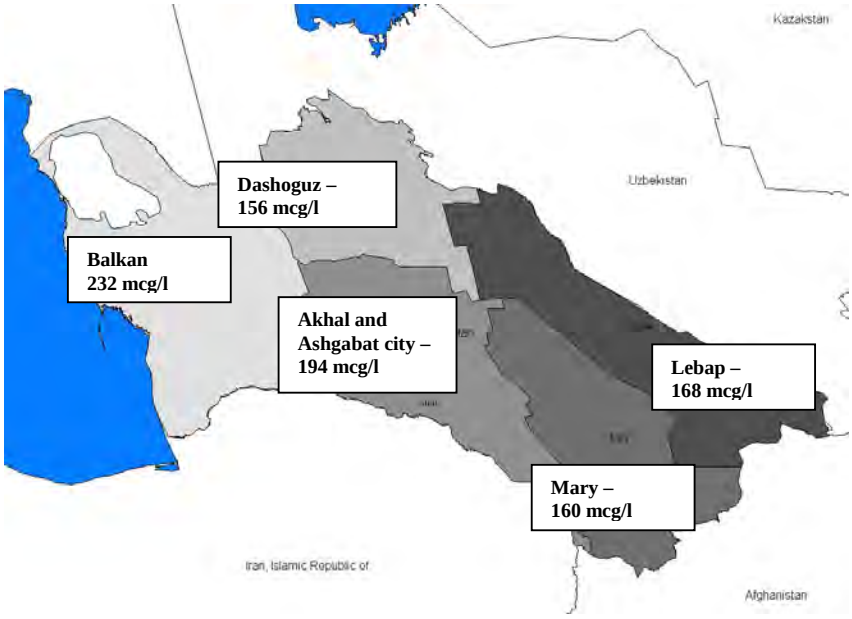


Figure. 1 Geographical distribution of median UI levels (mcg/l) by Turkmenistan velajats.

Geographical distribution of median UI levels by different regions of Turkmenistan is presented on Fig. 1. The highest median UI value was found in Balkan velajat (232 mcg/l) where single salt producer is located and where lag of iodized salt supply to retail trade is minimal. This velajat is situated near the shore of Caspian sea and consumption of iodine reach seafood there is relatively higher than in other regions.

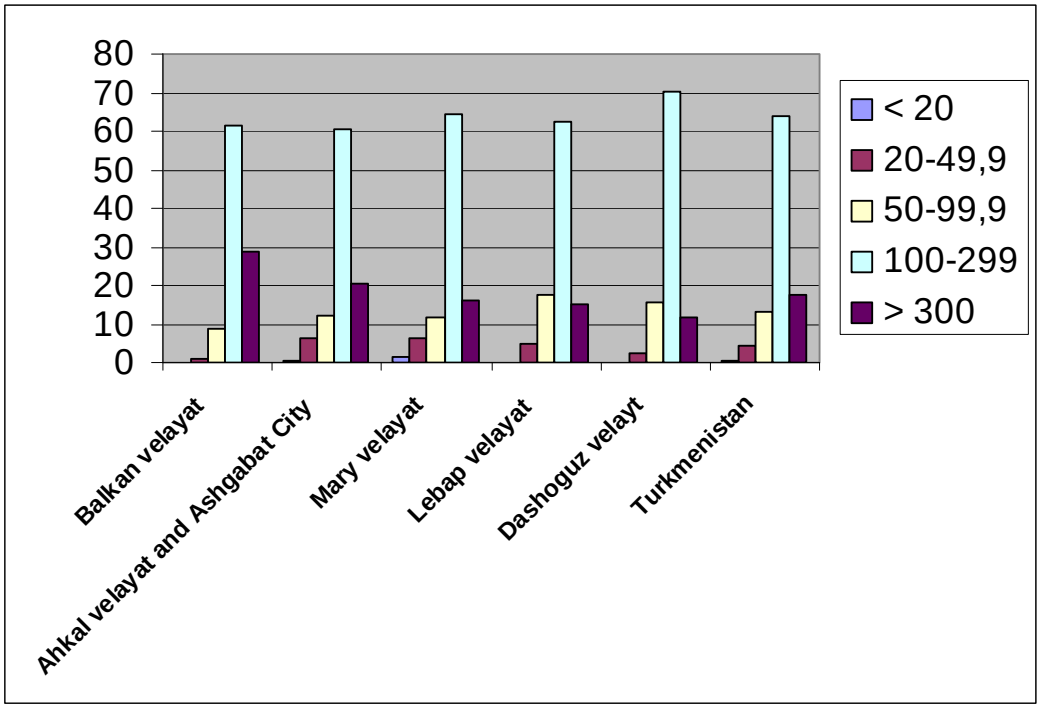
Median UI levels decreases with distance from the Caspian sea and the salt producer (from west to east): to 194 mcg/l in Akhal velajat and Ashgabat city and up to 168 -156 mcg/l in most remote velayats – Mary, Lebap and Dashgovuz. Thus, population of these remote velajats are at higher risk of developing iodine deficiency disorders and these regions should be more closely monitored for supply and quality of iodized salt and for values of UI.

Frequency distribution of UI levels provides important information on parameters of iodine nutrition of the population. Discriminating UI levels are - below 20 mcg/l, 20 to 49,9 mcg/l, 50 to 99,9 mcg/l, that characterize different levels of iodine deficiency, proportion of

samples with normal UI levels – 100 to 299 mcg/l and proportion of samples with high UI levels - above 300 mcg/l (Table 6).

Table 6. Frequency distribution of UI levels in samples from Turkmenistan survey

	UI concentrations (mcg/l)									
VELAJATS	**< 20**		**20-49,9**		**50-99,9**		**100-299**		**> 300**	
	N	%	n	%	n	%	N	%	N	%
Balkan	-	-	1	1,1	8	8,8	56	61,5	26	28,6
Akhal and Ashgabat city	1	0,48	13	6,3	25	12,0	126	60,5	43	20,6
Mary	3	1,45	13	6,3	24	11,7	133	64,5	33	16
Lebap	-	-	10	4,8	36	17,6	128	62,4	31	15,1
Dashgovuz	-	-	4	2,4	26	15,4	119	70,4	20	11,8
Turkmenistan	4	0,45	41	4,6	119	13,3	562	64	153	17,4



One of important indicators of adequate iodine nutrition (Table №2) is proportion of samples with UI level below 100 mcg/l (must be less than 50%) and below 50 mcg/l (must be less than 20%). In Turkmenistan, only 13.3% of samples (from 8.8 to 17.6% in different velajats) had UI level below 100 mcg/l and on average only 4.6% of samples (from 1.1 to 6.3% in different velajats) – had UI levels below 20 mcg/l. All these confirm adequate level of UI nutrition in Turkmenistan population.

Single government-owned salt producer ("Guvlyduz" salt plant) has set up rigorous quality control procedures, developed and adopted industry standard for edible salt GOST-630-2003 and has all necessary laboratory facilities for quality control. Resolution of the Ministry of Health and Medical Industry of Turkmenistan № 61 (6.05.2002) «On constant laboratory control and monitoring of iodized salt quality» strengthened monitoring system for production, distribution and transportation of iodized salt.

In the course of this survey 900 salt samples were collected from the households of schoolchildren and checked for iodine content by rapid testers and by titration method. Rapid testing was carried out directly in schools and titration - in SEIs laboratories. Results of these tests are presented in table №7.

Table №7. Results of quality testing of iodized salt in Turkmenistan

Velajats	Amount of salt samples tested by rapid tests	Tested positively for iodine	Amount of salt samples tested by titration	Conforming requirements of GOST 630-2003
Balkan	90	90	30	30
Akhal and Ashgabat city	210	210	70	70
Mary	210	210	105	105
Lebap	210	210	105	105
Dashgovuz	180	180	90	90
TOTAL for Turkmenistan	900	900	400	400

4. Conclusion

The data obtained during national representative survey of iodine nutrition in Turkmenistan show that this country has achieved the goal of elimination of iodine deficiency among its population (table №8).

Table №8. Goals and indicators of elimination of iodine deficiency in Turkmenistan

Indicators	**Goal**	**Turkmenistan results**
Urinary iodine levels: • Median (mcg/l) • Proportion of samples below 100 mcg/l • Proportion of samples below 50 mcg/l	 • 100-300 • < 50% • < 20%	 • 170 • 13,3% • 4,6%
Salt iodization: • Proportion of households consuming quality iodized salt	• > 90%	• 100%

This is evidenced by adequate median UI concentration in representative groups of schoolchildren (170 mcg/l) and insignificant proportion of samples with UI below 100 mcg/l (13.3%) and below 50 мкг/л (4.6%), that are significantly lower than recommended thresholds.

Adequate level of iodine nutrition was achieved through effective program of universal salt iodization and amount of households consuming quality iodized salt reached 100%.

ANNEX 1.

РЕГИСТРАЦИОННАЯ ФОРМА
ДЛЯ ПРОВЕДЕНИЯ КЛАСТЕРНОГО ОБСЛЕДОВАНИЯ

Название велаята и этрапа_____
Название населенного пункта_____
Номер школы_____ **Код (номер) кластера**_____
Общее число обследованных детей_____

Инд. №	Имя и фамилия ребенка	возраст (лет)	пол: 1- муж. 2- жен.	Соль*: 1 - йод 2 - нет	Уровень йода в моче	Прочее
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* - по результатам качественного экспресс теста: 1 - соль йодированная; 2 - соль нейодированная.