

Invited paper

Experiences in the prevention, control and elimination of iodine deficiency disorders: a regional perspective

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SUMMARY Before 1987, iodine deficiency was not considered an issue of major importance in the countries of the Eastern Mediterranean Region (EMR). Progress began with a systematic national study of goitre and other iodine deficiency disorders (IDD) in the Islamic Republic of Iran in 1983. Following a major review of the prevalence of IDD in member states, *Guidelines for national programmes for the control of iodine deficiency disorders in the EMR* were published by the World Health Organization (WHO) in 1988. This paper discusses progress towards elimination of iodine deficiency by reviewing the status of IDD in the countries of EMR and programmes for prevention and control of IDD with particular reference to the Islamic Republic of Iran, the first country to be declared IDD-free by WHO.

Introduction

Although a high prevalence of goitre and severe iodine deficiency in the Chitral and Gilgit regions of Pakistan was first reported as far back as 1908 [1], prior to 1987 iodine deficiency was not considered an issue of major importance in the countries of the Eastern Mediterranean Region (EMR). Despite the high rates in many areas of many countries of the Region (for example, Mosul province in Iraq, Shahryar in the Islamic Republic of Iran, and in most regions of Lebanon), goitre was regarded as being strictly restricted to certain geographical areas and thus not considered as an important public health problem [2,3]. Therefore, surveys in EMR countries had been limited to one or two endemic areas. This changed in 1983, when the Islamic Republic of Iran began to systematically study the prevalence of goitre and other iodine deficiency disorders and in 1989 conducted a national survey of iodine deficiency disorders

(IDD), which revealed hyper-endemic and endemic goitre in all provinces of that country [4].

Progress in monitoring and control of IDD

A major landmark in IDD control in the EMR was a review of the prevalence and control measures of IDD in EMR member states in 1987 [2]. For the first time, member states were alerted to the fact that, in a number of countries of this Region, IDD was a major public health problem meriting serious consideration and urgent action. Table 1 summarizes the major activities related to IDD in the last 15 years.

In order to respond to the growing interest of the member states, the EMR Office (EMRO) of the World Health Organization (WHO) convened an inter-country consultation of experts in December 1987 to collect more information, exchange ex-

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Table 1 Major iodine deficiency disorder (IDD) activities in the Eastern Mediterranean Region (EMR) since 1987

Year	Activity
1987	Review of IDD in EMR member states
1987	Inter-country consultation about IDD convened by WHO-EMRO
1988	Publication of EMRO guidelines for national IDD control programmes
1989	First Regional IDD survey and start of IDD control programme in Islamic Republic of Iran.
1990	Inter-country workshop in IDD (Tehran)
1990	Discussion of IDD at 37th session of WHO-EMRO Regional meeting
1992	Training workshop for laboratory staff (Damascus)
1994	UNICEF Middle East North Africa Regional IDD workshop (Tehran)
1995	First Regional meeting of salt producers (Jordan)
1996	Iodine sufficiency achieved in Islamic Republic of Iran
1999	Symposium/workshop on assessment and monitoring of IDD (Tehran)
2000	Regional meeting for promotion of iodized salt (Dubai)
2000	Islamic Republic of Iran and Tunisia declared IDD-free countries. Salt iodization started in 17 countries. Universal salt iodization achieved in 6 countries
2001 & 2002	First and second IDD Regional training course on monitoring and evaluation of IDD elimination (Tehran)

periences and develop guidelines that would assist countries to define the problem and mount national control programmes. These guidelines were published (in Arabic and English) in 1988 as *EMRO Technical Publication No. 12*, entitled *Guidelines for a national programme for the control of iodine deficiency disorders in the EMR*.

In 1990, an inter-country workshop on IDD was held in Tehran to exchange experiences and to develop approaches. Subsequently, a technical paper was presented to the 37th session of the WHO Regional Committee for the Eastern Mediterranean, alerting the ministers of health of all countries in the Region to the devastating effect of IDD on brain development and cognitive

function. Since then, WHO, often jointly with UNICEF and the International Council for the Control of Iodine Deficiency Disorders (ICCIDD), has made great efforts to support countries in their efforts to deal with this very important deficiency.

A number of important workshops and training courses have been held. A WHO tri-Regional travelling seminar was organized with EMRO and the South-East Asia and Western Pacific Region Offices in India and Nepal in 1991 to observe salt and oil iodization in practice. The first meeting on universal salt iodization for salt producers in the EMR Region was held in Jordan in 1995 and a number of technical consultancies were conducted. Among these, UNICEF held a Regional IDD workshop in

1994 in Tehran and WHO held a symposium workshop on assessment and monitoring of IDD in countries of EMR in 1999, also in Tehran [5].

In 1988, the Islamic Republic of Iran carried out the first national IDD survey in the Region, which revealed a high prevalence of IDD [4]. By 1999, Egypt, Jordan, Lebanon, Morocco, Oman and the Syrian Arab Republic had also carried out surveys. The Islamic Republic of Iran and the Syrian Arab Republic were the first countries in the Region to start iodizing salt. The first Regional meeting of salt producers in the EMR, held in 1995, led to the establishment of a Regional association of iodized salt producers.

By late 1998, 13 countries, and by 2004, 16 countries, had initiated salt-iodization programmes and 6 countries had reached the goal of universal salt iodization by demonstrating that at least 90% of households consume adequately iodized salt (Table 2).

The Islamic Republic of Iran was the first country in the Region to become iodine sufficient by showing that more than 95% of households consumed adequately

iodized salt and the median urinary iodine level was above 100 µg/L in each of the 26 provinces [6]. More recently, Tunisia also achieved satisfactory iodine status and both countries were accorded IDD-free status by WHO-EMRO in the year 2000 [6]. In 2001, the Endocrine Research Centre and the Ministry of Health of the Islamic Republic of Iran were appointed by WHO-EMRO to hold an annual training course on monitoring and evaluation of IDD elimination programmes. The first 2 courses were offered in 2001 and 2002 with the participation of 12 and 21 countries of the Region and countries of Central Asia and Eastern Europe respectively.

Status of IDD in the Region

By 2004, the status of IDD in the EMR countries was as follows:

- IDD under control: Islamic Republic of Iran and Tunisia;
- Mild IDD: Jordan, Lebanon, Libyan Arab Jamahiriya, Egypt, Palestine, Oman, Bahrain, Qatar, Syrian Arab Republic, United Arab Emirates, Kuwait and Yemen;
- Moderate IDD: Morocco, Sudan and Saudi Arabia;
- Severe IDD: Iraq, Afghanistan and Pakistan.

Table 3 shows the most recent information about the IDD status of the countries of EMR. In 8 of 17 countries the median urinary iodine level was ≥ 10 µg/dL and in 11 of 17 countries the proportion of households consuming iodized salt was $> 50\%$. Figures 1 and 2 show the distribution of household iodized salt consumption and median urinary iodine levels in the countries of EMR.

Table 2 Progress in control of iodine deficiency disorders (IDD) in countries of the Eastern Mediterranean Region in the year 2004 (adapted from WHO-EMR report [8])

IDD status	No. of countries
IDD a problem	18
Legislation in place	17
Salt iodization begun	16
Universal salt iodization achieved	6
IDD under control achieved	2

Table 3 Iodine deficiency disorder (IDD) status in the countries of the Eastern Mediterranean Region

Country [reference]	MUI (µg/dL)	TGR (%)	Household iodized salt use (%)	Salt legislation	IDD monitoring	IDD status	Notes
Afghanistan [8]	No data available	No data available	11.4	No	No	Severe	New salt plants being equipped with quality control laboratories. Ministry of Health, with UNICEF support, plans laboratories for testing iodine in salt and urine. A 5-year plan with financial support of WHO-EMRO and IDD coordinator in EMR was due for implementation in 3 stages. Stage 1: assessment of IDD situation over 16 months (2002–3). Stage 2: salt iodization (2003–5). Stage 3: monitoring (2005–6).
Algeria [8]	34.7	8	68	Yes	No data available	Unknown	No recent data. IDD previously endemic in some areas.
Egypt [12]	> 10	> 5	56	Yes	No	Mild to moderate	Data need to be updated. Salt iodization programme began in 1993 and government has successfully upgraded salt production plants to meet country's iodized salt needs. Major activities for national IDD control programme started in 2001 in 5 governorates and aim to cover all governorates within 2 years.
Iraq [13, 14]	2.4	24–44	90	Yes	No	Severe	–
Islamic Republic of Iran [8]	16.7	9.8	91	Yes	Yes	IDD-free	See main text.
Jordan [15, u/p ^a]	15.4	32.1	98	Yes	Yes	Mild	Needs regular monitoring.
Lebanon [u/p ^b]	9.4	25.7	87	Yes	Just for salt iodine	Mild	Data need to be updated. Universal salt iodization implemented in 1995. National Committee for IDD control formed in 1994.

Table 3 Iodine deficiency disorder (IDD) status in the countries of the Eastern Mediterranean Region (continued)

Country [reference]	MUI ($\mu\text{g/dL}$)	TGR (%)	Household iodized salt use (%)	Salt legislation	IDD monitoring	IDD status	Notes
Libyan Arab Jamahiriya [u/p ²]	None	None	90	Yes	No information	Mild	Data need to be updated. Universal salt iodization implemented in 1980. National survey planned to evaluate impact of salt iodization.
Morocco [8]	8.6	22	41	Yes	No	Moderate	Universal salt iodization officially endorsed in 1995. Next step is launch of national strategy to increase iodized salt consumption and implementation of monitoring system.
Oman [8]	9.5	10	68.5	Yes	Yes	Mild	No national IDD control programme.
Pakistan [16]	None	None	30	Recommended	No	Moderate to severe?	Data need to be updated. Little recent evidence of further progress and IDD probably remains a significant problem.
Saudi Arabia [8, 17]	18	4-30	No	No	No	Moderate	Needs IDD control programme, especially in southern province.
Sudan [18]	< 10	22	10	Yes	No	Moderate	Data need to be updated. Needs push for iodized salt. Follow-up information needed on national situation.
Syrian Arab Republic [u/p ²]	< 10	70	90	Yes	Yes	Mild	Data need to be updated. Survey in 2001 revealed increment in MUI (results not available).
Tunisia [19]	15.8	0.58	97	Yes	Yes, but not effective	IDD-free	Data need to be monitored. IDD control programme implemented in 1996. Declared IDD-free in 2000. South-east region had low iodized salt consumption (77.9%).

Table 3 Iodine deficiency disorder (IDD) status in the countries of the Eastern Mediterranean Region (concluded)

Country [reference]	MUI (µg/dL)	TGR (%)	Household iodized salt use (%)	Salt legislation	IDD monitoring	IDD status	Notes
United Arab Emirates [8]	10	1.5-20	6.5	No	No	Mild	National committee established in 2000. Salt iodization planned in 2001. National screening programme for neonatal hypothyroidism implemented since 1998.
Yemen [u/p ^a ,20]	17.3	16.8	60	Yes	No data	Mild	Needs regular monitoring. Low level of households consuming iodized salt may prevent goal of IDD elimination.

^aF. Azizi, unpublished report, 2001.

^bJ. Matovinovic, unpublished report, 1961.

^cF. Azizi, unpublished report, 1993.

^dR. Mohan, unpublished report, 1999.

^eF. Azizi, unpublished report, 1991.

MUI = median urinary iodine level.

TGR = total goitre rate.

u/p = unpublished.



Figure 1 Household consumption of iodized salt, Eastern Mediterranean Region, 2004



Figure 2 Median urinary iodine levels (µg/dL), Eastern Mediterranean Region, 2004

The Iranian experience

The Islamic Republic of Iran conducts an optimal programme for control of IDD. A sustainable and well-managed iodization programme is functioning in the country with the programmatic indicators set by WHO/UNICEF/ICCIDD [7,8].

The programme began in 1988, when reports of hyper-endemic and endemic areas of goitre in different parts of the Islamic Republic of Iran [9,10] prompted the Ministry of Health and Medical Education to form the Iranian National Committee for Control of IDD (INCCI). A nationwide survey, performed under the supervision of INCCI, showed that goitre was endemic in all cities and hyper-endemic in the capital cities of 5 provinces [4]. Median urinary iodine excretion was $< 100 \mu\text{g/L}$ in all localities and $< 20 \mu\text{g/L}$ in many localities examined [4,9,10].

The INCCI prepared a national plan, which detailed objectives and strategies for IDD control. Iodization of household salt supplies began in 1990. Although the production, distribution and consumption of iodized salt increased gradually, a nationwide survey in 1993 showed that less than 50% of the households were using iodized salt [11]. INCCI announced universal salt iodization and all salt factories were obliged by law to produce only iodized salt for household use. National surveys in 1994, 1996 and 1998 showed that more than 95% of Iranian households were consuming iodized salt [11].

Figure 3 shows the major reduction in the prevalence of goitre from the first Iranian national survey in 1989 to monitoring surveys in the years 1996 and 2001 [4,7]. In 1996, in the framework of the IDD monitoring programme, the second national survey was conducted 2 years after the implementation of the new law for manda-

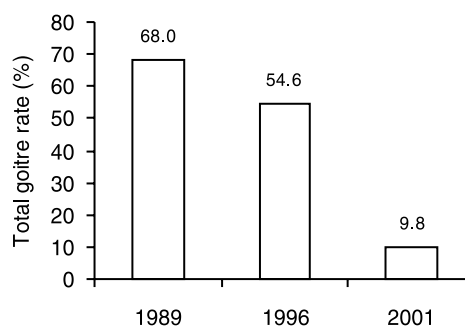


Figure 3 Total goitre rate in 3 national surveys (1989, 1996 and 2001) in the Islamic Republic of Iran [4,11]

tory salt iodization [11]. The total goitre rate was 54.6% and it was evident that the prevalence of goitre was still high in many provinces. The study was performed when the majority of people had used iodized salt for only for 2 years and the majority of 8- to 10-year-old children had, at the time, passed most of their life without adequate iodine supplementation. It was therefore too early to expect that the consumption of iodine should result in a reduction of goitre prevalence. The latest national IDD survey in 2001–02 showed a significant reduction in total goitre rate to 9.8%. The prevalence of goitre grade 2 in 22 provinces was lower than 5% and in the other provinces the goitre rate did not exceed 10%.

The most sensitive method for the monitoring and evaluation of an IDD control programme is the determination of urinary iodine excretion. The 1996 Iranian national survey showed that the median urinary iodine excretion in schoolchildren ($20.5 \mu\text{g/dL}$) was at the top of the optimal range (10 to $20 \mu\text{g/dL}$) recommended by WHO/UNICEF/ICCIDD [7,8] and 85.1% of children had urinary iodine $\geq 10 \mu\text{g/dL}$. By 2001, median urinary iodine was 16.7

µg/dL and only 5.8% of the study population had urinary iodine < 5 µg/dL which, based on international standards, is favourable.

According to these criteria, the Islamic Republic of Iran appears to have reached a sustainable IDD control programme since 1996, an achievement that was recognized by WHO-EMRO in the year 2000 [6]. Monitoring of the IDD control programme

is planned every 5 years to evaluate the sustainability of the programme.

The lessons from the Iranian experience are that implementation of an adequate and sustainable programme of IDD control requires many effective programmatic steps, in particular integration of IDD control into the health network and mandatory iodization of household salt.

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Some facts on iodine deficiency

- Iodine deficiency disorders (IDD) affect over 740 million people, 13% of the world's population, and 30% of the remainder are at risk.
- IDD preys upon poor, pregnant women and preschool children, posing serious public health problems in 130 developing countries.
- Iodine-deficient people may forfeit 15 IQ points.
- Nearly 50 million people suffer from some degree of IDD-related brain damage.
- We have the means to prevent it – small quantities of iodine which can be delivered in a simple, universally effective and in a credibly cheap way – IODIZED SALT.

Further information about IDD and its prevention can be found at:
<http://www.who.int/nut/idd.htm>