

IMPACT ASSESSMENT OF SALT IODIZATION ON THE PREVALENCE OF GOITER IN DISTRICT SWAT

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ABSTRACT

Background: To eliminate Iodine Deficiency Disorders, (IDD) universal salt iodization is the widely practiced intervention. District Swat (a hilly area of NWFP, highly endemic for IDDs is selected as a first model district of the province for salt iodization program.

Objectives: To find out the proportion of the families using iodized salt, iodine contents of the salts used by the families, urinary iodine levels in school children and the effect on goitre prevalence in Swat selected as a model district in 1998.

Subject & Methods: The study was conducted in 960 children of both sexes, age 8-10 years in primary schools of district Swat in the year 2000. A replicate model used for base line study in 1998 was adopted. The students were clinically examined for goitre using palpation method. 960 edible salt samples for its iodine content and 240 urine samples for iodine level were analysed.

Results: The overall goitre prevalence was found to be 52 and 45% in boys and girls respectively. 23% salt samples were found un-iodized, while in 25.6% the iodine content was less than 7ppm. The results revealed 18% decrease in total goitre rate and 35% increase in the use of iodized salt from the base line survey conducted in 1998, in school children of district Swat.

Conclusions: The study revealed that since the area of Swat is still highly endemic for Iodine Deficiency Disorders, sustained efforts are required to ensure 100% salt iodization.

KEYWORDS: IDD, Goitre, Universal salt iodization, School Children.

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INTRODUCTION

Iodine is an important element, required in the body for the production of thyroid hormones, responsible for many important functions of the body¹. Iodine Deficiency Disorder (IDD) is the most prevalent group of diseases and varies from abortion/stillbirth to goiter formation or impaired mental development since birth known as cretinism².

IDD is affecting some 30% population of the world, while 655 million people are noted with Goiter³. In Pakistan IDD is affecting about 50 million population, of whom 6.5 million are seriously affected⁴. IDD is not only confined to the hilly areas⁵⁻⁹ of the country, where its prevalence is reported upto 90%, but is also prevalent to an alarming extent in the plains like Swabi, Peshawar, Islamabad, Lahore, Karachi and Quetta (Balochistan)¹⁰⁻¹³. The results of

such studies reported from various parts of the country prompted the Health Ministry and International Donor Agencies to take serious steps and evolve strategies to eliminate this health menace.

Universal Salt Iodization (USI) is sustainable and cost effective and is the most widely practiced intervention in eliminating iodine deficiency disorders. In several countries USI is executed successfully among which Latin America and Islamic Republic of Iran achieved great success in eliminating IDD¹⁴.

Government of Pakistan with the cooperation of UNICEF started campaign to root out the menace of IDD through the promotion of iodized salt legislation and extensive awareness through print/electronic media. During 1986-1995, marketing of iodized salt and supplementation of iodized oil was made in a population of about 4 million people¹⁴. The ban on the production, distribution and sale of non-iodized salt in NWFP and Balouchistan is effective through legislation since 1994 and 1995 respectively.

District Swat, being a hilly area of NWFP is highly endemic for IDD and goitre since long, has been selected as a model district by the health department and UNICEF for strict iodization of edible salt and its exclusive use by the people of the area for effective elimination/ control of Iodine Deficiency Disorders. This study was undertaken to find out the number of families using iodized salt, iodine content of the salt used by the families, excretion of iodine in the urine of target group children and to find out the impact of USI on the prevalence of goitre in 8-10 years school children since the imposition of legislation in mid 90's and its selection as a model district in 1998.

SUBJECTS AND METHODS

Study model used for base line survey 1998¹⁵, was adopted for real comparison and impact assessment. According to the Directorate of Primary Education, the District Swat in the year 2000 was having 1048 and 418 primary schools for boys and girls respectively. Total number of children in the age group of 8-10

years studying in boys and girls schools was 104024 and 15000 respectively.

District Swat was divided into eight blocks. From each block two schools were randomly selected, one each for boys and girls. In the sampling unit, total number of male and female students in the age group of 8-10 years was 1025 and 630 respectively. Sample size was calculated by using Epi info version 6 at 95% confidence interval¹⁶. From each sex 480 students were randomly selected.

To ensure 100% attendance of the students, the selected schools administration was informed of the date and time of the team visit in advance. Polyethylene zip bags were distributed among the students to bring 5 gram of edible salt used by their family on the date of clinical examination.

A total of 960 primary school children were clinically examined for goitre using palpation method. Goitre was graded according to criteria recommended by WHO¹⁷. The sum of goitre grade I and II gives the total goiter prevalence of the area.

About 5 ml of casual urine sample was taken in a small white-capped bottle for analysis of iodine content¹⁸ from every 4th student being examined as per WHO recommendations¹⁷.

Samples of salt collected from each selected student was tested in the field using rapid semi quantitative iodine spot testing MBI Chemical kit with the ability of detecting low (< 7 ppm), moderate (7-15 ppm) and adequate (>15 ppm), quantity of iodine in the salt.

RESULTS

Through clinical examination, overall goiter rate in boys and girls has been found to be 52% and 45% respectively. A high (51.6%) prevalence of goitre was observed in the students of 9 years of age.

Prevalence of goitre amongst boys is presented in table-I. Total goitre rate was higher (56%) in 9-year age group, followed by age 8 years (51%). Goitre grade-I was high (43%) in the boys of 9 years age and goitre grade-II was highest in the age group of 8 years (16%).

Prevalence of total goitre rate was also high-

est (48%) in girl students of 9-year age. A high prevalence of goitre grade-I (37%) and grade-II (22%) was detected in girls students of age 9 and 10 years respectively. (Table-II)

Table-I: Prevalence of goitre in 8-10 years old boys in District Swat, Pakistan 2000

| Age | No. of Student | No. with Goitre | | | Prevalence* of Goitre (%) |
|----------|----------------|-----------------|----------|-------------|---------------------------|
| | | Grade I | Grade II | Grades I&II | |
| 8 | 160 | 56 | 26 | 82 | 51.25 |
| 9 | 160 | 68 | 21 | 89 | 55.6 |
| 10 | 160 | 58 | 21 | 79 | 49.4 |
| All ages | 480 | 182 | 68 | 250 | 52 |

* Grade I & II

Table-II: Prevalence of goitre in 8-10 years old girls in District Swat, Pakistan 2000

| Age | No. of Student | No. with Goitre | | | Prevalence* of Goitre (%) |
|----------|----------------|-----------------|----------|-------------|---------------------------|
| | | Grade I | Grade II | Grades I&II | |
| 8 | 160 | 54 | 12 | 66 | 41.25 |
| 9 | 160 | 60 | 16 | 76 | 47.5 |
| 10 | 160 | 51 | 22 | 73 | 45.6 |
| All ages | 480 | 165 | 50 | 215 | 44.8 |

* Grade I & II

A total of 960 salt samples were analysed in the field for its iodine content using semi quantitative rapid spot test kit. Data revealed that 220(23%) salt samples obtained were uniodized (Table-III). 26% of the salt samples had low iodine content (0-7 ppm), 15% had mod-

Table-III: Iodine content of edible salt collected from school children in District Swat, Pakistan

| Iodine Content | Number of salt | Percentage |
|----------------|----------------|------------|
| No | 220 | 22.9 |
| Low | 246 | 25.6 |
| Moderate | 140 | 14.6 |
| Adequate | 354 | 36.9 |
| Total | 960 | 100 |

erate iodine content (7-15ppm) while 37% of the salt samples had adequate iodine content (>15ppm).

Eighty percent (80%) and 76% of the salt samples submitted by the boys and girls respectively were iodized. The practice of using uniodized salt was still prevalent in 20-24% families.

Out of 240 urine samples collected, 236 were analysed for its iodine content. In four samples urine was insufficient for analysis. Urinary iodine excretion was in the range of 0.5-88 ug/dl, with a mean value of 15.87 ug/dl. Urinary iodine excretion in boy students is shown in table-IV.

Table-IV: Urinary iodine excretion in 8-10 years old boys, in District Swat, Pakistan

| Age (years) | No. of Samples analysed | Urinary Iodine (ug/dl) | | | | % Boys with low iodine |
|-------------|-------------------------|------------------------|--------|---------|---------|------------------------|
| | | <2.0 | 2-4.9 | 5-9.9 | >10 | |
| 8 | 38 | 4 | 4 | 5 | 25 | 34.2 |
| 9 | 40 | 3 | 3 | 7 | 27 | 32.5 |
| 10 | 39 | 5 | 1 | 10 | 23 | 41.0 |
| Total | 117 | 12 | 8 | 22 | 75 | 35.9 |
| | | (10.3%) | (6.8%) | (18.8%) | (64.1%) | |

Out of 117 urine samples from boys, analysed for iodine excretion, 36% were found with low iodine level. 41% of the boys were iodine deficient in the age group of 10 years, which was highest among 8-10 years boys. Severe iodine deficient children were 10.3%, with urinary iodine excretion less than 2 ug/dl. 57(48%) of the girl's students excreted less than 10 ug/dl in their urine, indicating iodine deficiency (Table-V). Low urinary excretion of 56% was

Table-V: Urinary iodine excretion in 8-10 years old girls, in District Swat, Pakistan

| Age (years) | No. of Samples analysed | Urinary Iodine (ug/dl) | | | | % Girls with low iodine |
|-------------|-------------------------|------------------------|---------|---------|---------|-------------------------|
| | | <2.0 | 2-4.9 | 5-9.9 | >10 | |
| 8 | 40 | 4 | 2 | 10 | 24 | 40.0 |
| 9 | 39 | 7 | 4 | 11 | 17 | 56.4 |
| 10 | 40 | 8 | 6 | 5 | 21 | 47.5 |
| Total | 119 | 19 | 12 | 26 | 62 | 47.9 |
| | | (15.9%) | (10.0%) | (21.8%) | (52.1%) | |

noted in girls of 9 years. 19(16%) of the female students were severely iodine deficient with iodine excretion levels less than 2 ug/dl.

According to WHO criteria, 64 % of the boys and 52% of the girl students had normal iodine status (urinary iodine excretion >10 ug/dl).

DISCUSSION

To eliminate Iodine Deficiency Disorders, different preventive measures were taken by the Government of Pakistan, including Universal Salt Iodization through legislation in mid 90s. This study was a follow-up of the base line survey¹⁵ conducted by IDD Control Steering Committee, Swat in 1998, when the area was selected as a model for USI. The study reported 70% and 52% goitre rate in boys and girls respectively. The comparison with this study shows that although a net reduction of 18% in the rate of goitre was observed in both sexes in pace of two years, yet it remained high enough to consider the problem as severe in the area. 62% cases showing sufficient iodine excretion in 1998 dropped to a level of 58% in 2000. The comparison of two studies revealed that there is an upward trend/increase in iodized salt use by 39 and 31% in boys and girls of the area respectively. Although mean positive difference of 35% in the use of iodine salt could be taken as satisfactory, efforts should continue to attain the target of 100% salt iodization.

Another fact noticed in this study is that 26% of the consumers were using edible salt with iodine content less than 7ppm, while it is recommended strategy that the level of iodization is fixed at a minimum of 15ppm at the consumer level and 30ppm at the production level¹⁹.

According to a recent estimation¹⁴, iodized salt production at the country level is 60,000 tons per year and consumption of iodized salt is only 30%. According to another study²⁰, only 9.5% of manufacturers in Peshawar are producing salt with adequate iodine. A recent Study¹² conducted in Peshawar revealed an overall goitre rate of 22% in school children

age 5-13 years, where the use of iodized salt has reached to 80%.

According to WHO recommendations, the area in which goitre rate in school children is more than 5%, then it should be declared endemic. A high rate of 52% and 45% goitre in boys and girls students observed respectively in this study is indicating that the area of District Swat is still highly endemic for IDD. The situation is alarming, not only in the hilly areas but also in plains, needs re-evaluation and further improvement in the strategies in line with the government of Islamic Republic of Iran, where 90% iodized salt consumption has been achieved and IDD is eliminated through National Control Programme for IDD¹⁴. Sustained efforts must be undertaken to ensure 100% Universal Salt Iodization at the country level with frequent monitoring for iodine level. Health and Nutrition programmes in the area should continue and needs strengthening.

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