# The Effect of Iodized Oil Injection on Visible Goitre in a Hyperendemic Area of Central Bangladesh

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**Abstract**

Many countries have been using prophylactic iodine to treat goitre sometime and the incidence of iodine deficiency disorders has notably declined in these countries. In this study for therapeutic effect of iodized oil injection on goitre was illustrated by the fact that one year after treatment, more than 70 percent of grade 2 (visible) has reverted to grade 1 (palpable). The over all median urinary iodine level was 14.1μg/dl among the treated group. The result reported in this paper shows that a single injection of iodized oil ensures a normal iodine supply for thyroid functioning and partial disappearance of goitre. It is concluded that single injection of slowly resorbable iodized oil administered to a population of severely endemic goitrous area constitute a simple effective way of treating and preventing endemic goitre.

## Introduction

Iodine deficiency has been a major world health problem for centuries[1], which leads to goitre and the syndrome of endemic cretinism together with clinical and subclinical defects of motor and cognitive function. This spectrum of defects has been collectively labelled as iodine deficiency disorders[2]. Over 1.5 billion people live in areas where the food and water normally consumed contain insufficient iodine to meet optimal requirement, putting them at risk from iodine deficiency disorders[3].

In Bangladesh iodine deficiency exists all over the country. Latest estimation indicates that there are 47.1% of the population have goitre (grade 1 and 2 together) and 68.9% are biochemically iodine deficient i.e urinary iodine less than 10 μg/dl, the cut off level indicating normal iodine intake[4].

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There is an overwhelming evidence to indicate that IDD can be effectively prevented by simply providing adequate intake of iodine. Iodine supplementation is available in several forms. Interventional measures designed to cover an entire population include iodized salt, iodized oil and iodized water[5].

In Bangladesh iodized oil was used as an interim measure in 38 goitre hyperendemic Thanas, selected on the basis of goitre prevalence rate 30% and above. The present study was designed to investigate the impact of iodized oil injection on visible goitre in a selected population of a particular area. An area adjacent to the spot was taken as control where no intervention for IDD was given.

**Materials and Methods**

The impact evaluation of Lipiodol oil injection was performed from January to March 1994. Two locations namely Raipura and Belabo of Narshingdi district about 70 km away from Dhaka City (central Bangladesh) were selected for the study.

The respondents was divided into two groups according to area covered with Lipiodol injection (Raipura) and area not covered with Lipiodol injection (Belabo).On the basis of the report of 1981-82, iodized oil injection was given to the visible goitrous persons of Raipura in Nov/Dec 1992. The iodized oil used was Lipiodol ultrafluid (obtained from Guerbet, France), and organic compound consisting of iodized ethyl esters of fatty acids of poppy seed oil, administered by intramuscular injection (1ml. containing 480 mg iodine).

The study population consisted of male and female children in the age group of 5 to 11 yrs, and female adults of 15-45 yrs. In each area, 50 respondents from each of the four groups were investigated. The thana health complex of the area taken as the central point. From that point one direction with densely populated households was selected and the respondents of the target groups who were previously injected lipiudol were investigated. To fulfil the required number of respondents, other direction from the center point was selected. The name, age, sex and place of residence of each respondent were recorded. The thyroid gland was examined by experienced experts using methods recommended by Perez et al[6] and was classified according to the grading system as recommended by the "Joint WHO/UNICEF/ICCIDD Consultation on IDD Indicators" (Nov 1992).[7]

On the spot, urine sample was collected in wide mouth screw capped plastic bottles. One drop of toluene was added to each urine sample. All the samples

were packed in paper carton and transported to the laboratory where they were stored at 4°C. The urinary iodine content was measured by the wet digestion method adopted by Gutekunst et al[8].

## Results

Prevalence of goitre among the respondents of the area covered and not covered with lipiodol injection is given in table 1.

**Table 1. Prevalence (%) of goitre among respondents**

| Sex(Age) | Area covered with Lipiodol injection* | | | | Area not covered with Lipiodol injection | | | |
|---|---|---|---|---|---|---|---|---|
| | Total Sample | Grade 1 | Grade 2 | TGR (1+2) | Total Sample | Grade 1 | Grade 2 | TGR (1+2) |
| Boys (5-11yrs) | 43 | 83.7 (36) | 16.2 (7) | 100.0 (43) | 51 | 62.7 (32) | 36.0 (19) | 100.0 (51) |
| Girls (5-11yrs) | 50 | 84.0 (42) | 16.0 (8) | 100.0 (50) | 50 | 64.0 (32) | 36.0 (18) | 100.0 (50) |
| Male (15-45 yrs) | 48 | 64.6 (31) | 35.4 (17) | 100.0 (48) | 54 | 51.4 (28) | 48.6 (26) | 100.0 (54) |
| Female (15-45 yrs) | 60 | 60.0 (36) | 40.0 (24) | 100.0 (60) | 45 | 22.2 (10) | 77.8 (35) | 100.0 (45) |
| Total | 201 | 73.2 (145) | 27.8 (52) | 100.0 (201) | 200 | 50.2 (102) | 47.9 (98) | 100.0 (200.0) |

Number of respondents are given in parenthesis.

* Injection was given to all had grade 2 goitre.

One year after the treatment the grade 2 goitre was found only in 16.2% and 35.4% among 5-11 yrs. and 15-45 yrs. males respectively (before treatment all respondents had grade 2 goitre). Among the untreated group, the grade 2 goitre was found to be 36.0% and 48.6% among the 5-11 yrs. and 15-45 yrs. males respectively (the area was not endemic, so no treatment was given during Lipiodol injection campaign programme).

Similarly, grade 2 goitre was found to be 16%, and 40% among the 5-11 yrs. and 15-45 yrs. females respectively of the treated group. Grade 2 goitre was found among 36.0 % and 77.8% of 5-11 yrs. and 15-45 yrs. females of the untreated group respectively.

Urinary iodine level among the respondents of the area covered and not covered with lipiodol is shown in table 2.

**Table 2. Percent distribution of the respondents according to urinary iodine level**

| Sex (Age) | Area covered with Lipiodol Injection | | | | Total | Area not covered with Lipiodol Injection | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | Urinary iodine level, µg/dl | | | | | Urinary iodine level, µg/dl | | | | |
| | Total Sample | <2.0 Severe | 2.0-4.99 Moderate | 5.0-9.99 Mild | | Total Sample | <2.0 Severe | 2.0-4.99 Moderate | 5.0-9.99 Mild | |
| Boys | 20 | 0.0 | 0.0 | 25.0 | 25.0 | 26 | 61.5 | 34.6 | 3.8 | 100.0 |
| (5-11 Yrs.) | | (0) | (0) | (5) | (5) | | (16) | (9) | (1) | (26) |
| Girls | 25 | 0.0 | 0.0 | 4.0 | 4.0 | 27 | 66.7 | 29.6 | 3.7 | 100.0 |
| (5-11 Yrs.) | | (0) | (0) | (1) | (1) | | (18) | (8) | (1) | (27) |
| Male | 22 | 0.0 | 4.5 | 36.4 | 40.9 | 24 | 72.0 | 20.8 | 4.2 | 100.0 |
| (15-45 Yrs.) | | (0) | (1) | (8) | (9) | | (18) | (5) | (1) | (24) |
| Female | 26 | 0.0 | 11.5 | 38.5 | 50.0 | 24 | 87.5 | 12.5 | 0.0 | 100.0 |
| (15-45 Yrs.) | | (0) | (3) | (10) | (13) | | (21) | (3) | (0) | (24) |
| Total | 93 | 0.0 | 4.3 | 26.0 | 30.3 | 101 | 72.7 | 24.4 | 2.9 | 100.0 |
| | | (0) | (4) | (24) | (28) | | (73) | (25) | (3) | (101) |

Number of respondents are given in parenthesis

Among lipiodol treated respondents, only 4.3% had the urinary iodine level within the range of 2.0-4.99 µg/dl i.e moderate and 26% were within the range of 5.0-9.99 µg/dl i.e. mild iodine deficiency Rest of the subjects were in normal r range. In area not covered with lipiodol injection, all of the respondents had their urinary iodine level lying below the cut off point (<10 µg/dl). Of iodine deficiency, 72.7% were severely iodine deficient (UIE <2.0 µg/dl), 24.4% within the range of 2.0-4.99 µg/dl i.e. moderate and only 2.9% were with the range of 5.0-9.99 µg/dl i.e. mild iodine deficiency.

Table 3 shows the median values of urinary iodine level of the respondents of the areas covered and not covered with lipiodol injection.

**Table 3. Median values of urinary iodine of respondents**

| Sex (Age) | Area covered with Lipiodol Injection | | Area not covered with Lipiodol Injection | |
|---|---|---|---|---|
| | Total Sample | Median urinary iodine(μg/dl) | Total sample | Median Uurinary iodine(μg/dl) |
| Boys (5-11 Yrs.) | 20 | 14.1 | 26 | 1.7 |
| Girls (5-11 Yrs.) | 25 | 18.5 | 27 | 1.2 |
| Male (15-45 Yrs.) | 22 | 12.5 | 24 | 2.1 |
| Female (15-45 Yrs.) | 26 | 11.2 | 24 | 0.7 |
| Total | 93 | 14.1 | 101 | 1.2 |

Among the total respondents of area covered with lipiodol, the median value for 5-11 yrs. age groups were 14.1 and 18.5 μg/dl and of 15-45 yrs. of age group were 12.5 and 11.2 μg/dl for males and females respectively. The overall median urinary iodine level was 14.1 μg/dl. The median values of urinary iodine of respondents of the area not covered with lipiodol were 1.7 μg/dl for 5-11 years boys, 2.1μg/dl for 15-45 years males, 1.2μg/dl for 5-11 years girls and 0.7 μg/dl for15-45 yrs. females. All the respondents were found biochemically iodine deficient in this group (untreated).

**Discussions**

Endemic goitre is easy to prevent. For developed countries and a number of developing countries this confident remark has been fully justified by subsequent experience. Many countries have been using prophylactic iodine for quite sometime and the incidence of iodine deficiency disorders has notably declined in these countries.

In this study, the therapeutic effect of iodized oil injection on goitre was illustrated by the fact that one year after treatment, more than 70 percent of the grade 2 goitre has reverted to grade 1. Similar results were obtained in previous studies done by Pretell and Watanabe et al. using intramuscular iodized oil[9, 10].

A very high prevalence rate of goitre was found among the respondents of the area not covered with injection (Belabo) during this study. For the injection

campaign program of 1992 only those spots were selected where the goitre rate was more than 30 percent. According to 1981 goitre goitre survey[11] prevalence of goitre at Belabo was not so high, therefore it was excluded from the program. After 13 years goitre prevalence increased and in 1994 the rate of the total goitre was 96.2% for male and 100% for female respondents in this area.

It was observed that the rate of goitre was high among the female adults than the males. This may be due to the increased physiological need at child bearing age. Moreover the greater vulnerability of pregnant womens towards iodine deficiency to meet the higher foetal requirement for growth and development. Similar observation was also reported in a study by Malvaux et al[12] who showed that before treatment, the frequency of goitre seemed to be increased with age in both sexes until puberty, after which it decreased, but to a lesser degree among females.

The median urinary iodine level of lipiodol injected respondents was found 14.1μg/dl, where the values were 13.3 μg/dl for male and 14.8 for female, which are almost close to each other. The value is higher than the cut-off point (<10.0 μg/dl) which may be due to excess excretion of iodine after lipiodol injection was given, Similar result was reported by Thilly et al.[13] The median urinary iodine level was very low (average 1.2 μg/dl) in the untreated group.

The result reported in this paper shows that a single injection of slowly resorbable iodized oil administered to a population of severely endemic goitrous area constitute a simple effective way of treating and preventing endemic goitre. Although iodized salt is rapidly and rightly becoming the global method of combating iodine deficiency; but in the initial stage of universal salt iodization there will always be groups of people for whom iodized salt alone will not be sufficient to control the deficiency. These people will need alternative iodine prophylaxis.

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