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Prevalence of goiter and utilization of iodized salt among rural residents

KEYWORDS: Prevalence of goiter, IDD, iodized salt

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ABSTRACT Iodine deficiency disorders have always been an endemic problem in India. This study tried to find the prevalence of goiter among 6-12 year old children and assess the level of iodine content in common salt at the consumption point in a block of Jorhat district, Assam.

Methodology: Cross-sectional community based study done in a block of Jorhat district, Assam.

Results: Prevalence of goiter was found 4.8% clinically among the 6-12 year old children with 4.04% of grade-I goiter. The prevalence was maximum (7.33%) in the age group of 10 to 12 years. Goiter was more common among males (10.44%). Most of the salt samples (85%) tested had adequate iodine content (>15 ppm).

Conclusion: The present findings revealed that goiter is no more a public health problem in the study area and iodine content in the salt samples tested were found to be adequate.

Introduction

Iodine deficiency disorders have always been an endemic problem in India. With the Himalayan goiter belt running through the northern frontier of the nation (Park K., 2013), Indian terrain is naturally susceptible to Iodine deficiency disorders (IDD). Indian Council of Medical Research (ICMR) in its studies since 1950 has clearly demonstrated that the prevalence of IDD was more than 10% (endemic) in 263 of the 325 districts surveyed (Pandav C.S. et al., 2013). In the context of Assam, it was reported that of the 23 districts surveyed, 14 were endemic. Highest prevalence was observed in Lakhimpur (40.2%). Jorhat showed goiter prevalence of 13.2% (Kapil U., 2007).

IDD is said to be present in an area when the total goiter rate in school aged children is more than or equal to 5% (WHO/UNICEF/ICCIDD, 1993). Hence, studying goiter can bring about a readily available representation of the disease endemicity.

Inspite of being one of the most common deficiency disorders, iodine deficiency is preventable through Universal Salt Iodization (USI). Iodization of common salt is one of the most economic of all the public health initiatives and also the most effective prophylactic measure (Tiwari B.K., 2006). Mere addition of iodine to common salt for consumption has brought about drastic fall in the prevalence of Iodine deficiency disorders worldwide (WHO, 2013). With the advent of newer scientific evidence regarding the impact of iodine deficiency throughout the course of life and its endemicity in India (Kochupillai N., et al., 1986), it was decided to iodize all edible salt in India from 1992 (Pandav C.S., et al., 1984).

School aged children (6-12 years) are one of the most vulnerable to developing goiter (WHO/UNICEF/ICCIDD, 1992; WHO/UNICEF/ICCIDD, 1993). Newborns, infants and preschool children are also highly susceptible to IDDs, but clinical evaluation of them for goiter sometimes becomes difficult (WHO/UNICEF/ICCIDD, 1992). Further, the 6-12 year old children can be easily accessed either at home or in school. So it is only reasonable that the current study be undertaken in this age group.

Keeping this in mind, this study was undertaken with the following objectives:

1) To find the prevalence of goiter amongst children aged 6-12 years in a block of Jorhat district, Assam?
2) To find the level of iodine in common salt at household level in a block of Jorhat district, Assam?

Methodology:

The study was conducted in Jorhat district of Assam from July 2015 to June 2016. Considering 50% prevalence, and 10% of *p* as allowable error, the sample size (n) was calculated to be equal to 384. It was calculated using the formula

$$n = \frac{z^2 pq}{d^2}$$

where, z= 1.96, hence z^2 = 3.14 for 95% confidence interval
p= positive character (anticipated prevalence) taken to be 50%
q= (1-p) taken to be (1-0.5) = 0.5
d= allowable error taken to be 10% of prevalence (50%)

A multistage sampling design was undertaken in the study. Out of the seven medical blocks of Jorhat district, Titabor block was selected in the first stage by Simple Random Sampling (SRS). Then the Primary Health Centre (PHC) list was obtained from Titabor medical block. Using random number table, 3 PHCs were selected. Then from each PHC, 2 Subcenters (SC) were selected as the next level of sampling. Village list of each SC was obtained and using SRS, 3 villages were chosen from each SC. Thus, a total of 6 villages from each PHC and a total of 18 villages from the block were chosen for data collection. The final stage of sampling was done at the household level. In each village, data on the total number of households was ascertained from the Subcentre ANM or village ASHA. From that data, 22 households were selected from each village using systematic random sampling. A total of 396 households were thus visited during the study period.

Salt samples were also analyzed from 10% of the total sample size to determine the level of iodine present in household common salt using the Rapid salt testing kit for iodized salt. A total of 40 samples were analyzed during the study. Systematic random sampling was utilized to select every 10^{th} household for salt testing.

Ethical clearance was obtained from the Institutional Ethics Committee (Human) of the Jorhat Medical College, Jorhat prior to the start of the study.

Observations and results:

Socio-demographic profile

Socio-demographically, most of the children (43.18%) were from the age group of 6-8 years. Majority were Hindus (85.61%) and females (54.04%). It was observed that most of the subjects belonged to class-IV socio economic status (30.40%) as per Modified B. G. Prasad's Scale (updated for August 2015).

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Figure 1: Prevalence of goiter (n=396)

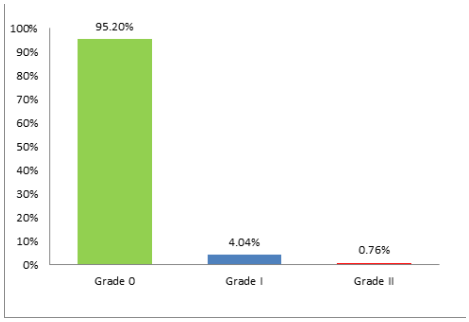
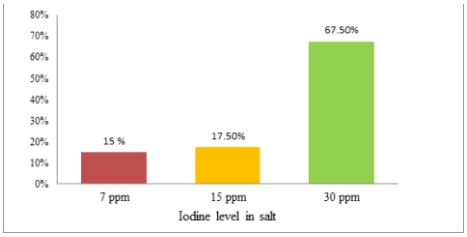


Table 1: Association of age and sex with goiter

Characteristics	Goiter (n=396)		Total (%)*	p value
	Absent (%)	Present (%)		
Age (years)				
6 to 8 years	168 (98.25)	3 (1.75)	171 (100)	<0.05#
8 to 10 years	70 (93.33)	5 (6.67)	75 (100)	
10 to 12 years	139 (92.67)	11 (7.33)	150 (100)	
Sex				
Male	163 (89.56)	19 (10.44)	182 (100)	<0.0001#
Female	214 (100)	0 (0)	214 (100)	

* row total # significant at 95% confidence interval

Figure 2: Level of iodine in common salt (n=40)



Prevalence of goiter

In the present study the prevalence of goiter was found clinically in 4.8% of the total 396 subjects examined. The prevalence of grade-I goiter was recorded 4.04% while grade-II goiter was 0.76% (Figure-1).

Maximum prevalence (7.33%) of goiter was observed in the age group of 10 to 12 years. It was observed that as the age increases the prevalence of goiter also increased and it was found to be statistically significant at 95% confidence interval (p value = 0.0461) (Table-1).

Goiter was more common among males (10.44%) with none of the female subjects being affected. A highly statistically significant association was found between the sex of the subject and the presence or absence of goiter (p value < 0.0001) (Table-1).

Level of iodine in common salt

A total of 40 salt samples were tested for its iodine content using the rapid testing kit. Most of the salt samples (85%) tested had adequate iodine content (>15 ppm) (Figure-2).

Discussion:

Prevalence of goiter

The current study revealed that the prevalence of goiter was 4.8% among the 6 to 12 year old children (Figure-1). This is very similar to the study done by Toteja GS, et al., 2004 where they found the overall prevalence of goiter as 4.78%. Similar findings were also observed in other study (National Institute of Nutrition, 2014-15). This study however differs from numerous other studies where prevalence of goiter ranged from 9.8% to 42.2% (Patowary S, et al., 1995; Chelleng P.K., et al., 1996; Ramesh, et al., 2013; Khan S.M.S., et al., 2014).

Increased awareness and availability of iodized salts, with change in consumption behavior of non-iodized salt to iodized salt by the study population may explain the low prevalence of goiter in our study. Iodized salt may have replenished the iodine deficit among the study subjects and thus led to the low prevalence rate of goiter which is now observed to be below the level of public health importance.

Grades of goiter

In the present study, it was observed that grade-I goiter was more common (4.04%) than grade-II (0.76%) (Figure-1). In conformity to our findings most of the earlier studies found that grade-I goiter was more common than grade-II goiter (Chandra A.K., et al., 2006; Das D.K., et al., 2008; Chandra A.K., et al., 2008; Misra S., et al., 2007; Chandwani H.R., et al., 2012; Ramesh, et al., 2013).

The lower prevalence of grade-II goiter implies the transition of iodine deficient status of the population to an iodine replenished status. With adequate levels of iodine in salt, the spectrum of IDDs tends to decrease and so also the grade of goiter.

Goitre with age

On comparing the prevalence of goiter with age, it was observed that goiter prevalence increases with advancement of age. A maximum of 7.33% prevalence of goiter was observed in the 10 to 12 years age group compared to 6.67% and 1.75% in the age groups of 8 to 10 years and 6 to 8 years respectively (Table-1).

The results are similar to other studies done in the past. The study conducted by Pandor J.M., et al., in 2011 in Gujarat found that the overall prevalence of goiter was highest 22.7% in 10 years, 20.7% in 11 years and 21.9% in 12 years of age. Other studies from Kerala and Jammu and Kashmir showed similar pattern in the age distribution of the goiter (Ramesh, et al., 2013; Khan S.M.S., et al., 2014). This can be explained by the fact that as the child progresses toward adolescence, his iodine requirement increases to meet the need for the growth spurt. This increased requirement cannot be met due to low iodine level in body and hence, hypertrophy of the thyroid gland occurs to improve iodine capture resulting in goiter.

Goiter with sex

It was observed that goiter was more prevalent among males 10.44% as compared to females (Table-1). The results are similar to a few other studies. The study done by Khan S.M.S., et al. in 2014 found that males 21.2% were more commonly affected than females (16.7%). Similarly in Bandipura district of Kashmir valley in 2014, it was observed that goiter among females (45.9%) was less common than in males (50.7%) (Pandit M.I., et al., 2015).

However, Chelleng P.K., et al., in 1996 contradicted our results. In their study male female ratio of goiter prevalence was 1:4.2. Prevalence of goiter has been observed to be more common in females in numerous earlier studies (Pandor J.M., et al., 2011; Ramesh, et al., 2013).

We could not explain why male children were affected more and it demands further in depth study to explain the cause of male preponderance.

Level of iodine in common salt

During the course of the present study, a total of 40 salt samples were tested for their iodine content. It was observed that 15% of the samples had inadequate iodine level (<15 ppm) as against 85% samples with 15 ppm or more iodine (Figure-2).

The results are similar to the findings of the National Iodine and Salt Intake Survey 2014-15 where only 14% of the households in India were observed to be still consuming inadequately iodized salt (5-14.9 ppm) ("India moves one step closer to achieving Universal Salt Iodization," 2015). Studies conducted in Gujarat and Mizoram also had similar findings (Chandwani H.R., et al., 2012; National Health Mission, Mizoram, 2014-15). On the contrary, in the national level

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study conducted in 15 districts of India by Toteja GS, et al., in 2004, it was observed that adequate iodine content was present only in 55.45% of the salt samples tested. Similarly in other past studies adequate level of iodine in edible salt ranged between 54.3% and 57.7% (Misra S., et al., 2007; Chandra A.K., et al., 2008; Kapil U., et al., 2014).

The high prevalence of adequate iodine in salt in our study may be implicated to the improved IEC materials regarding the correct storage practices of salt. Moreover only iodized salt is readily available in the consumer market in this part of India. Salt transport to the north-eastern region is primarily through railways with regular monitoring of salt iodine level by the Salt Commissioners Office. Hence, iodine level was seen to be adequate than the other earlier studies.

Conclusion:

From our present study, we found that NIDDCP has been a success in the community and we conclude that goiter is no more a public health problem in the study locality.

Conflict of interest:

The authors declare no conflict of interest.

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