Original Article

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Evaluation of Goitre and its Sociodemographic Risk Factors among Rural School Children of Kancheepuram, Tamil Nadu, India

Community Section

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ABSTRACT

Introduction: Iodine Deficiency Disorders (IDDs) are one of the most important disorders of childhood affecting the brain development. It is marked by a diffuse enlargement of the thyroid gland, known as goiter. A district is said to be endemic for goiter when its prevalence is >10% in the general population. Despite several national policies to rectify the problem, goiter seems to continue to persist as a major public health problem.

Aim: This study was done to evaluate the prevalence of clinical goiter among school going children and their salt consumption pattern.

Materials and Methods: This cross-sectional study was carried out among 670 school students between 6-14 years of age studying in rural schools of Kancheepuram, Tamil Nadu, India. The students were selected from five schools. The sampling method used was Probability Proportional to Size (PPS). A pretested structured interview schedule was used to collect information regarding the sociodemographic factors. Clinical examination was carried out and salt samples were procured for testing the iodine levels. Data collected was analysed using SPSS version 17.0.

Results: In present study, 388 (57.9%) were males and 282 (42.1%) were females and belonged to the age group of 6-14 years. The overall prevalence of goiter was 6.6%. About 43.5% of the participants consumed salt procured from petty shops. In 46.6% of the samples, the level of iodisation was between 7 to 14.99 ppm. It was observed that age, socioeconomic status, family history of goiter and iodisation levels <15 ppm were significant risk factors for goiter (p<0.0001).

Conclusion: This study shows that goiter still continues to be a major public health problem in Kancheepuram, Tamil Nadu, India. The public health authorities should ensure public awareness about the effects of IDDs and the need to consume adequately iodised salt. The availability of adequate and regular supply of iodised salt should be ensured.

Keywords: Iodine deficiency disorders, Salt iodisation, Thyroid dysfunction

INTRODUCTION

Goitre is a diffuse enlargement of the thyroid gland due to various causes of which iodine deficiency is one among them. IDD are a major public health problem globally affecting 130 countries and 13% of world's population [1]. IDD constitutes the single largest cause of preventable brain damage worldwide leading to learning disabilities and psychomotor impairment. WHO estimates that 12% of the world population is currently affected by goiter [2]. It is the first cause of preventable and irreversible brain damage in children. The term "endemic goitre" refers to enlargement of the thyroid gland due to insufficient iodine in the daily diet in a significantly large fraction of a population. According to the guidelines by WHO, a district is said to be endemic when the prevalence of goitre is >10% in the general population and the prevalence of goitre among primary school children aged 6-12 years is over 5% [3].

The consequences of iodine deficiency on health are the results of hypothyroidism which includes the implications on reproductive functions and lowering of IQ levels in school aged children by as much as 13.5 points as compared to children living in iodine sufficient areas [4]. It has been recognised that IDD starts before birth, affects child's mental health and often their survival. In pregnancy, severe iodine deficiency can lead to stillbirth, spontaneous abortion and congenital abnormalities like cretinism. It also leads to mental impairment that reduces intellectual capacity at home, in school and at work [5].

Recognising the importance of preventing IDD, the World Health Assembly adopted in the year 1990 the goal of eliminating iodine deficiency as a public health problem. In 1993, WHO and UNICEF recommended Universal Salt Iodisation (USI) as the main strategy to achieve complete elimination of IDD [6]. Since then, there has been a major effort to introduce salt iodisation as a safe, cost effective and sustainable strategy to ensure sufficient intake of iodine in deficient areas. Worldwide, iodised salt programs are now implemented in many countries, and two thirds of the world's population (71%) is currently estimated to be consuming adequately iodised salt [7].

According to WHO, at least 1,500 million people, or 29% of the world's population, live in areas at risk of iodine deficiency and 54 countries are still iodine deficient despite the efforts taken over the past decades [8]. Till date worldwide, only 50% of the population who are currently consuming iodised salt, have made substantial progress towards elimination of IDD [9]. 30 countries where IDDs are known or likely have, yet to report any control activities [10].

IDD constitute a major public health problem in India. Of the estimated 200 million people, who were affected by IDD, 71 million have goitre, 2.2 million suffer from cretinism and 6.6 million have neurological deficits [11,12]. It is now known that one out of every five people in India is at the risk of being affected by IDDs due to deficiency of iodine in the soil of the subcontinent and consequently the food derived from it due to various environmental reasons [13]. According to a survey done by the Health and Family Welfare Department in Tamil Nadu, India the prevalence was 10% of which, Chennai showed prevalence rate of 10.2% and Kancheepuram district showed a prevalence rate of 7.9% [14].

Considering the public health importance of IDD in India, the Government of India launched the National Goitre Control Program (NGCP) in 1962. The program was renamed as National Iodine Deficiency Disorders Control Programme (NIDDCP) in 1992 and USI was identified as the main strategy to eliminate IDD from India. In 1997, iodisation of salt was made mandatory in India. Although,

the ban on the sale of non iodised salt was lifted in 2000, it was again reinstituted in 2005 [15]. However, a deeper understanding into the knowledge and behavior patterns relating to iodised salt consumption is deemed necessary to alleviate this problem.

Based on this background, this study was planned with the objective of estimating the prevalence of clinical goitre among school going children aged 6 to 14 years and their salt consumption pattern in a rural area of Kancheepuram.

MATERIALS AND METHODS

The present study was carried out as a community based cross-sectional study. It was conducted amongst the school children aged 6-14 years, studying in five different schools in the Sripuram area of Kancheepuram district, which is the rural field practice area of Sree Balaji Medical College and Hospital, Bharath University, Chennai, Tamil Nadu, India. The study was planned and carried out during the period from July 2015 to February 2016.

According to an earlier study done by Pandav CS et al., the prevalence of goiter among school children was found to be 13.5% in rural area of Tamil Nadu, India [11]. Based on this prevalence, with a 95% level of significance and 20% relative precision, the sample size was calculated to be 615. Accounting 10% for non response and dropouts, the sample size was derived to be 670.

The study sample was identified based on the following inclusion criteria; school going children, aged between 6-14 years or studying in class I to VIII, residing in Sripuram area and whose parents have consented for participating in the study. The present study did not include those students and/or parents who were not willing to participate.

There were a total of 10 schools located in Sripuram area. Each school was approached individually to get permission to conduct the study among their students after explaining about the purpose of the study. Out of the 10 schools approached, only five school authorities granted permission to conduct the study. The total number of students in all five schools from class 1 to class 8 was found to be 1385. The required sample size of 670 was selected from these schools using PPS sampling method. The individual student from each school was selected using simple random sampling.

The Institutional Ethics Committee approved the study protocol. The participants were explained about the nature of the study and signature was obtained in the consent form from each student and their parents before conducting the data collection and examination. The informed consent form was in both English and Tamil.

The data collection was done using a pretested structured questionnaire. Pilot testing was carried out on 30 students from a different school in order to validate and standardise the questionnaire. This pilot tested sample numbers were not included in the data analysis.

Two different types of questionnaires were used for data collection. The first one consisted of participant's background history, diet history and details of clinical examination. Another self administered questionnaire was given through the students and parents were requested to send the filled questionnaire. The questionnaire consisted of questions regarding family profile, socioeconomic status, amount and nature of the salt used for cooking, family history and medical history of goiter.

Each of participants were given a resealable pouch and was requested to bring half a teaspoon of salt from their kitchen, which was later, tested for iodisation levels using Rapid Test Kits (RTK). The iodine content of the salt samples was estimated using standardised iodine testing kits for spot testing, manufactured by MBI Kits International, Chennai, India, which are used in the NIDDCP of India and expressed as iodine in parts per million [16]. Clinical examination was conducted by the investigators who were trained in the examination of neck for detecting goitre. Health assistants, staff nurses and interns were involved in carrying out the interview.

Assessment of size of thyroid glands: The clinical examination for the presence of goitre was done by palpation of the neck for the presence of nodules. In young children, the gland was considered to be enlarged if it was 4-5 times the normal size, i.e., twice the size of the thumb of the examiner. If nodules were present, the gland was considered to be goiterous. In adolescent children, the gland was considered to be enlarged when nodules are present or when the gland is enlarged thrice the size of the examiner's thumb [17]. To avoid exaggerating the prevalence recorded, doubtful enlarged glands were classified as normal.

Examination technique: Students were examined in standing position while the examiner stands behind the child with the head of the child slightly flexed to relax the neck muscles. The thyroid area is examined for any obvious swelling. The full extent of the thyroid area is palpated with both the thumbs simultaneously very gently.

The WHO criteria were used for grading the goitre based on the examination of thyroid gland [Table/Fig-1] [18].

Grade	Description
Grade 0	Persons without goitre (thyroid both impalpable and invisible)
Grade 1	Persons with neck thickening as a result of enlarged thyroid, palpable goitre, not visible in normal position of neck. Includes nodular goitre also.
Grade 2	Neck swelling, visible when the neck is in normal position, corresponding to enlarged thyroid found in palpation.

[Table/Fig-1]: WHO criteria for grading of goitre.

Operational Definition of Goitre: An abnormal increase in the size of the thyroid gland is called goitre [19].

STATISTICAL ANALYSIS

Data collected was analysed using SPSS version 17.0. Results were expressed in frequency and chi square test was used to check for any association. Association between the prevalence of goiter with age, gender, socioeconomic status, family history and level of iodisation were checked. A p-value <0.05 was considered as statistically significant.

RESULTS

A total of 670 students participated in the present study. Among the study participants, 388 (57.9%) were males and 282 (42.1%) were females and belonged to the age group of 6-14 years. About 380 (56.7%) participants belonged to middle socioeconomic class as per revised BG Prasad Scale (2014). The background characteristics of the study participants are given in the [Table/Fig-2].

Characteristics	Male (n=388) (%)	Female (n=282) (%)	Total (n=670)	Total (%)
Age (in years)				
6-8	167 (24.9)	138 (20.6)	305	45.5
9-11	133 (19.9)	103 (15.4)	236	35.3
12-14	88 (13.1)	41 (6.1)	129	19.2
Socioeconomic status of the students (based on revised BG Prasad scale-2014)				
Upper class	0 (0)	0 (0)	0	0
Upper middle class	5 (1.3)	6 (2.1)	11	1.6
Middle class	222 (57.2)	158 (56.0)	380	56.7
Lower middle class	161 (41.5)	117 (41.5)	278	41.5
Lower class	0 (0)	1 (0.4)	1	0.2

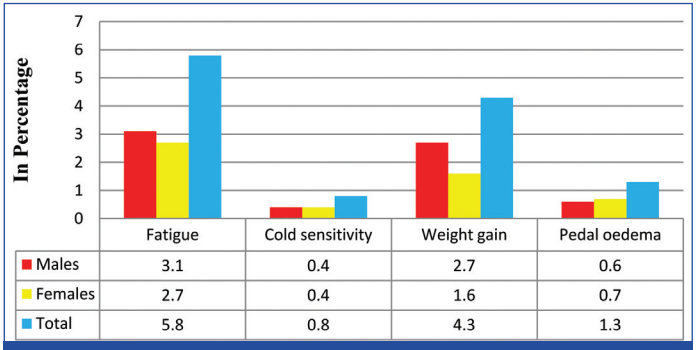
[Table/Fig-2]: Background characteristics of study participants.

The particulars regarding procurement and consumption of salt and the details regarding iodisation levels in the samples are given in [Table/Fig-3]. It was observed that 628 (93.8%) of the participants consume non vegetarian food, 292 (43.5%) participants purchased the salt from petty shops. It was observed that in 312 (46.6%) samples, the iodisation levels were between 7-14.99 ppm, while in 298 (44.5%) samples, the levels were between 15-30 ppm.

Characteristics	Total (n=670)	Total (%)
Type of diet		
Vegetarian	42	6.2
Non vegetarian	628	93.8
Purchase of salt		
Petty shops	292	43.5
General stores	193	28.8
Ration shops	182	27.2
Storage of salt at house hold level		
Container without lid	342	51
Container with lid	328	48.9
Amount of salt used per day for cooking (in teaspoon; 1 teaspoon=5.69 grams)		
<1 tsp	8	1.2
1-2tsp	39	5.8
≥2 tsp	623	93
Level of iodisation of salt (in ppm) (using RTK)		
0 (totally non iodised)	23	3.4
0.1-6.99 (non iodised)	37	5.5
7-14.99 (inadequately iodised)	312	46.6
15-30 (adequately iodised)	298	44.5

[Table/Fig-3]: Procurement and consumption of salt among the study participants.

The symptoms specific for thyroid dysfunction are given in [Table/Fig-4]. In present study, 5.8% of the students had fatigue, 0.9% of them complained of cold sensitivity, 4.3% had increased weight gain inspite of normal eating habits and 1.3% of them had bilateral pedal oedema occasionally.



[Table/Fig-4]: Symptoms of thyroid dysfunction among the study participants.

The prevalence and grading of goiter as per WHO classification is given in [Table/Fig-5]. The overall prevalence of goiter was 6.6% (95% CI; 4.7-8.5). Grade 2 goiter was present in 12 (1.8%) participants, while Grade 1 was present in 32 (4.8%) participants.

Prevalence	Frequency	Percentage	95% CI
Grade 0	626	93.4	91.52-95.28
Grade 1	32	4.8	3.18-6.41
Grade 2	12	1.8	0.79-2.80
Total goitre prevalence	44	6.6	4.72-8.47

[Table/Fig-5]: Prevalence and grading of goiter among study participants.

The association between goitre and background characteristics is given in [Table/Fig-6]. Age, socioeconomic status and family history of goitre were significant risk factors. It was observed that children between 6-10 years were at significantly higher risk of goiter compared to children between 11-14 years {Odds Ratio (OR)-8.6; p-value<0.0001}. Goitre was higher among children of low socioeconomic status. A positive association was seen between children from lower socioeconomic status {OR-34.94; p-value<0.001}.

Character-istics	n=670	Goitre (n=44) (%)	Chi square	Odds ratio	95% CI	p-value
Age (in years)						
6-10	425	41 (93.2)	17.9	8.6	2.6-28.1	0.0001*
11-14	245	3 (6.8)				
Sex						
Female	282	20 (45.5)	0.2	1.16	5.8-61.9	0.639
Male	388	24 (54.5)				
Socioeconomic status						
Lower class	279	42 (6.26)	56.1	34.46	8.3-145.67	0.0001*
Middle class	391	2 (0.29)				
Diet						
Vegetarian	42	5 (11.4)	2.1	2.04	0.7-5.5	0.149
Non vegetarian	628	39 (88.6)				
Family history of goitre						
Present	45	14 (31.8)	47.3	8.9	4.3-18.5	0.0001*
Absent	625	30 (68.2)				
Level of iodisation						
0-14.99 ppm	59	36 (81.8)	312.6	117.9	49.3-282.1	0.0001*
15-30 ppm	611	8 (18.2)				

[Table/Fig-6]: Association between goitre and background characteristics of study participants.
p-value <0.05 is statistically significant at 95% CI

Similarly, family history of goitre was a potential risk factor for goitre compared to the absence of family history of goitre {OR-8.9; p<0.0001}. Similarly, iodisation levels <15 ppm were significantly at risk for goitre development {OR- 117.9; p-value<0.0001}.

DISCUSSION

To assess the IDDs in a region, school children of age 6-14 years are considered as true representatives of community and are sampled to investigate the iodine status in general population, as they are more vulnerable and easily accessible through schools. Chronic iodine deficiency results in goitre and hence, can be used as a baseline assessment of a region's iodine status and also as an indicator for the success of a program that intervenes iodine deficiency. Hence, the prevalence of goitre is used as an indicator to measure the degree of IDDs in the study area.

The overall prevalence of goitre (both grade 1 and grade 2) in this study area was found to be 6.6% (44), which is similar to the findings of Pradhan et al., done among 6-12 years school going children of urban areas of Udaipur, Rajasthan, India [19]. A recent study done by Pandav CS et al., conducted in Tamil Nadu showed a total goitre prevalence rate of 13.5% [20]. A study conducted by Zama SY et al., among school children aged 6-12 years, in Chamarajanagar, Karnataka, India was in accordance with the current study, which showed a total goitre prevalence of 7.74% [21].

On analysing the relationship of the prevalence of goitre with age, it was observed that the overall prevalence of goitre was higher among younger children, a study done by Kamath R et al., showed similar results [22]. Another study done by Sarkar S et al., showed that the prevalence of goitre among school children aged 9-13 years was 15.24% where as significant association was found between

goitre and age of the children [23]. The probable reason for higher prevalence of goitre among the children of age 6-10 years is that malnutrition is higher among that age group.

In the present study, a positive association was found between socioeconomic status of the children and the presence of goitre. A higher prevalence of goitre was found among the children who belonged to lower socioeconomic status (p-value<0.0001). Similarly, Knudsen N et al., in his study showed that improving the socioeconomic status of the population has an improvement on reducing the prevalence of endemic goiter [24].

In the present study, a statistically significant association was found between prevalence of goitre among study participants and family history of goiter (p-value <0.0001). Similar results were seen in study done by Mesele M et al., [25]. This indicates the importance of genetic predisposition in development of goitre.

WHO recommends that 91% of households should consume adequately iodised salt to achieve USI. In the present study, the number of households consuming adequately iodised salt (15-30 ppm of iodine) was found to be 44.5%, around 46.6% consumed inadequately iodised salt (7-14.99 ppm of iodine) and 8.9% of them consumed non iodised salt (0-6.99 ppm). This finding showed that the USI program in the state is not universally implemented. The prevalence of goitre was higher among those children who were consuming inadequately iodised salt.

A significant association was found between the prevalence of goitre and the consumption of inadequately iodised salt (p-value <0.001). Similar results were seen in National Family Health Survey-3 report [26]. Raveesh PM et al., in his study done in Kashmir, India showed that 32.82% of salt samples collected from retail shops were non iodised, 22.56% samples were inadequately iodised and only 44.62% of samples were adequately iodised [27]. Similarly, in the study by Jyothsna PM et al., among school children in Gujarat, India, showed that 93% households were using iodised salt with >15 ppm iodine, 2% with <15 ppm and 5% with no iodine [28].

In the present study, the common symptoms of thyroid dysfunction were fatigue (5.8%), weight gain (4.3%), pedal oedema (1.3%) and cold sensitivity (0.8%). Similarly a study done by Singh A et al., found that the symptoms of thyroid dysfunction were weight gain (49.2%), non pitting oedema (41%) and heat intolerance (75%) along with other symptoms [29].

LIMITATION

In the present study, the investigators could not verify personally the data collected from the households regarding the procurement of salt and other relevant information provided by the parents of the children. Moreover, urinary iodine excretion is a good marker of recent dietary iodine intake however, for the present study, urinary iodine excretion levels were not estimated due to non feasibility of doing the test.

CONCLUSION

The present study shows that the overall prevalence of goitre was 6.6% in the study area of Kancheepuram District, Tamil Nadu, India indicating that it is still an endemic area, according to the criterion of goitre endemicity by World Health Organisation. This reveals that goitre is still a public health problem in our country. Factors such as age, socioeconomic status, family history of goitre and level of iodisation had significant effect on occurrence of goitre. More effort is, therefore, needed to bring down the prevalence of goitre to below 5% level to make the district non endemic. People should be given adequate knowledge about the effects of IDDs and the need to consume adequately iodised salt. The availability of adequate and regular supply of iodised salt should be ensured. Widespread health education and awareness creation should be practiced so that the public is motivated to consume iodised salt to prevent occurrence of IDDs.

REFERENCES

[1] Vir SC. Current status of Iodine Deficiency Disorders (IDD) and strategy for its control in India. Indian J Pediatr. 2002;69(7):589-96.
[2] Assessment of iodine deficiency disorders and monitoring their elimination. A guide for programme managers. Third edition (updated 1st September 2008). World Health Organization, UNICEF, ICCIDD. Available from: http://www.who.int/nutrition/publications/micronutrients/iodine_deficiency/9789241595827/en/. [Last accessed Oct 15,2017].
[3] Andersson M, Karumbunathan V, Zimmermann MB. Global iodine status in 2011 and trends over the past decade. J Nutr. 2011;142:744-50.
[4] Bleichrodt N, Born MP. A meta-analysis of research on iodine and its relationship to cognitive development. In: Stanbury JB. The damaged brain of iodine deficiency-Cognitive behavioral, neuromotor, educative aspects. NewYork: Cognizant Communication Corporation. 1994. 195-200.
[5] World Summit for Children - Mid Decade Goal: Iodine Deficiency Disorders. UNICEF-WHO Joint Committee on Health Policy. 1994 (JCHPSS/94/2.7). Available from:http://www.ceecis.org/iodine/01_global/01_pl/01_01_1994_summit.pdf. [Last accessed Oct 15, 2017].
[6] WHO Guideline: fortification of food-grade salt with iodine for the prevention and control of iodine deficiency disorders. Geneva: World Health Organization; 2014. P-9. [Available form: https://www.ncbi.nlm.nih.gov/books/NBK254243/pdf/Bookshelf_NBK254243.pdf. Last accessed Oct 15, 2017.
[7] Indicators for Assessing Iodine Deficiency Disorders and their Control Programmes. Report of a Joint WHO/UNICEF/ICCIDD Consultation. Geneva: World Health Organization; (Internet)1992. Available from: http://apps.who.int/iris/bitstream/10665/70715/1/WHO_NUT_94.6.pdf. [Last accessed Oct 15, 2017].
[8] Assessment of the iodine deficiency disorders and monitoring their elimination. A guide for programme managers. 3rd Edition (WHO/ICCIDD/UNICEF). 2007. Available from: http://www.cdc.gov/labstandards/pdf/ equip/EQUIP_Booklet.pdf. [Last accessed Oct 15, 2017].
[9] Zimmermann MB, Jooste PL, Pandav CS. Iodine-deficiency disorders. Lancet. 2008;372(9645):1251–62.
[10] Indicators for assessing iodine deficiency disorders and their control programmes. Review version September 1993. Report of a joint WHO/UNICEF/ICCIDD consultation, 1992. Available from: http://apps.who.int/iris/bitstream/10665/62614/1/WHO_NUT_93.1.pdf. [Last accessed Oct 15, 2017].
[11] Pandav CS, Yadav K, Srivastava R, Pandav R, Karmarkar MG. Iodine deficiency disorders (IDD) control in India. Indian J Med Res. 2013;138(3):418-33.
[12] Notes on Demands for Grants, 2010-2011. Ministry of Health and Family Welfare, Demand No. 46; p109. Available from: http://planningcommission.gov.in/reports/genrep/health/h_fw2010-11.pdf. [Last accessed Oct 15, 2017].
[13] UNICEF. Coverage Evaluation Survey 2009, All India Report. Ministry of Health and Family Welfare, Government of India. Available from:http://www.unicef.org/india/Coverage_Evaluation_Survey_2006.pdf. [Last accessed Oct 15, 2017].
[14] State Health Society, Tamil Nadu Department of Public Health and Preventive Medicine, H&FW, Tamil Nadu. Programme Implementation Plan (2012–13). 2010, Available from: http://www.nrhmtn.gov.in/pip/pip 12_13.pdf. [Last accessed Oct 15, 2017].
[15] Stanbury JB, Ermans AM, Hetzel BS, Pretell EA, Querido A. Endemic goitre and cretinism: Public health significance and prevention. WHO Chron. 1974;28(5):220-28.
[16] Rah JH, Anas AM, Chakrabarty A, Sankar R, Pandav CS, Aguayo VM. Towards universal salt iodisation in India: achievements, challenges and future actions. Matern Child Nutr. 2015;11:483-96.
[17] Activity Report, National Coalition for Sustained Iodine Intake (NCSII), 2009-2010. New Delhi: The Secretariat; ICCIDD.
[18] Perez C, Scrimshaw N, Munoz A. Classification of goitre and technique of endemic goitre surveys. Bulletin World Health Organisation. 1958;18(1-2):217-32.
[19] Pradhan R, Choudhry M. Assesment of iodine deficiency disorders in urban areas of Udaipur district, Rajasthan. Indian Pediatrics. 2003;40:406-09.
[20] Pandav CS, Krishnamurthy P, Sankar R, Yadav K, Palanivel C, Karmarkar MG. A review of tracking progress towards elimination of Iodine deficiency disorders in Tamil Nadu, India. Indian J Public Health. 2010;54:120-25.
[21] Zama SY, Ahmed M, Vadiraja N. Prevalence of goitre in school children of Chamaraja nagar District, Karnataka, India. J Clin Diagn Res. 2013;7(12):2807-09.
[22] Kamath R, Bhat V, Rao R, Das A, Ganesh KS, Kamath A. Prevalence of goiter in rural area of Belgaum District, Karnataka. Indian J Community Med. 2009;34(1):48-51.
[23] Sarkar S, Mohanty B, Basu S. Iodine deficiency in school going children of Pondicherry. Indian J Pediatr. 2007;74(8):731.
[24] Knudsen N, Bulow I, Laurberg P, Ovesen L, Perrild H, Jorgensen T. Low socio economic status and familial occurrence of goitre are associated with a high prevalence of goitre. Eur J Epidemiol. 2003;18(2):175-81.
[25] Mesele M, Degu G, Gebrehiwot H. Prevalence and associated factors of goiter among rural children aged 6-12 years old in Northwest Ethiopia, cross-sectional study. BMC Public Health. 2014;14(1):130.

[26] National Family Health Survey-3. 2005-06: Tamil Nadu Report. P-89 2012. Available from: http://rchiips.org/NFHS/NFHS-3%20Data/TamilNadu_report.pdf. [Last accessed Oct 15, 2017].
[27] Raveesh PM, Ajay Kumar G, Boramma G, Reddy S, Kapate R. Prevalence of iodine deficiency disorders among 6-12 years school children of Gulbarga. Indian J Comm Health. 2014;26,S2:166-69.
[28] Jyotsna MP, Jivraj RD, Navneet GP, Govind LN. A study to measure prevalence of goiter in school children of Narmada district, Gujarat. National Journal of Community Medicine. 2011;2(2):201-03.
[29] Singh A, Purani C, Mandal A, Mehariya KM, Das RR. Prevalence of thyroid disorders in children at a tertiary care hospital in western India. J Clin and Diagn Res. 2016;10(2):SC01-SC04.

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