International Journal of Medical and Pharmaceutical Research
Website: https://ijmpr.in/ | Print ISSN: 2958-3675 | Online ISSN: 2958-3683
NLM ID: 9918523075206676
Volume: 4 Issue:2 (Mar-Apr 2023); Page No: 105-112

Research Article

IJMPR

Study of Prevalence of Iodine Deficiency Disorders and Salt Consumption Patterns in an Urban area of South- West Maharashtra. A Cross Sectional Study

Dr. Kotnis Shubhalaxmi Devdatt[1] Dr. Rokade Hemalata G.[2], Dr. Rohan Bembre[3], Dr Talekar Swati[4], Dr. Dhanashri Kakade[5], Mrs Rajshri Salamwade[6], Dr.Kamalakar Mane[7], Dr, Anurag Gupta[8]

[1]Associate professor, Department of Community Medicine, Dr. Rajarshi Chhatrapati Shahu Maharaj Govt. Medical College, Kolhapur; [2]Assistant professor, Department of Community Medicine, Dr. Vaishampayan. Memorial Government Medical College, Solapur, Maharashtra; [3]Assistant professor. Department of Community Medicine Dr. Vaishampayan. Memorial Government Medical College, Solapur, Maharashtra; [4]Assistant professor, department of Biochemistry, Dr. Vaishampayan. Memorial Government Medical College, Solapur, Maharashtra; [5]Assistant professor, department of Biochemistry Solapur; [6]Assistant professor in statistics. Department of community Medicine, Rajarshi Chhatrapati Shahu Maharaj Govt. Medical College, Kolhapur; [7]Professor, department of Biochemistry. Dr. V.M.G.M.C. Solapur; [8]Assistant professor, department of community Medicine, Rajarshi Chhatrapati Shahu Maharaj Govt. Medical College, Kolhapur

ABSTRACT

Introduction: Globally more than 1•9 billion individuals have inadequate iodine nutrition of whom 285 million are school-aged children. [1]
Nutritional Iodine deficiency could result in abortion, stillbirth, mental retardation, deaf mutism, squint, dwarfism, goitre, neuromotor defects etc. [2] Prevalence surveys of iodine status, including measurement of urinary iodine levels and an analysis of the salt situation is needed for sustained elimination. [3]
It was found in India, 337 districts were endemic for Iodine deficiency disorder i.e., prevalence is >10% [4]. Community based research may be more practical and less costly and possible on a more regular basis. [4,5] Considering this the present study was undertaken to find the recent status of Iodine deficiency disorders in the subpopulation of Maharashtra.
Objectives: To study the prevalence of goitre, median urine iodine levels in 6 to 12 years children. And to study pattern and practices of salt consumption and salt iodine estimation at household level.
Methodology: A cross sectional observational study of 551 children from six randomly selected schools from different localities was done during the period, 1/4/2019 to 1/3/2020.History taking, clinical examination was done and on spot urine sample and household salt sample were collected for iodine estimation.
Results: Prevalence of goitre was 1.45%. Median urinary iodine level was 90mcg/L. 55% of households were having Salts with Iodine content of >15 pp Study shows the Iodine deficiency of mild endemicity in the area. Goitre was not found to be a public health problem.

Key Words: *Goitre survey, Iodine Deficiency Disorder, Urinary iodine level, Pattern of salt use.*

***Corresponding Author**
Dr. Kotnis Shubhalaxmi Devdatt
Associate professor, Department of Community Medicine, Dr. Rajarshi Chhatrapati Shahu Maharaj Govt. Medical College, Kolhapur

INTRODUCTION

Iodine deficiency is the main preventable cause of brain damage in children and therefore constitutes a public-health concern worldwide.1 Assessment of the magnitude of iodine deficiency disorders (IDD) and monitoring of the progress made towards its elimination represent the cornerstone of the strategy for IDD control. [1] Globally more than 1·9 billion individuals have inadequate iodine nutrition (defined as urinary iodine excretion <100 (µg/L), of whom 285 million are school-aged children.[1] Iodine deficiency through its effects on the developing brain, has condemned millions of people to a life of few prospects & continuous underdevelopment. People living in areas affected by severe Iodine deficiency may have an IQ of up to 13.5points below that of those from comparable communities in areas where there is no iodine deficiency [2]. About 31% (900.9 million) of the world's population is estimated to have insufficient iodine intakes, with the most affected WHO regions being South-East Asia and Europe. [2]

Nutritional Iodine deficiency reckons its impact of right from development of the foetus to all ages of human beings. It could result in abortion, stillbirth, mental retardation, deaf mutism, squint, dwarfism, goitre, neuromotor defects etc. [3] A third of India's population (A sixth of the total global population) is at risk of iodine deficiency disorder. [4]

Out of 414 districts surveyed, 337 districts are Iodine deficiency disorder endemic i.e., Prevalence is >10% [4]. In order to eliminate Iodine deficiency from India & to comply with international goals of universal iodization, compulsory iodization of all the table salt was introduced in 1983 & sale of non-iodized salt for direct human consumption was banned in the entire country in 2006.India has National Iodine disorder Control Programme since 1992. [5,6] Its evaluation must be done periodically, for these National surveys can be costly, and a community-based method may be possible and less expensive. Considering this the present study is undertaken.

To find the recent status of Iodine deficiency disorder in subpopulation of Maharashtra, this study will be helpful.
Aim: To study the endemicity of Iodine deficiency disorder in Solapur city.

Objectives:
1. To study the prevalence of goitre, endemicity (severity of public health problem) of iodine deficiency amongst 6 to 12 years children.
2. To study pattern, knowledge and practices of salt consumption at household level
3. To study the salt iodine level at consumer level and its determinants and its association with iodine deficiency in the study population.

Methodology:
Ethical- The project was approved by the institutional ethical committee. The purpose of the study and how to send salt sample was explained to participants and principal of the schools. The written informed consent was also be taken.

Study Design: Cross Sectional Observational study.

Study Area: A city in southern Maharashtra, India.

Study population: 1. All school going children from the age group 6 to 12 years residing in the city
2. Retail shops from the area under study.

Inclusion criteria: Students willing to participate.

Exclusively criteria: students who are ill.

Time period of data collection-1/4/19 to 1/3/20

Six schools from different localities of the city were randomly selected using the list of all schools from the municipal corporation. Girls and boys from first to seventh class were selected using stratified sampling with proportional allocation and 253 girls and 298 boys were included in the study from all six schools. (As per sample size calculation from prevalence of Goitre in Maharashtra as 11.9% [5], the sample size taking 95% confidence interval and 5% allowable error would be 167.)

The selected children were examined for thyroid enlargement, as recommended by ICMR bulletin 1986 [2].

On-spot casual urine samples were collected from all the selected subjects in the school. Urine samples were collected in the wide-mouthed 100-ml plastic bottle with screw capped lid. and transported under cold condition to laboratory at Department of Biochemistry. The urine samples were stored under refrigeration and analysed by ammonium persulphate method for urinary iodine and results expressed in µg/l. the severity as a public health problem is assessed as per ICMR guidelines [2].

All study subjects were asked to bring 50 g salt from home in appropriate container provided for the purpose. The salt samples were analysed for I_2 content by titrimetric analysis and results were expressed as I_2 ppm.

Data Collection:

With the pre-tested pre-structured proforma and with the help of paediatrician the required information and clinical findings were recorded. All the school children were examined by the authors, and resident doctor, who were trained in paediatrics department of the college, to examine goitre. Urine samples with proper care and precaution were collected from each student in appropriate containers on the spot.

Air tight containers were provided with the parents/students and asked to collect 20 g i.e., 4 tea-spoons full of salt from their daily used salt container and to be submitted by the students on the next day Urine and salt samples were

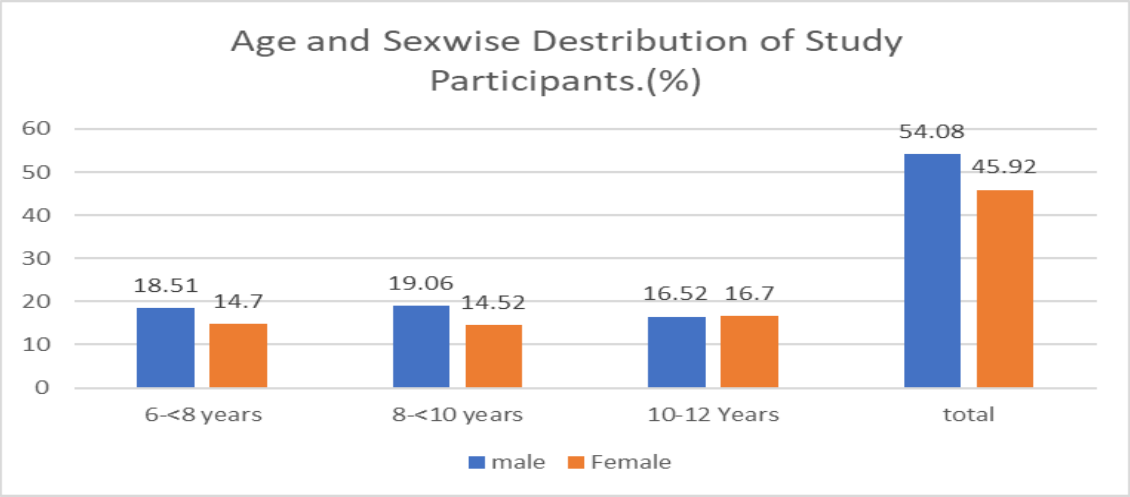
immediately handed over to Department of Biochemistry in cold storage. Salt samples were analysed for iodine content in ppm by Idometric Titration Method [3].The urine iodine estimate in Microgram per 100 ml was estimated by Titration by thiosulphate [3]

Data Analysis:

Proper coding of the data was done and entered into the Microsoft excel sheet. Appropriate statistical tests were applied to compare different variables. Chi-square test was used to study the association of salt iodine level consumed and iodine estimates in the urine. Endemicity and severity of public health problem was estimated as per guidelines of WHO/UNICEF/ICCIDD.[2,3]

RESULTS

Graph 1:-Age and Sex distribution of study participants.



298 boys253 girls of six to twelve age group participated. M: F=1.18

Table 1. Socio Economic class of the participants.

S-E class	No	%
Upper Class (White Ration Card	28	5.08
Above Poverty Line.(Orange Ration Card)	174	31.58
Below Poverty Line (Yellow Ration Card)	349	63.34
Total	551	100

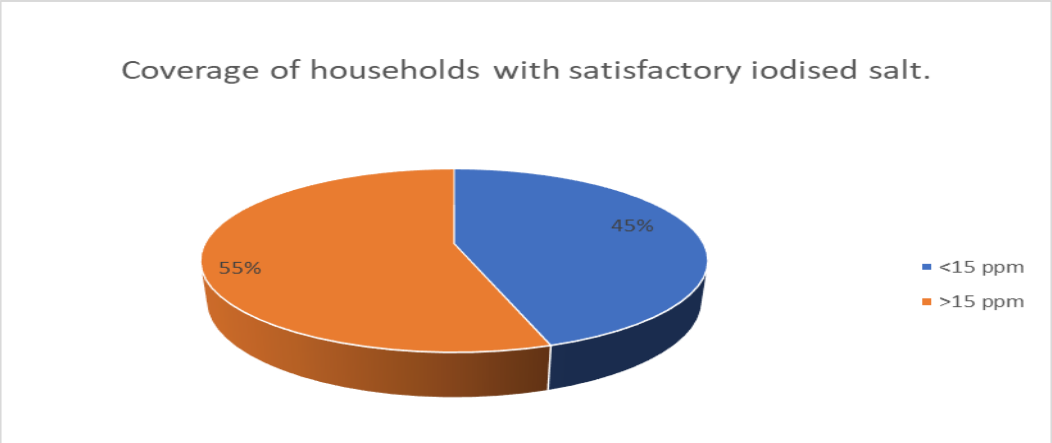
63.34% participants belonged to below poverty-line socio economic class.

Table 2. Knowledge regarding source of iodine and Importance of Iodine for health.

Knowledge		**Frequency**	**Percent**	**P**
Knowledge about iodized salt	Yes	200	36.30	<0.001
	No	351	63.07	
Importance of iodine in diet	Know	112	20.18	<0.001
	Don't Know	439	79.82	
Knowledge about sources of iodine	Yes	59	10.54	<0.001
	No	492	89.45	
Total		551	100.0	

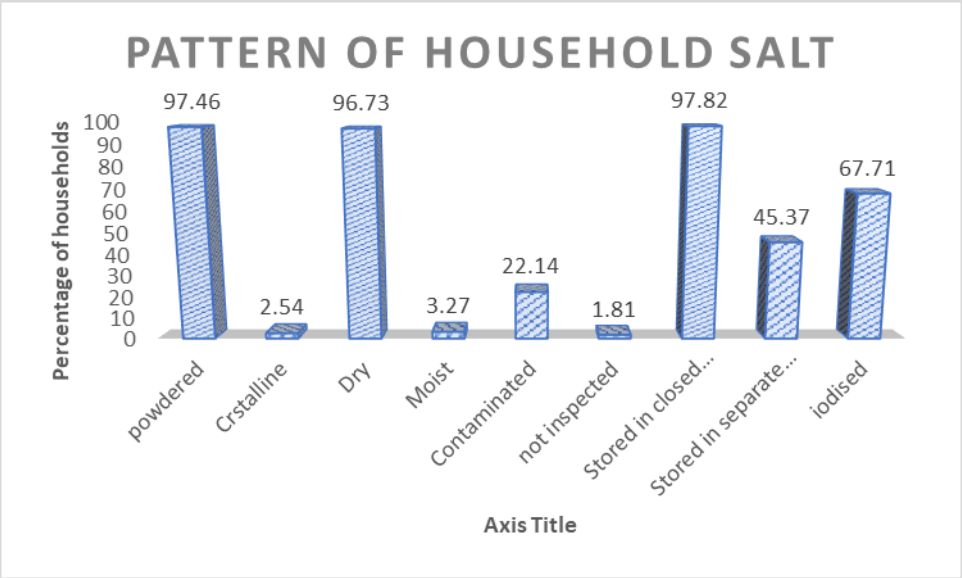
Knowledge regarding Iodization of common salt, its importance for health, sources of Iodine were very poor. (Test of difference between two proportions shows knowledge was significantly poor p<0.001) Graph 2. Households with satisfactory level of Iodized Salt.

Graph 2. Households with satisfactory level of Iodized Salt.



Only 55% of households were having Salts with Iodine content of >15 ppm in it.

Graph 3. Pattern of household salt on inspection.



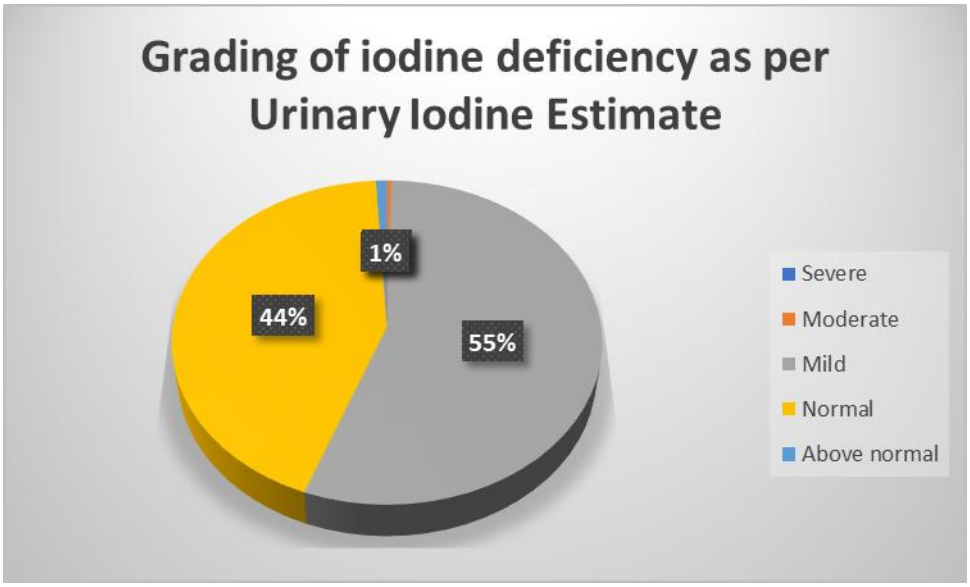
67.71% households were using iodised salt. 2.54% households were using coarse crystalline salt. In 3.27% households, the salt was moist while in 22.14% households, it was contaminated. 2% households stored the salt in open container. In 42.24% households the pattern of salt use was unsatisfactory.

Table 3. Grades of goitre

Grade of goitre	Number of children	Percentage of children
0	**543**	**98.55**
1	**6**	**1.09**
2	**2**	**0.36**
Total	**551**	**100**

Total Prevalence of goitre was found be 1.45%. Prevalence of Grade two goitre was only 0.36%

Graph 4:Grading ofiodine deficiency as per Urinary Iodine estimates.



Median urinary iodine level estimated was 90 mcg%.16 (2.96%) had UIL less than 50 mcg%. Nobody had severe iodine deficiency as per UIL. Total prevalence of iodine deficiency according to UIL is 55.71%

Table 4. Association between salt iodine level and Urinary Iodine Level

Salt iodine level	Urinary Iodine Level		Total
	< 100	>=100	
<15	176	69	247 (44.83%)
>=15	131	175	304 (55.17%)
Total	307	244	551

Chi square value = 46.41. P <0.001. Strong association was found between salt iodine level and UIL.

Table 5. Iodine content of salt at retail shops

Sr. No.	Locality of shop	salt Iodine level(ppm)
1	Lodhi Galli	10
2	Lodhi Galli.	15
3	begum Peth	5
4	begum Peth.	16
5	Panchsheel Nagar	5
6	Panchsheel Nagar.	19
7	Querban Husain Nagar	5
8	Querban Husain Nagar.	18
9	Gurunanak Chouk	5
10	Gurunanak Chouk.	18
11	Railway lines	15
12	Siddharth chouk	18

 for samples from branded sealed packets.
Salt samples from 41.66% retail shops showed iodine content of less than 15 ppm.
Branded and packaged samples of salt had adequate iodine.

DISCUSSION:

In the present study M: F was 1.18. There was slight male preponderance.63.34% of the children were from below poverty line. A multinational study showed that adequately iodized salt coverage was significantly more in higher socio-economic households. In India, it was 80.6% in the higher S-E strata and 70.5% in lower S-E strata [6,7].

Studies showed that coverage with adequately iodized salt was significantly higher in urban than in rural households in Bangladesh (68.9% compared with 44.3%, respectively), India (86.4% compared with 69.8%, respectively). household coverage of adequately iodized salt was significantly higher in high- than in low-SES households in Bangladesh (58.8% compared with 39.7%, respectively), Ghana (36.2% compared with 21.5%, respectively), India (80.6% compared with 70.5%, respectively)[8].

This study found 63.07% of children were not knowing about Iodised salt, and whether their parents were purchasing Iodised salt.79.82% were not knowing its importance in diet for health and 89.45% were not knowing sources of Iodine As per WHO/ Unicef3, the Iodised salt consumption can be improved by improving public knowledge. A study in rural households reported that only 58.7% households were aware about Iodised salt [7].

The study revealed 373(67.71%) households were using iodised salt. As per NFHS III 71.1% households consume Iodised salt [4]. The iodine content of salt samples up to the standard (iodine content > 15ppm) was in the range of 52 % to 100 %in a study in India4 in a National level survey in 2009, 91% households had access to Iodised salt with wide state wise variation5. As per NISI sueve,78% households in India consume adequately Iodised salt but in South zone of India only 62% household coverage of Iodised salt was found [7].National household level Iodised salt coverage was found to be varying from 61% in Niger to 97% in Uganda and Iodised salt coverage was more in Urban areas than rural areas8.In the study in New Zealand 51%children did not use iodised salt at table and only 69% of them used iodised salt for cooking [9].

We found in 247 (44.65%) households iodine content of the salt was less than recommended 15 ppm. Goal of NIDDCP, India is to ensure 100% households should consume adequately iodised salt [2,4] One survey in India showed in 52-100% of samples in various regions, the iodine content of the salt was adequet4. A survey by ICCIDD showed that in Tamil Nādu only18.2%households had Iodine level more than 15ppm.it was 91.1% in Goa [5]. Mean I_2 content of salt samples was 16.95 ± 7.07 from household samples in Jammu study[10]. In Karnataka study 95.3% of household salt was with more than 15ppm iodine. In Karnataka study 2.6% of household salt samples showed no Iodine content [11]. Juhi Agrawal et. Al[12]found salt with iodine levels of at least 15 ppm at consumption level was 88·8 % that only 6·1 % of the families were consuming salt with iodine content less than seven ppm. Amar K Chandra found about 82% salt samples had iodine level more than 30 ppm and the iodine content in salt samples less than 15 ppm was only about 3% indicating the salt samples at house hold contain adequate iodine [13].In four districts of Chhattisgarh Iodised salt coverage was >90% household coverage [14].

66.24% household in the study population were found to consume 5-10 gm salt per capita per day. WHO suggests per capita per day salt consumption of 10 gm where Iodine content of the salt at various levels are low[3].

On the pattern of Salt use, we found 2.54% households were using coarse crystalline salt. According to Tivari[2] iodisation of such salt cannot be uniform and changes as per particle size. WHO reports Iodine content of the salt can vary by particulate size of the salt3. In Jammu region, 74.47% of households consume powdered salt with 98.17% powdered salt samples having an I2 content of greater than 15ppm [10].

The Present study found in 96.73% households the salt was kept dry. In 122(22.14%) samples it was contaminated. In total, we found pattern of salt use was improper in 62.24% households. Control of moisture content in iodized salt throughout manufacturing and distribution, by improved processing, packaging and storage, is critical to the stability of the added iodine [2]. Storing methods, moisture, contamination can lead to Iodine loss by more than 50%[3].

Prevalence of Goitre from present study is 1.45% in children of 6-12 years age group. Including the prevalence of grade II goitre of 0.36%. According to MOHFW[2], there is significant reduction in visible Goitre in the country [4]. The prevalence of goitre was highest in Maharashtra (11.9%) and West Bengal (9%) as reported by Chandrakant Pandav et al[5].

Finding from state level surveys during 2000-2006, Total Goitre Rate (TGR)ranged from 0.95 in Jharkhand to 17.5% in Goa [6. In New Zealand study [9] Goitre prevalence among 6-12 years children was in the range of 3.37-17.56% [9] An overall goitre prevalence of 11.98% was observed in the region of Jammu and the prevalence of goitre varied from 3.5 to 21.2% [10]. The prevalence of goitre among the 6 - 12 years children was found to be 8.6%in the study in Karnataka11.Amar Chandra et. al found that the total goitre rate was 34.96% (Grade 1- 32.15%; Grade 2- 2.81%) showing that IDD is a severe public health problem in N-E India [13]. In districts of Chhattisgarh, it was observed that overall prevalence of goiter in the surveyed district was in the range 3.37-17.56% [14]. the prevalence of goitre among the 6 - 12 years children was found to be 8.6% [14].in Ramanagaram, Karnataka [11].In the study by Kamala Guttikonda et. al prevalence of goitre was zero [15]. The prevalence of goitre in the study by Sanjiv Bhasin was 6.5% [16]and the total number of children having grade-I goitre were 59 (6.2%) and those withgrade-II goitre were 3 (0.3%). Harsh Chandwani et. al found, goitre prevalence of 23.2% (grade 1 – 17.4% and grade 2 – 5.8%) [17].

In the present study312 (56.62%) of children had urinary iodine levels ranging between 50-99 mcg/L indicating mild Iodine deficiency. The median urinary Iodine level (UIL)estimated was 90mcg/L.16(2.96%) children had UIL less than 50mcg/L. In S-E Asia survey UIL were<100mcg/L in 39.9%[1]. According to WHO/UNICEF median urinary iodine estimates between 100-199 mcg/L suggests population has adequate iodine intake and if more than 20% samples are with <50mcg/L of UIL it is a major public health problem 3. In findings of monitoring of NIDDCP in India during the year

2014-15 showed that, the UIL (optimal) >100 µg/L was in the range of 49 % to 100 %4 State level surveys during 2000-2006 show the median urinary iodine excretion ranged from 76 µg/L in Goa to 173.2 µg/L in Jharkhand[6]. The median urinary iodine concentration of the children was 6.6 mg/dl in New Zealand study [9]. Forty-nine percent of subjects in Jammu study had biochemical iodine deficiency with 6.7% having moderate and 42.53% mild iodine deficiency [10]. The median UIE was 96.5 µg/l. The median UI was lowest in district Doda (87.01 µg/l), whereas the highest was recorded in district Jammu (120 µg/l [10]. In the study conducted in Delhi, The median UIE was found to be 198.4 µg/l. Approximately 6·3 % of the values were <50 µg/l, 15·9 % of the values were <100 µg/l and 84·2 % of the values were ≥100 µg/L [2] .Study in N-E India showed ,the median urinary iodine levels in the studied areas were in the ranges from 12.5-17.5 microg/dl indicating no biochemical iodine deficiency in the region [13] .Chhattisgarh study showed that it was less than normal in two districts out of four namely Rajnandgaon (44.80mcg/L) and Kanker (76.32 mcg/L) Urinary iodine measurements indicative of mild iodine deficiency were present in 51% (n=379) of participants, moderate deficiency in 16% (n=120), and severe deficiency in 1% (n=8)[14]. Kamala Guttikonda et. al found, Median UIC for school children was 82 microg/L, and 14% of children had UICs below 50 microg/L[15].

Sanjiv Kumar Bhasin etal found the mean urinary iodine level was 9.457 µg/dl. Twenty-four (18.2%) children had moderate degree of iodine deficiency as indicated by UIE levels between 2.0 to 4.9 µg/dl, while 55 (41.7%) children had UIE levels between 5.0 to 9.9 µg/dl indicating mild degree of iodine deficiency. No child had UIE levels less than 2.0 µg/dl (indicating severe degree of deficiency). The median UIE in these children was 8 µg/dl.16Study in Bharuch foundmedian urinary iodine excretion level was 110 µg/L[17].

We found 41.66% of samples from retail shops were having iodine content of salt<15ppm.Samples from branded packages of salts had >15 ppm iodine content in them. At retail level in Delhi study four (6·7 %) samples had less than 7 ppm iodine. Another three (5·0 %) samples had iodine content between 7 and 14·9 ppm. In the remaining fifty-three (88·3 %) samples, iodine content was 15 ppm or more % of salt samples had >15 ppm iodine.[12]

Summary and conclusion:

1. In 6-12 years, school children from a city in southern Maharashtra, the coverage with iodized salt use was only 67.71%, and only55.35% household samples were showing adequate Iodine in it when Consumption of Adequately iodized salt is important for adequate daily iodine supplement to the individual.
2. Goiter Prevalence found to be 1.45%.This indicates it is not a public health problem in the study area and study population but median urinary iodine of 90mcg/L suggest endemicity of mild grade iodine deficiency.
3. Poor quality salt in retail market and poor storage pattern of salt in the households are responsible for inadequate iodine in the salt.
4. Health education to the school children regarding importance of use of iodized salt and its proper storage at household level may prove helpful for better coverage of adequately iodized salt in the community.

Acknowledgement

We thank MRU, Dr. VMGMC for timely provision of all chemicals and material needed for the project. We thank H.O.Ds of departments of community medicine and Pediatrics, biochemistry for their active involvement. We thank Solapur municipal corporation, school education department for giving consent for this project. We are grateful to the principals and teachers and the student participants in this project.

Funding-By Medical Research Unit, Dr. V.M.G. Medical college, Solapur.

REFERENCES

1. de Benoist, B., Andersson, M., Takkouche, B., & Egli, I. (2003). Prevalence of iodine deficiency worldwide. The Lancet, 362(9398), 1859-1860.
2. Tiwari, B. K. (2006). Revised Policy Guidelines on National Iodine Deficiency Disorders Control Programme. New Delhi: IDD and Nutrition Cell, Director General of Health Services, Ministry of Health and Family Welfare, Government of India.
3. World Health Organization. (2007). Assessment of iodine deficiency disorders and monitoring their elimination: a guide for programme managers.
4. Directorate of National Vector Borne Disease Control Programme (2012). Directorate General of Health Services, Ministry of Health and Family Welfare, Government of India. Strategic Plan for Malaria Control in India, 2017.
5. Chandrakant S. Pandav, Kapil Yadav, Rahul Srivastava, Rijuta Pandav,* and M.G. Karmarkar(2013) Iodine deficiency disorders (IDD) control in India. Indian J Med Res.; 138(3): 418–433.https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3818611.
6. Chandrakant S Pandav(2015). From Research to Policy to Programme: Success Story of Seven State Iodine Deficiency Disorders (IDD) Survey in India. Annals of the National Academy of Medical Sciences (India). Home /Archives /Vol. 51 No. 4.

7. Yadav, K., & Pandav, C. S. (2018). National iodine deficiency disorders control programme: current status & future strategy. The Indian journal of medical research, 148(5), 503.
8. Universal Salt Iodization Coverage Survey Team Knowles Jacky M jknowles@ gainhealth. org Garrett Greg S Gorstein Jonathan Kupka Roland Situma Ruth Yadav Kapil Yusufali Rizwan Pandav Chandrakant Aaron Grant J. (2017). Household coverage with adequately iodized salt varies greatly between countries and by residence type and socioeconomic status within countries: results from 10 national coverage surveys. The Journal of nutrition, 147(5), 1004S-1014S.
9. Skeaff, S. A., Thomson, C. D., & Gibson, R. S. (2002). Mild iodine deficiency in a sample of New Zealand schoolchildren. European Journal of Clinical Nutrition, 56(12), 1169-1175.
10. Imtiyaz A Bhat, Iqbal M Pandit, and S Mudassar(2008). Study on Prevalence of iodine Deficiency Disorder and Salt Consumption Patterns in Jammu Region. Indian J Community Med.; 33(1): 11–140.
11. Biradar, M. K., Manjunath, M., Harish, B. R., & Goud, N. B. (2016). Prevalence of iodine deficiency disorders among 6 to 12 years school children of Ramanagara district, Karnataka, India. Int J Community Med Public Health, 3, 166-9.
12. Agarwal, J., Pandav, C. S., Karmarkar, M. G., & Nair, S. (2011). Community monitoring of the national iodine deficiency disorders control programme in the national capital region of Delhi. Public health nutrition, 14(5), 754-757.
13. Amar K Chandra , L Hemchandra Singh, Smritiratan Tripathy, Arijit Debnath, Jasmina Khanam.Indian J Pediatr. 2006 Sep; 73(9):795-8. https://pubmed.ncbi.nlm.nih.gov/17006037/
14. Ashish Kumar Sinha, Kamlesh Jain, Aditi Chandrakar, Srishti Dixit(2016). Impact of iodine deficiency disorders control programme implementation in four districts of Chhattisgarh, India: baseline survey. International Journal of Community Medicine and Public Health Sinha AK et al. Int J Community Med Public Health. 3(7):1940-1944.
15. Guttikonda, K., Boyages, S., Travers, C. A., & Lewis, P. R. (2003). Iodine deficiency in urban primary school children: a cross-sectional analysis. Medical journal of Australia, 179(7), 346-348.
16. Bhasin, S. K., Kumar, P., & Dubey, K. K. (2001). Comparison of urinary iodine excretion and goiter survey to determine the prevalence of iodine deficiency. Indian pediatrics, 38(8), 901-905.
17. Haresh Ramesh kumar Chandwani and Bhavesh Dahyabhai Shroff(2012). Int J Prev Med.; 3(1): 54-60