

KNOWLEDGE, ATTITUDE, PRACTICE ABOUT IODIZED SALT USAGE AMONG MOTHERS IN URBAN AREAS OF KANCHEEPURAM DISTRICT, TAMILNADU.

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ABSTRACT

Introduction: Iodine is one of the important trace element responsible for the human brain development and a spectrum of diseases. Iodine Deficiency Disorders (IDD) have been prevalent all over the world since many decades. The Government has introduced programs, by iodizing the salt to increase the uptake of Iodine, thereby trying to decrease the prevalence of the Iodine Deficiency Disorders (IDD). The current study was conducted with the objective to study the Knowledge, Attitude and Practice about iodised salt usage among mothers in the Urban areas of Kancheepuram District, Tamil Nadu.

Methodology: The current study is a cross sectional study conducted in an Urban area where Simple random sampling technique was used and data was collected among 255 study participants. A structured questionnaire was used to collect data. Data was analyzed using SPSS 23.

Results: The current study consisted mostly of women belonging to 20-60 years. Nearly 99% said that they use iodized salt while cooking. Ninety one percentage participants knew that thyroid is an important gland. Everyone (100%)knew that iodized salt was available in the market but however all did not know it is mandatory by the government. Eighty eight percentage participants had good

knowledge, 92% had a positive attitude about the usage of iodized salt. Almost 99% had a Good practice in using iodized salt.

Conclusion: Though almost everyone (99%) practised using iodized salt, they did not know the purpose of using iodised salt. So, it is the responsibility of the community workers, to impart the knowledge regarding the usage of iodized salt among mothers. So that we can achieve 100% iodised salt usage among mothers .

Key Words: Iodine Deficiency Disorder, Thyroid Disorders, KAP Study

INTRODUCTION

Iodine is considered as one of the most essential trace elements required by the human body for the synthesis of thyroid hormones. It is needed in small quantities for the normal growth and development, especially by the brain, during the fetal and the early postnatal life. ^(1,2)

Iodine Deficiency Disorders (IDD) has been recognized as a major public health problem worldwide by WHO⁽³⁾ Earlier, iodine deficiency was considered to bring about problems like, goiter and cretinism, but, in the recent past, it is proved to produce a much wider spectrum of disorders. Iodine deficiency causes hypothyroidism, endemic goiter, cretinism, abortion and stillbirths, psychomotor defects, hearing and speech impairment, intellectual disability. They even produce a risk of coronary artery diseases, cognitive impairment, psychiatric disorders, autoimmune disorders, and cancer.^(4,9) Most of the outcomes of IDD are not visible to the naked eyes but these problems are curable. The IDD can affect a person since intrauterine life, through his childhood and also into his adulthood, causing serious health issues, not only health problems but social issues, even physical and mental retardation.^(10,11)

Globally, about 1.88 billion people worldwide live with a risk of acquiring iodine deficiency disorders, out of which more than 655 million individuals are already a victim to IDD.^[9] Amongst children, 241 million have an inadequate intake of iodine worldwide. Of which, 50% of the children with insufficient intake of iodine reside in South/South-East Asia and Africa.⁽¹²⁾

In India, due to the lack of Iodine in the soil and the food grown from it, the entire nation is prone to IDD. In the recent years, 1.2 billion people were at risk of developing IDD in India. Nearly 264 million individuals are at high risk. ^(4,5) While, more than 71 million individuals were suffering from goiter and other consequences of the IDD.^[5] Each year 9 million pregnant women and 8 million newborns are at the

risk of developing IDD in India. India has the largest number of children born vulnerable to IDD.^(13,14) All the state and Union Territory (UT) in India has not been spared from IDD ^[15].

One of the significant causes of preventable damage to the brain during childhood is the deficiency of iodine, due to a low levels of iodine intake in the diets. This was the foremost motivating factor behind the initiation of Universal Salt iodization (USI). USI is the proven, most widely practiced intervention to eliminate iodine deficiency. Its main aim was to be sure that all edible salt was iodized. Since, salt was thought to an ideal vehicle for adding iodine into each and every individual's diet. Salt is taken in the diet by everyone across the globe, in approximately uniform proportions, round the year. ^(16,17)

United Nations Children's Fund (UNICEF), The World Health Organization (WHO) and the International Council for the Control of Iodine Deficiency Disorders (ICCIDD) have set a cut-off level of 20–40 parts per million (ppm) for iodine to be present in the salt. The main goal is to achieve at least 90% usage of adequate iodized salt in the households (≥ 15 ppm iodine) and also to test the salt for the presence of iodine as an indicator for monitoring the progress towards achieving the Universal Salt Iodization (USI).⁽¹⁸⁾ Even though the International Organizations had suggested USI to be an economically viable, safe and consistent strategy to make sure correct quantity of iodine is took by all populations, worldwide, nearly 2.2 billion individuals reside in areas with deficiency of iodine ^[19]. Globally, the portion of individuals who consumed salt which was iodized increased drastically. In early 90's it was only less than 20% which raised to 70% by the year 2000. The UNICEF report showed that South East Asia and Pacific had accessed iodized salt to about 91% and 87% respectively.⁽²⁰⁾ Still, 38 million newborns born in developing countries each year are prone to damage their brain due to iodine deficiency disorders (IDD) ^[21,22]. Also, the school children urinary iodine report stated that iodine deficiency still remains a public health issue in many countries. Globally, 36.5% of the children have inadequate iodine intake.^[23]

Many countries all over the world have introduced the Universal Salt Iodization program, including India. As early in 1960s, India identified the iodine deficiency as one of the major national public health issue. To overcome this problem, India started providing iodized salt to the endemic population. National Goiter Control Programme (NGCP) was launched and edible salts were iodized. The iodization came under the supervision of revised Prevention of Food Adulteration Act of 1988. ^(24,25) After the launch of this program, about 91% of households in India had the access to iodized salt, but only 71% literally consumed the correct amount of iodized salt ⁽²⁶⁾. For the past two decades, India has really saved 4 billion IQ score points by providing adequate iodization through salt⁽²⁷⁾ The usage of iodized salt all throughout the nation, it ranged from 98% in Manipur to as low as 30% in Chhattisgarh. A higher rate, 80% to 94%

used iodized salt in north eastern states and in states of New Delhi, Punjab, Haryana, Goa, Jammu and Kashmir, Himachal Pradesh, and all union territories. In the states of Andhra Pradesh, Karnataka, Tamil Nadu, Uttar Pradesh, Odessa, Madhya Pradesh and Jharkhand, the usage of iodized salt was less. This variation not only prevailed between states, but it also prevailed among the urban and rural areas. Nearly 83.2% of households in residing in the urban areas used iodized salt. Whereas, only 66.1% of households living in the rural areas consumed iodized salt. ⁽²⁸⁾

This variation in the usage of iodized salt between the rural and the urban areas brought about an insight to do the current study. The current study was planned with an objective to understand the knowledge, attitude and practice about the use of iodized salt in an urban area of Kancheepuram district, Tamilnadu.

METHODS

Study design

The current study is a population based descriptive cross-sectional study, which was carried out in the urban field practice areas of the Urban Health Training Centre attached to Sree Balaji Medical College and Hospital, Bharath University, Chennai, Tamil Nadu, India.

Study area

The current study was conducted in the urban field practice area of the Urban Health Training Centre attached to the Institution, located at Anankaputhur in Kancheepuram District of Tamil Nadu.

Study Population

The adult population covered by the Urban Health Training Centre is about 48050 as per 2011 census. The adult population consisted of 24158 males and 23892 females. Study population identified household females who are involved in cooking daily meal, residing in the study area permanently at the time of the study.

Study period

Study was carried out between January 2020- June 2020.

Sample size

The sample size was estimated using the study by Anjan Datta et al, in the year 2018. That study showed that 87.3% of the study population had a good practice regarding the consumption of iodized salt.* Based on this, the sample size was estimated using the formula $4pq/L^2$, where, prevalence (P) = 87.3%, Q = 12.7%, precision (L) = 4.36 (5%of 'p'). With 10% attrition, the estimated sample size was calculated as 255.

Inclusion Criteria

Women above 18 years of age and who consented to participate in the study were included.

Women who are involved in cooking the daily meals for the family.

Exclusion Criteria

Women who are all not involved in cooking the daily meals.

Data collection

Simple random sampling method using computer generated random number tables was used to carry out this study. From the field survey of the Urban health Training centre (UHTC), the house numbers were obtained. The houses to be surveyed was thus obtained by random sampling technique using the computer generated random numbers. If there were no females of appropriate inclusion criteria in that house, the next house with appropriate study subject was selected. The data was collected using the standardized pretested structured interview schedule. This was carried out until the required sample size.

Study Tool

A standardised pretested structured questionnaire consisting of the socio demographic particulars and questions to understand the knowledge, attitude and practice were included. There were totally 11 questions for knowledge, 9 for attitude and 4 for practice. More than 50% correct response in each category separately was considered to be Good knowledge, Positive attitude and correct practice.

Statistical analysis

Data collected was analyzed using SPSS version 23 software. Frequencies and percentage were calculated.

Informed Consent & Ethical considerations

The current study was started after getting the ethical clearance from the Institutional Ethical Committee and after obtaining informed consent from the study participants.

RESULTS

The current study was carried out in the urban area, Kancheepuram District among 255 study participants. Table 1 represents the Socio-demographic characteristics of the study participants. More than half, 52% belonged to 20-45 years age group and 38% belonged to 45-60 years. Nearly, 16% were illiterate and 2% were graduates. Almost, 72% had atleast primary education. Almost 46% belonged to Upper/Lower Upper socioeconomic status according to modified BG Prasad Scale. Only 26% belonged to Upper Class and 28% belonged to Middle/Upper Middle. Most of them , 98% were Hindus.

Table 1 : Socio-demographic characteristics of the study participants.

S.No	Socio-demographic Characteristics	Frequency	Percentage
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		(n=255)	(%)
1.	Age		
	Less than 20 years	5	2
	20-45 years	133	52
	45-60 years	97	38
	Above 60 years	20	8
2.	Education		
	Illiterate	41	16
	Primary	31	12
	Secondary	87	34
	Highschool	66	26
	PUC/Diploma	25	10
	Graduate	5	2
3.	Socioeconomic Status (Modified BG Prasad)		
	Lower/Upper Lower	118	46
	Middle/Upper Middle	71	28
	Upper	66	26
4.	Religion		
	Hindu	250	98
	Christian	3	1
	Muslims	2	1

Table 2 shows the knowledge component on usage of iodized salt. Ninety one percentage participants knew that the thyroid gland is important and 82% knew it was important for human brain development. The knowledge about its function in maintaining the basal metabolic rate was only 79%. But, 97% knew that iodine was necessary for thyroid to function and 99% knew they had to use iodized salt every day. Eighty seven percentage participants knew that iodine prevented thyroid problems. The availability of iodine salt in the market was known by everyone, 100%. But less than half of them (43%) only knew that not every salt in the market contains iodine. Only 56 % knew that it was mandatory by Government of India to use iodized salt. The proper storage of iodized salt was known only by 77% of them

Table 2: knowledge on usage of iodized salt among the study participants.

S.No	Knowledge on Usage of Iodized Salt	Frequency (n=255)	Percentage (%)
1.	Thyroid Gland is an important gland of our body.		
	Yes	232	91
	No	10	4
	Don't Know	13	5
2.	Thyroid hormone is important for human brain development		
	Yes	209	82
	No	15	6
	Don't Know	31	12
3.	Thyroid hormone is helpful to maintain basal metabolic rate of our body		
	Yes	201	79
	No	18	7
	Don't Know	36	14
4.	Iodine is important for the functions of thyroid gland		
	Yes	247	97
	No	3	1
	Don't Know	5	2
5.	We should take iodine daily in our diet		
	Yes	252	99
	No	2	0.5
	Don't Know	1	0.5
6.	Iodine intake will prevent thyroid deficient problems		
	Yes	222	87
	No	5	2
	Don't Know	28	11
7.	Iodized salt is available in the market		
	Yes	255	100
	No	0	0
	Don't Know	0	0
8.	Not every salt in the market contains Iodine		
	Yes	110	43
	No	107	42

	Don't Know	38	15
9.	Iodized salt has been mandatory by Govt. of India		
	Yes	143	56
	No	31	12
	Don't Know	81	32
10.	Iodine has an impact on our health		
	Yes	245	96
	No	3	1
	Don't Know	7	3
11.	Improper storage of iodized salt will lose the iodine content of the salt.		
	Yes	196	77
	No	54	21
	Don't Know	5	2

Table 3 shows the attitude component on usage of iodized salt. Eighty eight percentage participants agreed that the thyroid gland is an important gland of our body and 82% agreed that it was important for the human brain development. Nearly 79% only agreed that thyroid gland's function is to maintain the basal metabolic rate of the body. But, 95% agreed that iodine was necessary for thyroid gland to function and 92% agreed that they have to use iodized salt everyday. Eighty nine percentage of them agreed that the iodine prevented them from thyroid problems. Almost 77%, agreed that not every salt in the market contains iodine. Nearly all of them, 98% agreed that iodine had an impact on the health. The proper storage of iodine was correctly agreed by 97% of them

Table 3: Attitude on usage of iodized salt among the study participants.

S.No	Attitude on Usage of Iodized Salt	Frequency (n=255)	Percentage (%)
1.	Do you agree that thyroid gland is an important gland of our body?		
	Agree	224	88
	Do not Agree	38	12
2.	Do you agree that Thyroid hormone is important for human brain development		
	Agree	209	82

	Do not Agree	46	18
3.	Do you agree that Thyroid hormone is helpful to maintain basal metabolic rate of our body		
	Agree	201	79
	Do not Agree	54	21
4.	Do you agree that Iodine is important for the functions of thyroid gland		
	Agree	242	95
	Do not Agree	13	5
5.	Do you agree that We should take iodine daily in our diet		
	Agree	235	92
	Do not Agree	20	8
6.	Do you agree that Iodine intake will prevent thyroid deficient problems		
	Agree	227	89
	Do not Agree	28	11
7.	Do you agree that Not every salt in the market contains Iodine		
	Agree	196	77
	Do not Agree	59	23
8.	Do you agree that Iodine has an impact on our health		
	Agree	250	98
	Do not Agree	5	2
9.	Do you agree that Improper storage of iodized salt will lose the iodine content of the salt?		
	Agree	247	97
	Do not Agree	8	3

Table 4 represents the practice on usage of iodized salt among the study participants. Almost everyone, 99% practiced using iodized salt, they used it every day. Only 1% used other salts while cooking. Nearly 87% of them stored the salt in air tight containers.

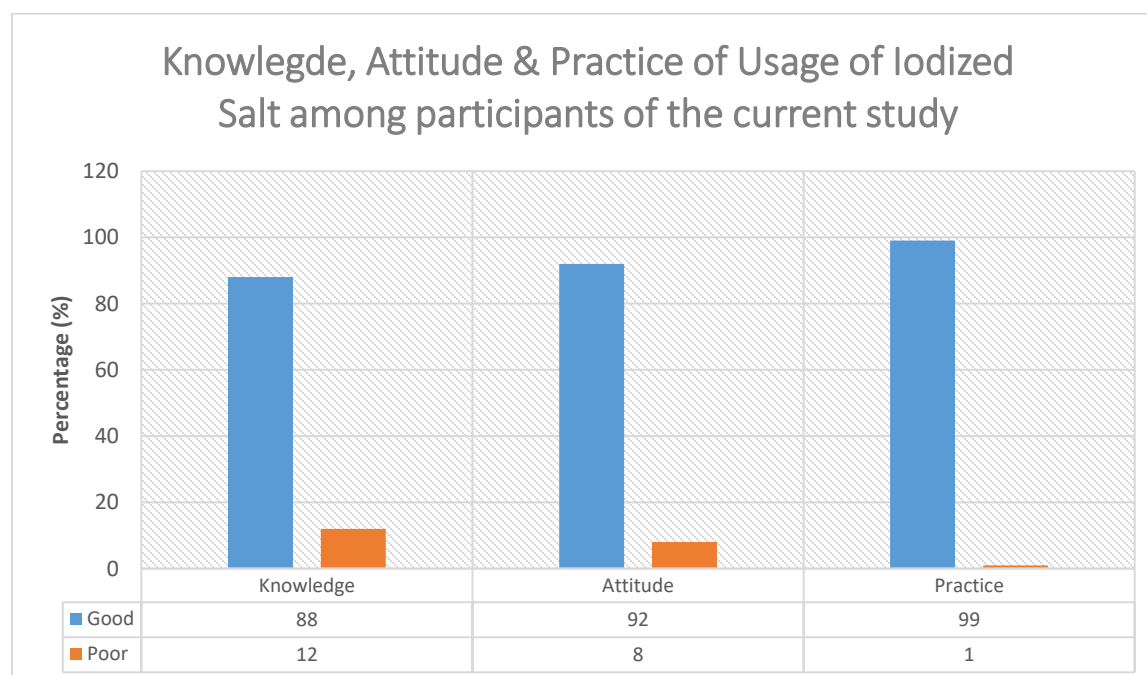
Table 4: Practice on usage of iodized salt among the study participants.

S.No	Practice on Usage of Iodized Salt	Frequency (n=255)	Percentage (%)
1.	Do you use iodized salt in your cooking?		

	Yes	253	99
	No	2	1
2.	Do you use iodized salt daily in your cooking?		
	Yes	253	99
	No	2	1
3.	Do you use any other salt other than iodized salt in your cooking?		
	Yes	2	1
	No	253	99
4.	Do you use a tightly closed container for storing iodized salt?		
	Yes	222	87
	No	33	13

Fig 1 represents the level of knowledge, attitude and practice among the study participants. Eighty eight percentage participants had good knowledge on the use of iodized salt. Nearly, 92% had a positive attitude about the usage of iodized salt. Almost 99% had a Good practice in using iodized salt.

Fig 1: Level of knowledge, attitude and practice among the study participants.



DISCUSSION

The main objective of the current study was to find out the knowledge, attitude and practice of the people residing in Urban areas about the adequate usage of iodized salt. In the current study majority of them (52%) belonged to 20-45 years age group. In a study by Deepika et al, 68.5% belonged to 25-50 years and in a study by Karmakar et al, 30.4% belonged to 31-40 years age group.^(29,30) In this study, 16% were illiterates, which was less compared to the study conducted by Deepika et al, 68%.⁽²⁹⁾ In this study, 98% were Hindus. Similarly in a study by Karmakar N et al, 90.4%, majority of them were Hindus.⁽³⁰⁾

In the current study, 99% knew they had to use iodized salt every day. In a study by Vasudevan S et al, only 64.6% have heard about iodized salt.⁽³¹⁾ In a study by Datta A et al, 64.62% have not heard of iodized salt.⁽³²⁾ In a study by Roy R et al, almost more than half of the study population, 53.8% were unaware of the benefits of iodine.⁽³³⁾

In the current study, 87% knew that iodine prevented thyroid problems. In a study by Yamada C et al, in the year 1998, 95% knew about Iodine Deficiency Disorders and iodized salt.⁽³⁴⁾ In a study by Gerensea H et al, 81% have heard of deficiency of iodine.⁽³⁵⁾ In a study by . Vasudevan S et al, only 23.8% were aware that iodine deficiency causes health problems.⁽³¹⁾

In the current study, 99% practiced using iodized salt, they used it every day. In a study by . Yamada C et al, conducted in 1998, 90% used iodized salt. This study was conducted in Ulaanbaatar. This shows how well the people are equipped.⁽³⁴⁾ In a study by Deepika PS et al, 83.6% used iodized packaged salt.⁽²⁹⁾ This was similar to a study conducted by Gerensea H et al, where 83% bought iodized salt.⁽³⁵⁾ In a study by Roy R et al, 93.7% used packed salt but only 62.5% consumed iodized salt.⁽³³⁾ Only 36% used iodized salt in a study conducted by Imdad SE et al, in Lahore and 38% by Aredo MT et al.^(36,37) In a study by Gidey B et al, only 33 % utilized iodized salt.⁽³⁸⁾ In a study by Tariku WB et al, only 25.7% had proper utilization of adequately iodized salt. In a very recent study, in Ethiopia done by Dida N et al, showed that only 32.7% had adequately iodized salt.^(39,40) Still worse, was in a study conducted by Khan GN et al, in Pakistan where only 15% had iodized salt. But it was in the year 2012. Probably now the knowledge has improved and consumption has changed.⁽⁴¹⁾ In a study by Goris JM et al, in Gulf, in 2018 , only 64% consumed salt the rest did not use salt at all for the day. Salt is chosen as the vehicle for introducing iodine just because it easily available and used by everyone. When so many people do not use salt, then

no point in advising them to take iodized salt. Some other means has to be thought about for reaching that population.⁽⁴²⁾

Nearly 87% of them stored the salt in air tight containers in the current study. In a study by Gidey B et al, 92.3 % stored the iodized salt in covered containers and 91.8% stored it in dry places too. Almost everyone now a days stores the salt in air tight containers in the Urban area. There may be difference when the same is studied in the rural population.⁽³⁸⁾

In the current study 88% had good knowledge on the use of iodized salt . In a study conducted in Ethiopia, by Tariku WB et al, in the year 2019, only 28.7% had good knowledge. A fast gap is seen even in the recent years. May be, since Ethiopia is far behind us and the health care system is not as good as us, this gap could have been seen.⁽³⁹⁾ In the current study, almost 99% had a Good practice in using iodized salt. In a study by Datta A et al, 87.3% had a good practice. That study was also carried out in India, in 2018. This shows that India is developing and strengthening the prevailing practice level to improve the health care of the population.⁽³²⁾

CONCLUSION:

In the current study the knowledge and attitude among the participants were good. But interestingly the level of practice was much better than the knowledge and attitude. This shows the fruitfulness of the steps taken by Government to overcome the Iodine Deficiency Disorders.. So the awareness on knowledge and attitude should be reinforced to fill the lacuna in the knowledge and attitude. This can be done through health education programs giving all the required information. Hence the Community health professionals should bring about a change through Information, Education and Communication (IEC) .

REFERENCES

1. Delange F. Iodine deficiency. In: Braverman LE, Utiger RD, eds. The thyroid - A fundamental and clinical text. 8ed. Philadelphia: Lippincott Williams and Wilkins; 2000. p. 295–315.
2. Park K. Park's Textbook of Preventive and Social Medicine. 24th ed. Jabalpur, India: M/s Banarsidas Bhanot Publishers; 2017. p. 662-3,680-2.
3. World Health Organization. Assessment of iodine deficiency disorders and monitoring their elimination: a guide for programme managers – third Edition. Page No: 1-108. Available on: http://apps.who.int/iris/bitstream/10665/43781/1/9789241595827_eng.pdf; 2007.

4. Yadav K, Pandav CS, Karmarkar MG. Adequately iodized salt covered seventy-one percent of India in 2009. International council for control of iodine deficiency disorders. IDD Newsletter. 2011;39(2):1–20 Available on: http://www.iccidd.org/cm_data/IDD-NL-2011-2.pdf.
5. Yadav K, Srivastava R, Badhal S, Palanivel C, Pandav CS, Karmarkar MG. Iodine nutrition of pregnant women in India: evidence of significant iodine deficiency. Indian J Med Specialties. 2011;3:49–54. <https://doi.org/10.7713/ijms.2012.0011>. Published online on 24/11/2011.
6. Citizen Charter. National Iodine Deficiency Disorder Control Program and Nutrition, 2014. Available from: <http://www.nagahealth.nic.in>.
7. Patrick L. Iodine: Deficiency and therapeutic considerations. Altern Med Rev 2008;13:116-27.
8. Verheesen RH, Schweitzer CM. Iodine deficiency, more than cretinism and goiter. Med Hypotheses 2008;71:645-8.
9. Jameson LJ, De Groot LJ, editors. De Groot and Jameson Endocrinology. 4th ed. Philadelphia, PA: Saunders; 2008. p. 1529.
10. Hetzel BS, Delange F, Dunn JT, Ling J, Venkatesh M, Pandav CS, editors. Towards the Global Elimination of Brain Damage Due to Iodine Deficiency-A Global Program for Human Development with a Model Applicable to a Variety of Health, Social and Environmental Problems. International Council for the Control of Iodine Deficiency Disorders. New Delhi: Oxford University Press; 2004. Available from: http://www.iccidd.org/cm_data/hetzel-afrontpage.Pdf.
11. Pandav CS, Yadav K, Srivastava R, Pandav R, Karmarkar MG. Iodine deficiency disorders (IDD) control in India. Indian J Med Res 2013;138:418-33.
12. Andersson M, Karumbunathan V, Zimmermann. Global iodine status in 2011 and trends over the past decade. MBJ Nutr. 2012;142(4):744-50.
13. United Nations International Children’s Emergency Fund. Coverage Evaluation Survey, All India Report New Delhi: Ministry of Health and Family Welfare, Government of India; 2009 Available on: <http://www.unicef.org/india/health.html>.
14. India Census. Provisional Population Totals Paper I of 2011 India Series 1. New Delhi: The Office of Registrar General and Census Commissioner. Ministry of Home affairs, Government of India; 2011. Available from: http://censusindia.gov.in/2011-prov-results/data_files/india/Final_PPT_2011_chapter3.pdf.
15. Taneja DK. Health policies and programmes in India. National Iodine Deficiency [10] Disorders Control Programme. 13th edition. New Delhi: Doctors Publications; 2004. Pp. 377.

16. Iodine Status Worldwide - WHO Global Database on Iodine Deficiency; Department of Nutrition for Health and Development, World Health Organization, Geneva, Switzerland, 2004. [Available at: <http://apps.who.int/iris/bitstream/10665/43010/1/9241592001.pdf>]
17. World Health Organization (2007) Assessment of iodine deficiency disorders and monitoring their elimination: A Guide for programme managers. Switzerland, World Health Organization.
18. State of the world's children 2006. New York, United Nations Children's Fund, 2006. [Available at: <http://www.unicef.org/sowc/archive/ENGLISH/The%20State%20of%20the%20World's%20Children%202006.pdf>]
19. Fisch A, Pichard E, Prazuck T, Sebbag R, Torres G, et al. (1993) A new approach to combatting iodine deficiency in developing countries: the controlled release of iodine in water by a silicone elastomer. *Am J Pub Health* 83: 540-5.
20. UNICEF Data. Update: monitoring the situation of children and women: current status & progress. Available on: <https://data.unicef.org/topic/nutrition/iodinedeficiency/#;2018>.
21. Bruno de Benoist MA, Ines Egli, Bahi Takkouche, Henrietta Allen (2004) Iodine status worldwide WHO Global Database on Iodine Deficiency. World Health Organization, Geneva
22. UNICEF (2008) Sustainable elimination of iodine deficiency: Progress since the 1990 World Summit for Children: UNICEF.
23. Andersson M, Takkouche B, Egli I, Allen HE, Benoist Bd (2005) Current global iodine status and progress over the last decade towards the elimination of iodine deficiency. *Bull World Health Organ* 83: 518-25.
24. Pandav CS, Moorthy D, Sankar R, Anand K, Karmarkar MG, Prakash R. National Iodine Deficiency Disorders Control Programme, National Health Programme Series- 5. New Delhi: National Institute of Health and Family Welfare; 2003.
25. Kochupillai N, Pandav CS, Godbole MM, Mehta M, Ahuja MM. Iodine deficiency and neonatal hypothyroidism. *Bull World Health Organisation*. 1986;64(4):547-51.
26. UNICEF. Coverage Evaluation Survey 2009, All India Report. Ministry of Health [11] and Family Welfare, Government of India, New Delhi. 2010. [Last accessed on 2018 Feb 12]. Available from http://www.indiaenvironmentportal.org.in/files/National_Factsheet_30_August_no_logo.pdf
27. UNICEF: Guidance on the Monitoring of Salt Iodization Programmes and Determination of Population Iodine Status: for every child. 1-19. Available on: <https://www.unicef.org/nutrition/files/Monitoring-of-Salt-Iodization.pdf>.

28. UNICEF. Coverage Evaluation Survey 2009, All India Report. Ministry of Health and Family Welfare, Government of India, New Delhi, 2010. Available from: <http://www.unicef.org/india/health.html>. Accessed 16 January 2016.
29. Deepika PS, Rao BT, Vamsi A, Valleswary K, Sekhar MC. A cross sectional study on proper use of iodized salt in communities of rural areas and its relevant factors in Prakasam district, Andhra Pradesh, India. *International Journal of Community Medicine and Public Health*. 2019 Mar;6(3):1083.
30. Karmakar N, Datta A, Nag K, Datta SS, Datta S. Knowledge, attitude, and practice regarding household consumption of iodized salt among rural women of Tripura, India: A mixed-methods study. *Journal of education and health promotion*. 2019;8.
31. Vasudevan S, Senthilvel S, Sureshababu J. Knowledge attitude and practice on iodine deficiency disorder and iodine level in salt in retail and vendors among the rural population in south India: A community based observational and descriptive study. *Clinical Epidemiology and Global Health*. 2019 Sep 1;7(3):300-5.
32. Datta A, Karmakar N, Nag K, Singha S. A Study on Knowledge, Attitude and Practices Regarding Household Consumption of Iodized Salt among Selected Urban Women of Tripura, India. *Journal of Clinical & Diagnostic Research*. 2018 Nov 1;12(11).
33. Roy R, Chaturvedi M, Agrawal D, Ali H. Household use of iodized salt in rural area. *Journal of family medicine and primary care*. 2016 Jan;5(1):77.
34. Yamada C, Oyunchimeg D, Igari T, Buttumur D, Oyunbileg M, Umenai T. Knowledge, attitudes, and practices of people in Ulaanbaatar, Mongolia, with regard to iodine-deficiency disorders and iodized salt. *Food and Nutrition Bulletin*. 1998 Dec;19(4):353-8.
35. Gerensea H, Yohannse A, Baymot B, Atsbha H. Knowledge, attitude and practice (KAP) towards iodized salt utilization in HaweltiKebelle, Axum, Tigray, Ethiopia, 2015. *Edorium J Nutr Diet*. 2016 Jan 1;2:1-8.
36. Imdad SE, Shoukat MS, Khalid MU. Appraisal of the knowledge & practices about iodized salt amongst housewives in Toba Tek Singh city and the impact of socio economic factors on such knowledge and practices. *Pak J Med Health Sci*. 2011;5(4):796-9.
37. Aredo MT, Demise HF, Regesu AH. Proper Utilization Of Iodized Salt And Associated Factors Among Rural Community Of Hetosa District, Oromia Regional State, South East Ethiopia. *Biorxiv*. 2020 Jan 1.
38. Gidey B, Alemu K, Atnafu A, Kifle M, Tefera Y, Sharma H. Availability of adequate iodized salt at household level and associated factors in rural communities in Laelay Maychew District, Northern Ethiopia: a cross sectional study. *J Nutr Health Sci*. 2015;2(1):1.

39. Tariku WB, Mazengia AL. Knowledge and Utilization of Iodized Salt and Its Associated Factors at Household Level in Mecha District, Northwest Ethiopia. *Journal of nutrition and metabolism*. 2019 Mar 28;2019.
40. Dida N, Legese A, Aman A, Muhamed B, Damise T, Birhanu T, Hailu S, Darega J, Woldamichael B, Gadisa E. Availability of adequately iodised salt at household level and its associated factors in Robe town, Bale Zone, South East Ethiopia: community-based cross-sectional study. *South African Journal of Clinical Nutrition*. 2020 Jul 2;33(3):58-63.
41. Khan GN, Hussain I, Soofi SB, Rizvi A, Bhutta ZA. A study on the household use of iodised salt in Sindh and Punjab provinces, Pakistan: Implications for policy makers. *Journal of Pharmacy and Nutrition Sciences*. 2012;2(2):148-54.
42. Goris JM, Temple VJ, Zomerdijk N, Codling K. Iodine status of children and knowledge, attitude, practice of iodised salt use in a remote community in Kerema district, Gulf province, Papua New Guinea. *PloS one*. 2018 Nov 28;13(11):e0197647