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DOI:

10.4103/jehp.jehp_248_18

Knowledge, attitude, and practice regarding household consumption of iodized salt among rural women of Tripura, India: A mixed-methods study

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Abstract:

INTRODUCTION: Iodine is an essential element for thyroid function; it is necessary in minute amounts for normal growth, development, and well-being of all humans. There is gap in the utilization of adequately iodized salt in the rural areas due to nonavailability, poverty, poor knowledge of iodine deficiency diseases, and faulty storage practices.

OBJECTIVE: The objective was to find out knowledge, attitude, and practices (KAP) regarding iodized salt consumption and association of sociodemographic factors, if any, among rural women of Tripura.

MATERIALS AND METHODS: This community-based study was conducted among 270 rural women residing at Madhupur village, Tripura. A self-made pretested schedule (Cronbach's alpha = 0.7) was used as the study tool to collect information on KAP regarding iodized salt consumption.

RESULTS: Majority of the participants belonged to 31–40 years (30.4%), with a mean age of 38.6 (± 13.8) years; all were predominantly Hindus (90.4%). Knowledge and attitude regarding iodized salt consumption were significantly associated with age groups ≤ 36 years, literacy, and general caste ($P < 0.05$), but practice was not significant ($P > 0.05$). Good knowledge and attitude regarding use of iodized packed salt were less than half (46.7% and 41.1%, respectively), but higher level (83.3%) of correct practice was found ($P > 0.05$).

CONCLUSION: The existing knowledge and attitude of participants toward iodized salt usage were less, but majority were consuming iodized salt without knowing its benefits. Hence, there is a need to educate rural people through nutrition education or knowledge, with active participation of grassroot level workers in generating awareness about the health benefits of consuming adequately iodized salt.

Keywords:

Cross-sectional study, female, health education, iodized salt, poverty

Introduction

Iodine is an essential element for thyroid function; it is necessary in minute amounts for normal growth, development, and well-being of all humans.^[1] Iodine deficiency disorder (IDD) has been recognized as a public health problem in India^[2] which affects people of all ages; both sexes from different socioeconomic status (SES).^[3] Previously, iodine deficiency was thought to cause goiter

and cretinism (representing only the tip of the iceberg), but, over decades, it was found that it leads to a much wider spectrum of disorders commencing in intrauterine life and extending through childhood into adult life with serious health and social problems, even physical and mental retardation.^[4,5]

Globally, IDDs are associated with many thyroid-related diseases including hypothyroidism, hyperthyroidism, goiter, and cretinism; they even inherit real risk

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How to cite this article: 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. *J Edu Health Promot* 2019;8:21.

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Received: 31-07-2018

Accepted: 25-08-2018

of coronary artery diseases, autoimmune disorders, psychiatric disorders, cognitive impairment, and cancer.^[6-8] About 1.5 billion people worldwide live at a risk of IDD, of which more than 655 million people are already affected with IDD.^[9] In India, more than 200 million people are at risk of IDD, while above 71 million persons are suffering from goiter and other IDD.^[5] Salt iodization programs have been implemented in many countries of the world including India, and two-thirds of the global population (71%) is estimated to be covered by iodized salt.^[10,11]

Surveys conducted in various states showed that no state in India was free from IDD; till now, many consequences of IDD are invisible and irreversible, but at the same time preventable.^[10,12] Although universal salt iodization was made mandatory from 2005, still only 91% of households have access to iodized salt, of which 71% consume adequately iodized salt^[12] and another 9% consume salt with no iodine.^[13] This gap in the utilization of adequately iodized salt may be due to nonavailability in the rural areas, poverty, poor knowledge of iodine deficiency diseases, and faulty storage practices.

Previous literature revealed that emphasis has been mostly on the estimation of household salt consumption,^[2,14-18] but issues regarding KAPs among rural inhabitants are explored only to a fewer extent throughout the country,^[19] particularly in the North-East India with a dearth of literature. With this background, this study was conducted to assess the knowledge, attitude, and practices (KAP) about iodized salt consumption and to find out association of sociodemographic factors, if any, among rural women of Tripura, India.

Materials and Methods

This community-based study was conducted among women residing at Madhupur village, the field practice area of Rural health Training Center (RHTC), Madhupur, under the Department of Community Medicine, Tripura Medical College, and Dr. BRAM Teaching Hospital, India, for 4 months (September 2017–December 2017).

Madhupur is a large village located in Bishalgarh R. D Block of Sepahijala district, Tripura, India, with a population of 8017 (1940 families; 4133 males and 3884 females) as per the Population Census 2011. RHTC, Madhupur, is approximately 20 km away from the main city Agartala, India. This is available for training undergraduate MBBS and B.Sc, M.Sc, and nursing students in community-oriented primary health care, family visits, nutrition and environmental survey, and rural-based health education.

In this study, an explanatory mixed-methods design was used in which the quantitative phase (cross-sectional

study) was followed by a qualitative phase (focus group discussion [FGD]).^[20,21]

Study population and study period

Quantitative method

A total of 270 women currently involved in cooking daily household meals and gave their consent to participate were included in the study. Sample size was calculated using the following formula: $Z\alpha^2pq/L^2$ where $Z\alpha$ = Standard normal deviate at a desired confidence level (95%); P = previous prevalence; $q = 100 - p$; L = allowable error (at 95% confidence level [$Z\alpha=1.96$]). Taking 62.5%^[16] as the prevalence of adequately iodized salt consumption with 10% relative allowable error, the sample size became 240. Finally, 270 study populations were included in this study, taking 10% as nonresponse rate.

A predesigned, pretested, semi-structured schedule was used to collect the required information regarding KAPs of iodized salt usage at household level. This had two parts: Part 1: sociodemographic variables and part 2: questions on KAPs on various aspects of iodized salt usage. This was prepared by the researchers with the help of previous literature and suggestions from public health experts. This was pretested among thirty randomly selected rural women from a different area by researchers so as to assess clarity as well as time for response; finalization and validation were done with some minor modification by experts after this pretesting. The internal consistency of this study tool was found to be acceptable (Cronbach's alpha = 0.7).

Qualitative method

Two FGDs were carried out separately among ten participants in each session by researchers. Vocal and willing women were purposively chosen for FGDs with prior consent from each participant. FGDs were conducted by a trained facilitator using a semi-structured guideline with broad open-ended questions at a time convenient to participants. FGDs lasted on an average of 45 min (range: 30–60 min) till we reached saturation points.^[20]

Data collection

Quantitative method

Participants (270 women) were selected by simple random sampling, using a computer-generated random number table starting from one fixed point at Madhupur village. Household numbers from routine field survey of RHTC were used for random sampling. In case of more women (target population) in a house, woman who was cooking daily meal for longest period in that family was interviewed. If women were not found or absent in any house during survey, the next household as per the random number table was visited until the required

sample size was achieved. The researcher and other data collectors (medical social worker) obtained consent from all participants, and respondents were asked about their sociodemographic and behavioral characteristics and iodized salt usage regarding salt-purchasing and consumption habits, benefits of iodine, and iodized salt awareness, etc., using the pretested, semi-structured schedule.

Qualitative method

The FGDs started with briefing of participants on the purpose of interview. The discussions were recorded and the transcripts were prepared as verbatim on the same day of interview. Rural women were interviewed by researchers (faculties trained in qualitative research) in local language and recorded. In case of difficulty in understanding what was shared, appropriate clues, even explanation, were given in simple terms to understand easily and information was debriefed for participant validation.

Data entry and statistical analysis

Quantitative method

The collected data were entered in SPSS software, version 16.0 (Statistical Package for the Social Sciences Inc, Chicago, IL, USA) and represented in proportions with the help of frequency distribution tables. Variables were summarized using means (standard deviation) and frequencies (percentages), as applicable. Chi-square test and Fisher's exact test wherever applicable were used to find out association between sociodemographic factors with the KAP of the participants and $P < 0.05$ was considered statistically significant.

Variable and scores

The independent variables were age, religion, social caste, education, occupation, type of family, and SES. The dependent variables were "good and poor knowledge," "positive and negative attitude," and "correct and wrong practice."

Two marks were awarded for every correct answer and one for every wrong answer. Later, scores below or equal to mean value and above mean value, respectively, were categorized as having "good and poor knowledge (mean score 8.2 ± 1.7)," "negative and positive attitude (mean score 4.4 ± 0.7)," and "correct and wrong practice (mean value 8.8 ± 0.5)."

Qualitative method

Recorded interviews were transcribed verbatim on the same day. Manual content analysis of transcripts was done together by two independent researchers to increase trustworthiness of results.^[21] Descriptive coding was done in transcripts. Later, similar codes were merged together to form categories or themes.

These were reviewed by another researcher who was not involved in earlier stage to avoid subjective bias and strengthen interpretive credibility. Any discrepancies between researchers were resolved by mutual discussion; statement in "*Italics and inverted comma*" connotes direct quotes/words/statements from participants.

Ethical clearance

The study proposal was submitted to the Institutional Ethics Committee of Tripura Medical College and Dr. BRAM Teaching Hospital, Agartala, and ethical clearance was taken before commencing the study.

Results

The present study showed that majority of rural women belonged to 3rd and 4th decades, i.e., 21–30 years (27%) and 31–40 years (30.4%) and least (1.9%) in 71–80 years, with a mean age of 38.6 ± 13.8 years. They were predominantly Hindus (90.4%), majority of them belonged to general caste (40%) followed by scheduled caste (SC) (29.6%), other backward caste (OBC) (25.9%) and scheduled tribe (ST) (4.4%). Most of them (77.4%) were literate, in which 33% had completed secondary level education, 25.9% middle (class VIII pass) education, and only 2.6% were graduated and above. Participants were mostly homemaker (77.4%) followed by farmer (4.1%), daily laborer (9.6%), student (3.3%), business (1.1%), service holder (3.7%), and old age/retired 2 (0.7%). A majority of the participants (84.4%) were married; a majority were from nuclear families (67%). Mean per capita income was Rs. $1732.8 \pm 1261.3/-$; majority belonged to SES of lower class (34.6%) followed by upper lower class (30.4%), lower middle class (22.3%), upper middle class (11.2%), and few upper class (1.5%) according to Modified BG Prasad scale (May 2016)^[22] [Table 1].

Table 2 shows that majority (68.9%) of the participants had heard about iodized salt, but 38.9% did not know the meaning of iodized salt, whereas 26.7% replied that it is ordinary common salt with small quantity of iodine. Nearly half of the respondents (46.7%) got this information from mass media, family members and relatives (6%), health workers (5.9%), school teacher (2.2%), and panchayat members (0.8%). Half (52.6%) of them did not know that edible salt contains iodine, only 7.4% know about it, but 40% replied that salt did not contain iodine. Majority (54.8%) could not comment on the taste of iodized salt, whereas 24.8% replied that iodized salt differs in taste from that of common salt. Most of them (54.1%) did not recognize iodized salt packet, only 10.4% could show smiling sun on packet and 17.8% identified iodine level printed on packet.

Majority (58.9%) knew that intake of iodized salt is important for health; 20% of the participants believed

Table 1: Distribution of study population according to sociodemographic characteristics (n=270)

Characteristics	Frequency, n (%)
Age group (years)	
≤20	17 (6.3)
21-30	73 (27.0)
31-40	82 (30.4)
41-50	56 (20.7)
51-60	24 (8.9)
61-70	13 (4.8)
71-80	5 (1.9)
Religion	
Hindu	244 (90.4)
Muslim	26 (9.6)
Social caste	
SC	80 (29.6)
ST	12 (4.4)
OBC	70 (25.9)
General	108 (40.0)
Education	
Illiterate	61 (22.6)
Primary	29 (10.7)
Middle	70 (25.9)
Secondary	89 (33.0)
Higher secondary	14 (5.2)
Graduate and above	7 (2.6)
Occupation	
Homemaker	209 (77.4)
Farmer	11 (4.1)
Labor	26 (9.6)
Business	3 (1.1)
Student	9 (3.3)
Employed	10 (3.7)
Old age or retired	2 (0.7)
Marital status	
Married	228 (84.4)
Unmarried	6 (2.2)
Widow	36 (13.3)
Type of family	
Nuclear	181 (67.0)
Joint	89 (33.0)
Socioeconomic class	
Lower (PCI Rs. <942)	90 (34.6)
Upper lower (PCI Rs. 942-882)	79 (30.4)
Lower middle (PCI Rs. 1883-3138)	58 (22.3)
Upper middle (PCI Rs. 3139-6276)	29 (11.2)
Upper (PCI Rs. ≥6277)	4 (1.5)
Total	270 (100.0)

PCI=Per capita income

that it is required to maintain health and 17.8% told that it would prevent from goiter. On further inquiries about the effect of IDD in body, responses such as generalized weakness (12.6%), goiter (8.9%), and impaired brain development (1.1%) were found.

Regarding attitude toward the use of iodized salt, almost all participants (99.6%) felt the necessity of using it with

the reason being taste (48.5%), tradition (25.2%), and improvement of health (18.9%). Many of them (30.7%) felt that consumption of iodized salt in diet was very important, but 45.2% of them thought that it was somewhat important.

Regarding practice of consumption of iodized salt, there was predominance of usage of iodized packed salt (98.9%) by the study population and only 1.1% used coarse salt (nonpacked). Most of them store salt in dry area (96.3%) and kept their salt in a covered container (95.6%); however, 8.9% reported sunlight exposure to salt. Majority (52.6%) stored salt for a period of half to 1 month, whereas 24.1% stored less than or equal to half month. More than a third (39.6%) used one to two packets of salt in a month, 27.8% used half to one packet, and more than three packets in a month were consumed by 6.7% of the respondents. More than half (61.1%) bought salt from local shop and 37.4% from the wholesale shop (ration). Majority (60.4%) added salt at the middle of cooking, 37.4% at the beginning, and least 1.9% at the end.

Mean scores of KAP domains among the study population were 8.2519 ± 1.65733 , 4.4926 ± 0.65522 , and 8.8333 ± 0.45422 , respectively. Table 3 shows that knowledge regarding iodized salt consumption was significantly associated with age ≤ 36 years, literacy, and general caste ($P < 0.05$). Similarly, attitude was significantly associated with age ≤ 36 years and level of education ($P < 0.05$). Practice of iodized salt consumption was not significantly associated with age, education, and type of health personnel ($P > 0.05$).

Table 4 shows that though good knowledge and positive attitude regarding the use of iodized packed salt were less than half (46.7% and 41.1%, respectively), higher level (83.3%) of correct practice was found. It was further observed that knowledge and attitude of participants were directly associated with their practice of using iodized salt ($P > 0.05$).

Descriptive coding was done in transcripts; various issues related to iodized salt usage were merged under 14 codes which were grouped into three categories: knowledge regarding iodized salt, attitude toward iodized salt usage, and practice of household consumption of iodized salt. These along with responses provided by respondents were listed in Table 5.

Discussion

This is a community-based study in rural India to assess KAP regarding iodized salt consumption and influential factors. In the present study, majority belonged to the age group of 31–40 years (30.4%) and least (1.9%) in

Table 2: Distribution of study population according to knowledge, attitude, and practice of the respondents on iodized salt consumption (n=270)

Variables regarding knowledge, attitude, and practice of the respondents on iodized salt consumption	Frequency, n (%)
Knowledge of the respondents on iodized salt consumption	
Heard about iodized salt	
Yes	186 (68.9)
No	52 (19.3)
No response	32 (11.9)
Meaning of iodized salt	
Ordinary common salt with a small quantity of iodine	72 (26.7)
Common salt	2 (0.7)
Don't know	105 (38.9)
No response	91 (33.7)
Edible salt contains iodine	
Yes	20 (7.4)
No	108 (40.0)
Don't know	142 (52.6)
Difference in taste of iodized salt from that of common salt without iodine	
Yes	67 (24.8)
No	55 (20.4)
Don't know	148 (54.8)
Recognition of iodized salt packet by	
Smiling sun on packet	28 (10.4)
Iodine level printed on packet	48 (17.8)
Color and design of packet	8 (3.0)
Don't know	146 (54.1)
No response	40 (14.8)
Intake of iodized salt is important for health	
Yes	159 (58.9)
No	4 (1.5)
Don't know	107 (39.6)
Intake of iodized salt is important	
To prevent from goiter (swelling of neck)	48 (17.8)
To keep healthy	54 (20.0)
To prevent iodine deficiency	2 (0.7)
To grow well	3 (1.1)
Don't know	67 (24.8)
No response	95 (35.6)
When there is iodine deficiency in the body, there is	
Generalized weakness	34 (12.6)
Goiter	24 (8.9)
Growth retardation	1 (0.4)
Brain development is hampered in children	3 (1.1)
Birth defects	2 (0.7)
Defect in hearing and speech	1 (0.4)
Don't know	155 (57.4)
No response	50 (18.5)
Attitude of the study participants on iodized salt consumption	
Opinion on salt preference	
Packed salt	269 (99.6)
No response	0 (0.4)
Reason for salt preference	
Taste	131 (48.5)

Table 2: Contd...

Variables regarding knowledge, attitude, and practice of the respondents on iodized salt consumption	Frequency, n (%)
Attitude of the study participants on iodized salt consumption	
Tradition	68 (25.2)
Quantity	4 (1.5)
Health	51 (18.9)
Quality of salt	11 (4.1)
Free of cost	2 (0.7)
Cheaper	3 (1.1)
Importance of iodized salt in your diet	
Very important	83 (30.7)
Somewhat important	122 (45.2)
Not at all important	4 (1.5)
No response	61 (22.6)
Practices of the study participants regarding iodized salt consumption	
Type of salt used	
Iodized packed salt	267 (98.9)
Coarse salt (nonpacked)	3 (1.1)
Sunlight exposure to salt	
Yes	24 (8.9)
No	245 (90.7)
Don't know	1 (0.4)
Salt storage place	
Dry area	260 (96.3)
Moist area	7 (2.6)
Near to fire	3 (1.1)
Type of salt container	
With cover	258 (95.6)
Without cover	12 (4.4)
Duration of salt storage at household level	
Less than or equal to ½ month	65 (24.1)
½ to 1 month	142 (52.6)
1 to 1 and ½ months	44 (16.3)
1 and ½ to 2 months	14 (5.2)
More than or equal to 2 months	4 (1.5)
No response	1 (0.4)
Addition of salt in cooking during	
Beginning	101 (37.4)
Middle	163 (60.4)
At the end of cooking	5 (1.9)
Early and middle	1 (0.4)
Number of salt packets consumed per month	
Half packet	6 (2.2)
Half to one packet	75 (27.8)
One to two packets	107 (39.6)
Two to three packets	64 (23.7)
More than three packets	18 (6.7)
Usually bought salt from	
Local shop in the same town or village	165 (61.1)
Shop in the nearby town or village	2 (0.7)
From the wholesale shop (ration)	101 (37.4)
From weekly market	2 (0.8)

71–80 years' age group, with mean of 38.6 ± 13.8 years, similar to the findings in rural Tamil Nadu (19–76 years,

Contd...

Table 3: Association of knowledge, attitude, and practice of respondents regarding iodized salt usage and their sociodemographic characteristics (n=270)

Characteristics	Knowledge			Attitude			Practice		
	Poor, n (%)	Good, n (%)	χ^2 and P	Negative, n (%)	Positive, n (%)	χ^2 and P	Wrong, n (%)	Correct, n (%)	χ^2 and P
Age (years)									
≤36	57 (41.3)	81 (58.7)	16.410, 0.000	70 (50.7)	68 (49.3)	7.772, 0.005	20 (14.5)	118 (85.5)	0.960,
>36	87 (65.9)	45 (34.1)	or <0.001	89 (67.4)	43 (32.6)		25 (18.9)	107 (81.1)	0.327
Religion									
Hindu	130 (53.3)	114 (46.7)	0.003, 0.562	147 (60.2)	97 (39.8)	1.927, 0.120	40 (16.4)	204 (83.6)	0.136,
Muslim	14 (53.8)	12 (46.2)		12 (46.2)	14 (53.8)		5 (19.2)	21 (80.8)	0.443
Social caste									
SC	52 (65.0)	28 (35.0)	7.930, 0.047	51 (63.8)	29 (36.2)	3.769, 0.287	18 (22.5)	62 (77.5)	2.958,
ST	7 (58.3)	5 (41.7)		9 (75.0)	3 (25.0)		2 (16.7)	10 (83.3)	0.398
OBC	37 (52.9)	33 (47.1)		42 (60.0)	28 (40.0)		9 (12.9)	61 (87.1)	
General	48 (44.4)	60 (55.6)		57 (52.8)	51 (47.2)		16 (14.8)	92 (85.2)	
Education									
Illiterate	51 (83.6)	10 (16.4)	0.000 or	50 (82.0)	11 (18.0)	17.337, 0.000	14 (23.0)	47 (77.0)	2.241,
Literate	93 (44.5)	116 (55.5)	<0.001	109 (52.2)	100 (47.8)	or <0.001	31 (14.8)	178 (85.2)	0.099
Occupation									
Housewife	108 (51.7)	101 (48.3)	1.023, 0.194	119 (56.9)	90 (43.1)	1.455, 0.145	36 (17.2)	173 (82.8)	0.208,
Others	36 (59.0)	25 (41.0)		40 (65.6)	21 (34.4)		9 (14.8)	52 (85.2)	0.406
Family type									
Nuclear	91 (50.3)	90 (49.7)	2.062, 0.096	109 (60.2)	72 (39.8)	0.402, 0.307	30 (16.6)	151 (83.4)	0.003,
Joint	53 (59.6)	6436 (40.4)		50 (56.2)	39 (43.8)		15 (16.9)	74 (83.1)	0.954
PCI category									
≤1333.33	81 (61.4)	51 (38.6)	6.691, 0.010	79 (59.8)	53 (40.2)	0.098, 0.754	22 (16.7)	110 (83.3)	0.000,
>1333.33	63 (45.7)	75 (54.3)		80 (58.0)	58 (42.0)		23 (16.7)	115 (83.3)	1.000
Total (%)	144 (53.3)	126 (46.7)		159 (58.9)	111 (41.1)		45 (16.7)	225 (83.3)	
Mean scores		8.2519±1.65733			4.4926±0.65522			8.8333±0.45422	

PCI=Per capita income

Table 4: Association of knowledge and attitude with practice regarding iodized salt usage (n=270)

Characteristics	Total, n (%)	Practice		χ^2 and P
		Wrong, n (%)	Correct, n (%)	
Knowledge				
Poor	144 (53.3)	23 (16.0)	121 (84.0)	0.107,
Good	126 (46.7)	22 (17.5)	104 (82.5)	0.743
Attitude				
Poor	159 (58.9)	29 (18.2)	130 (81.8)	0.688,
Good	111 (41.1)	16 (14.4)	95 (85.6)	0.407
Total		45 (16.7)	225 (83.3)	

mean: 40 years) by Banumathi *et al.*,^[15] Sakhalkar and Sultana in rural Osmanabad,^[23] and Northern Ethiopia by Gidey *et al.*^[16]

In our study, majority of the participants were Hindus (90.4%), which was predominantly consistent with other studies.^[15,16,24] Sen in Bengal found 76.5% of Hindu families including 24.5% SC, ST, or OBCs.^[2] In this study, majority (40%) were general, SC (29.6%), OBC (25.9%), and least (4.4%) were ST, similar to the findings of Kumar *et al.*,^[24] whereas in the study by Roy *et al.*,^[14] a majority (83.3%) were OBC and only 2% belonged to general caste. In our study, 84.4%

were married women similar to the findings of Gidey *et al.*^[16]

In the present study, majority were literate (77.4%), in which 33% had secondary education and only 2.6% were graduated and above, similar to other studies^[15,19] but less (93.1%) than study by Singh *et al.* in rural Kanpur,^[17] whereas less literate (33.3%), and 14% graduate were found in rural Osmanabad.^[23] Majority in our study were homemaker (77.4%), similar result was obtained in rural Assam,^[19] but less (98%) than rural Tirunelveli.^[15] In the current study, majority were from nuclear family (67%). Sakhalkar found that 65.5% were from nuclear families and 71.5% had income of Rs. 7001–15,000/- per month.^[23] In our study, majority (34.6%) belonged to lower class and only 1.5% belonged to upper class (≥Rs. 6277/-); another rural study found high (30%) and upper middle class (49%) households.^[14]

Knowledge

The current study found that 68.9% of participants heard about iodized salt, but 38.9% did not know the meaning, whereas 26.7% replied that it is ordinary common salt with a small quantity of iodine; similar to other studies,^[2,24] where 90% of respondents heard about iodized salt elsewhere.^[23]

Table 5: Focus group discussion: (among rural women of Tripura)

Criteria	Code	Response
Knowledge regarding iodized salt	Meaning of iodized salt	Majority rural women have heard about iodized salt. They had an idea that this iodized salt is nothing but ordinary salt which contains some amount of iodine Majority did not know that edible salt contains iodine. But, few of them replied that every salt contains iodine Taste of iodized salt may different from that of common salt without iodine
	Source of knowledge	They knew about iodized salt from family members/relatives, neighbors, doctors, health workers, ANM, ASHA, AWW, shopkeeper, television, and newspaper <i>"I remember when my daughter was in her teens that time we used to see advertisement in TV and radio about iodized salt in DD 1 channel; sometimes there were some pathonatok (street play) and putul khela (puppet show) here in Madhupur"</i>
	Important of iodized salt	They knew that intake of iodized salt is important for health not only to prevent goiter (swelling of neck), but also for proper growth and development of an individual, students have better educational performance There are other benefits such as prevention from pregnancy-related complications such as abortion/ stillbirth, birth defects <i>"ANM, health workers told me about the importance of iodized salt for me and my baby when I used to have my antenatal check-ups during my pregnancy period"</i>
	Effects of iodine deficiency	There are generalized weakness, growth retardation, and brain development is hampered in children, defect in hearing and speech, and goiter. There may be pregnancy-related complications such as birth defects, abortion, still births <i>"One of our neighbour did not have any child after marriage, when they went for check-up she was found to have some thyroid problem and doctors advised regular medication, some food items (cabbage) to avoid and regular use of iodized salt in diet at family level"</i>
	Recognize iodized salt packet	They identified a salt packet as iodized by noticing the iodine level printed on salt packet, also from the "smiling sun on packet" symbol with some descriptions on the packet
	Attitude toward iodized salt usage	General opinion
Consumption amount		They had idea that for healthy diet and regular food consumption, a person can take/add one to two teaspoon salts daily in each meal individually
Important of iodized salt		They thought that it is somehow important to use iodized salt in regular diet and more salt should be consumed during any type of illness (in case of diarrhea take salt and water) and specific conditions such as pregnancy/lactation
Time of adding salt during cooking		Majority of them gave opinion that salt can be added anytime during cooking a meal <i>"I think taste of the cooked food is related to the timing of salt addition in cooking processes"</i>
Practice of household consumption of iodized salt	Place of purchase	They were not involved in purchase of salt or other food items at their family level on a regular basis. <i>"My husband/son usually bought salt packets from local shop in Madhupur bazaar (market), Haat baar/ Bazar baar (weekly market)"</i> <i>"Iodized salt is always available but recently for last 1 month my husband did not bought the salt packet we use for long time due to unavailability"</i>
	Regularity of use	Few of them purchase from wholesale shop (ration) Nearly all participants were using iodized packed salt for cooking Roughly, on an average, their family had consumed one to two packets of salt per month, over a period of last 6 months
	Storage	They stored salt in dry area in their kitchen and no sunlight exposure months at household level. Majority families store salt for 1 to 1 and ½ months <i>"I keep salt in an archi (old, dry half coconut shell) near our cooking place in kitchen"</i> For regular daily salt usage, they used covered salt containers but often they did not keep the container air tight
	Time of adding salt during cooking	Most of them preferred to add salt during middle of cooking, but few of them also add salt at the beginning <i>"Me, my sister-in-law and mother-in-laws add salt on table during eating. We keep this extra portion of salt separately in the floor adjacent to our thala (food-plate) from beginning of eating whether it's needed or not"</i>
	Reasons for never and occasional use of iodized salt	Some rural women had used iodized salt irregularly <i>"I don't know about iodized salt and am not aware of the benefits and any difference between these two types, i.e., iodized and noniodized salt. Whatever salt packet is coming to my house I use that only"</i>

AWW=Anganwadi worker, ASHA=Accredited social health activist, ANM=Auxiliary nurse midwife

Nearly half (46.7%) knew about iodized salt from mass media, 6% from family members and relatives, 5.9%

from health workers, and only 2 (0.8%) from panchayat members, which is consistent with studies conducted in

other places.^[2,24] Friends and relatives (41.48%) were the major medium about the importance of iodized salt and iodine-deficiency diseases in rural Assam.^[19]

In our study, 52.6% of women did not know that edible salt contains iodine, only 7.4% know, but 40% replied that salt did not contain iodine. A majority of respondents (90.9%) knew that packet salt contains iodine, while 51.4% were wrongly aware of the presence of iodine in open salt.^[14]

A majority of respondents (58.9%) in our study know that iodized salt is important for health, 20% reasoned to keep healthy, and 17.8% know that this prevents from goiter. On further inquiries on iodine deficiency in the body, 12.6% replied generalized weakness, 8.9% goiter, and 1.1% reported hampered brain development; similar result was obtained in other studies.^[16,24,25] Nearly 74.67% had knowledge that inadequate intake of iodized salt leads to goiter, whereas 70.67% opined to maintain health. Majority (63.33%) agreed that iodine deficiency can lead to growth retardation, particularly in children, even mental retardation (68%).^[19]

A majority of respondents were unaware of the benefits of iodized salt found elsewhere;^[2,16] in rural Uttar Pradesh, 54.1% knew its role in cure of goiter, growth, and development (15.4%).^[14] Kumar *et al.* showed that 4% knew smiling sun logo and 15% knew the print level on salt packet.^[24] The current study showed that majority (54.1%) did not know recognized iodized salt packet, only 10.4% know smiling sun on packet, and 17.8% identified iodine level printed on packet.

Attitude

In our study, almost all (99.6%) felt the necessity of using packaged salt, with the reasons being taste (48.5%), tradition (25.2%), and health (18.9%). Around 30.7% of the respondents felt that it is very important to have iodized salt in diet, 45.2% thought somewhat important; comparable with findings in rural Uttar Pradesh where 15% believed the need to remain healthy.^[14] Nearly 28% of respondents felt that iodine deficiency was serious, 20% felt that it was not serious, and 26% did not know about it in a study conducted by Lowe in Pakistan.^[25] In a study conducted in Sindh and Punjab, participants responded that iodized salt is better for physical growth and prevents from goiter.^[18] In another study, 58.2% of the respondents opined that iodized salt should be consumed.^[2] Few studies reported unavailability (52.2%), high cost (12%), and taste as the major reasons for not using iodized salt.^[14-16]

Practice

In the present study, 98.9% of participants were using iodized packed salt and only 1.1% were using coarse

salt (nonpacked). Similar findings were found in studies elsewhere consciously even without knowing its benefits.^[14,15,19,23-25]

Singh *et al.* revealed that 18% were consuming crystalline salt.^[17] The actual use of iodized salt was found lower in rural Pakistan (18% and 7% in Sindh and Punjab, respectively)^[18] while 83.3% of households in rural Bengal, India purchasing loose salt were used to consume inadequately iodized salt compared to others (22.4%) who always purchased packet salt.^[2]

The current study revealed that 96.3% stored salt in dry area; however, 8.9% reported sunlight exposure to salt; while only 2.7% exposed salt in sunlight though 91.8% stored salt in dry places.^[16] Nearly 30.5% of the respondents used earthenware for salt storage as they thought that it absorbs dampness or moisture of salt.^[23]

Around 95.6% of women in the present study kept salt in a covered container similar to others.^[14,19,24] Again, 32% used steel containers, whereas 8% used earthenware pot for salt storage in rural areas of Kanpur.^[17] Nearly 79% of respondents were unaware about covering of salt container and 46% of respondents explained that they may use wet hands to take salt while cooking.^[23]

Almost 52.6% of women in this study stored salt for a period of half to 1 month and 24.1% store less than or equal to half month. Nearly 51.7% stored salt for more than 2 months after purchase.^[16] Around 39.6% used 1–2 packets salt in a month, >3 packets in a month was consumed by 6.7% of respondents, while 73% of rural population consumed 2 kg salt per month.^[24]

In our study, 61.1% bought salt from local shop in the same village and 37.4% from the wholesale shop (ration), consistent with other studies.^[14,23] In our study, knowledge and attitude regarding iodized salt consumption were significantly associated with age groups ≤ 36 years, literacy, and general social caste ($P < 0.05$), but practice was not significant ($P > 0.05$). Good knowledge and attitude regarding use of iodized packed salt were less than half (46.7% and 41.1%, respectively), but higher level (83.3%) of correct practice was found ($P > 0.05$). Similarly, no significant association ($P > 0.05$) between SES and type of salt used was found in rural Uttar Pradesh.^[14]

Conclusions

The existing knowledge and attitude of participants toward iodized salt usage and benefits were low; still a majority of individuals were consuming iodized salt without knowing its benefits. Majority gained knowledge about benefits of iodine through mass media and others

through relatives and health workers. Hence, there is a need to educate rural people through nutrition education about iodized salt and benefits by active participation of grassroot-level workers and mass media in generating awareness about the health benefits of consuming adequately iodized salt.

Acknowledgments

The authors gratefully acknowledge the participants and field workers of the RHTC Madhupur and local accredited social health activists working in the study areas for their contribution in conducting the research work.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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