

IODINE SALT CONSUMPTION IN INDONESIAN HOUSEHOLDS: BASELINE HEALTH SURVEY 2007

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ABSTRACT

Background: Iodine Deficiency Disorder (IDD) reduction program has been implemented since 1976. According to the National Economic Survey 2002, the average consumption of iodized salt was 6.26 grams. The results of Iodine Salt Survey (SGY) 2003 showed that the consumption of iodine salt at the household level was 73.2%, meanwhile, the baseline health survey (Riskesdas) 2007 showed there was reduction of iodine salt consumption towards 60.2%. **Methods:** Type of study was secondary data analysis with cross-sectional design utilizing the Riskesdas 2007's data. Sample was selected purposively according to the previous SGY's survey based on the endemically criteria namely highly endemic, mediocre and non endemic. **Results:** The results of the analysis were there was discrepancy of iodine salt consumption among urban and rural areas as well as mother's education level. The iodine salt consumption was higher in the urban area (65.5%) compare to the rural area (52.9%). The higher the education of mothers the better the iodine salt consumed. The usage of iodine salt in the households based on salt quick test was 60.2%, meanwhile, according to the salt titration it was only 23.4%. The results of Excretion Iodine Urine showed that the iodine intake among the school children (age of 6–12 years old) was 12.8% and was still below the cut-off point prevalence, which is greater than 50%. The conclusion of this analysis is that there was evidence of iodine salt reduction consumed at the household level. Conversely, there was inclination of the percentage of iodine urine level among the school children in Indonesia in the year 2007. It is recommended that policy analysis need to be conducted due to the achievement of the Universal Salt Iodization target, especially in the endemic areas to asses the existence of the IDD prevalence.

Key words: Iodine salt at the households, Iodine salt consumption, urine iodine excretion

ABSTRAK

Program penurunan prevalensi gangguan akibat kekurangan yodium (GAKY) sudah dimulai sejak tahun 1976. Menurut hasil Susenas, hingga tahun 2002 rata-rata konsumsi garam beryodium perkapita perhari mencapai 6,26 gram. Hasil survei garam yodium (SGY) 2003 menyatakan bahwa penggunaan garam beryodium di tingkat rumah tangga sudah mencapai 73,2%, sementara hasil Riskesdas 2007 menunjukkan penurunan-konsumsi menjadi 60,2%. Jenis studi adalah analisis data sekunder Riset Kesehatan Dasar (Riskesdas) dilakukan dengan memanfaatkan data Riskesdas 2007, dengan disain studi potong lintang. Sampel dipilih secara purposive yakni rumah tangga dari 30 kabupaten/kota yang tercakup dalam survei sebelumnya (SGY 2003), berdasarkan kriteria endemisitas wilayah: berat, sedang dan non endemik. Hasil analisis menunjukkan, terjadi perbedaan tingkat konsumsi garam beryodium antarperdesaan dan perkotaan dan tingkat pendidikan ibu. Konsumsi garam beryodium lebih tinggi di wilayah perkotaan (65,5%) daripada perdesaan (52,9%). Makin tinggi tingkat pendidikan ibu, makin tinggi persen penggunaan garam beryodium di rumah tangga. Penggunaan garam beryodium di rumah tangga berdasarkan tes garam cepat baru mencapai 60,2%; sedangkan menurut uji titrasi garam baru mencapai 23,4%. Hasil titrasi urin menunjukkan tingkat asupan yodium pada anak sekolah telah mencapai target. Proporsi anak usia 6–12 tahun yang memiliki kandungan yodium dalam urin mencapai 12,8% dan masih berada di bawah angka kesepakatan internasional untuk masalah kekurangan yodium (bila kandungan yodium urin > 50%). Kesimpulan dari analisis ini adalah terjadi penurunan tingkat konsumsi garam beryodium rumah tangga, tetapi sebaliknya, terjadi peningkatan kadar yodium urin anak sekolah di Indonesia pada tahun 2007. Rekomendasi penelitian adalah perlu adanya pengkajian kebijakan tentang pencapaian target Universal Salt Iodization (USI) dan penelitian khusus untuk wilayah endemik untuk melihat angka prevalensi GAKY.

Kata kunci: Konsumsi garam beryodium, kadar yodium urin

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INTRODUCTION

Programs inducing the prevalence of IDD through salt iodization have been developed in 1976. The goal of the program is to achieve the target of iodine salt consumption (30–80 ppm) covering 90% of the households. According to the National Socio-economic Survey 2002, the average consumption of iodine per-capita per-day was 6.25 grams. The following 'salt' survey conducted by the Ministry of Health in 2003 found that the iodine salt consumption achieving 72.8% of the households.

The high prevalence of Iodine Deficiency Disorders (IDD) in Indonesia leads the Indonesian government intensively support the IDD's prevention programs since 1976. Some efforts had already terminated due to the significant prevalence reduction, for example lipiodol injection, and others continuously been implemented through salt fortification as well as monitoring to the iodine salt consumption over the community. As a result, the IDD prevalence has reducing significantly after almost 20 years of program implementation. In the year 1994 the President Statement number 69 launched mentioning that all of the salt consumption distributed over the country has to contain appropriate iodine (1).

Riskesdas 2010, a national baseline health survey provides the information of iodine content in salt consumption. The assessments were done through direct salt quick test, laboratory salt titration, as well as urine titration to examine the iodine content of school children aged of 6–12 year old (2). For the two later methods, especially, the sample was selected purposively within 30 districts adopting the previous salt survey sampling frame (3).

The objective of this analysis is to understand the percentage of iodine salt consumption in the households, comparing the results of the salt quick test, salt titration as well as urine intake excretion of the school children.

METHODS

Type of research is secondary data analysis of Riskesdas 2010, with the study design of cross-sectional design. Place and time of analysis is in Jakarta, taking the data of the 30 districts that had been selected purposively implementing the previous sampling frame of salt survey 2003.

The households sample of Riskesdas 2007 involving the core sample of Susenas 2007, including 280,000 households. Each household has a border line called census block (BS). The salt quick test data was collected from all of households' samples; however, salt titration and urine test were only involving the thirty districts. The selection of the 30 districts was purposively implementing the salt survey (SGY) sampling frame, done in the year 2003 based on the criteria endemic ties as well as the frequency of iodine salt consumed namely highly endemic, mediocre and non endemic. Unfortunately, the numbers of districts analyzed in this paper were 27 out of 30 districts involved in Riskesdas 2007.

Indicators of iodize salt consumption include the variables of keeping and using salt in the household, quick salt test assessment's result, salt titration, and urine test of school children. Instruments and the way of data collected referred to the Riskesdas 2007.

Materials and methods namely salt quick test gotten from the direct field test through two drops of Kalium Yodat solution (brand of Povidon, produced by Kimia Farma) over two table spoons of salt taken from the household salt container. The test results indicates: no iodine content (no change color of the sample salt, or it changes the color slightly and gone after second), improper iodine content (color of light blue), and enough iodine (color of dark blue). Laboratory salt titration informed of iodine content in the salt sample with a continuous number and cut-off point of ≥ 30 ppm. Univariate analysis was implemented to compare the results using SPSS version 15.0.

RESULTS

Characteristic of salt consumption of the households

Most of the households interviewed have and kept salt in their households, either in the urban or rural areas, achieving 96.8%. The salt quick test analysis showed 58.3% of the households' salt having proper iodine (≥ 30 ppm). There was percentage difference on iodine salt used between urban (65.5%) and rural (52.9%) as can be seen at table 1.

In total, there was only 58.3% salt used in the households contain enough iodine. There was proportion difference in iodine salt reserved

Table 1. Iodine content in salt based on some characteristics

No	Characteristics	Urban		Rural		Total	
		N	%	N	%	N	%
1	Households kept salt						
	• Yes	833	98.1	1,093	95.8	1,926	96.8
	• No	16	1.9	48	4.2	64	3.2
2	Salt quick test						
	• Without iodine	84	9.9	307	26.9	391	19.6
	• Improper iodine	209	24.6	230	20.2	439	22.1
	• Enough iodine	556	65.5	604	52.9	1,160	58.3
3	Mother's education						
	• No schooling	36	4.3	147	12.9	183	9.2
	• Un-finished primary school	59	7.0	236	20.7	295	14.8
	• Finished primary school	179	21.1	387	33.9	566	28.5
	• Finished secondary school	179	21.0	129	11.3	307	15.4
	• Finished high school	294	34.7	218	19.1	512	25.8
	• Graduated	102	12.0	23	2.0	125	6.3
4	Salt titration						
	• < 30 ppm	612	72.1	912	79.9	1,524	76.6
	• ≥ 30 ppm	237	27.9	229	20.1	466	23.4
5	Urine intake excretion						
	• < 100 mcg/L	101	11.9	153	13.4	254	12.8
	• 100–299 mcg/L	559	65.8	774	67.8	1,333	67
	• ≥ 300 mcg/L	189	22.3	214	18.8	403	20.3

in the households based on mother's education characteristics. Salt quick test results showed the proportion salt with enough iodine was higher in the urban area compare to the rural area. Consistently, proportion of improper iodine content was also higher at the urban area. Almost one fifth of the household's salt contain no iodine.

Titration analysis results showed lower percentage. The percentage of salt with proper iodine (≥ 30 ppm) used in the households was 23.4%, and, are higher in the urban area (27.9%) than in the rural (20.1%).

The analysis towards the urine titration showed that urine intake excretion (UIE) of the school children was quite good. Only 13% of the school children did consume less than 100 mcg/L iodine.

Iodine content in salt based on salt quick test, salt titration and iodine urine excretion assay

The salt examination implemented to the Riskesdas 2007, called salt quick test that is two drops of KIO₃ solution on two spoons salts sample; salt titration and urine's iodine examination in the laboratory. Based on those methods, it was given the information of percent

iodine content in the samples specimens. The cut-off points were different according to the tests. The quick salt test results indicated by changing in salt color after the test implemented from nothing to dark blue (enough iodine); the salt titration's cut-off is ≥ 30 ppm; meanwhile the urine intake excretion (UIE) cut-off is 100–299 mcg/L.

Based on the salt quick test result, the analysis found as much as 60.23% households consumed salt with enough iodine. The highest percentage revealed in Tapanuli Tengah, Karo district and Metro municipality, where a hundred percent of the salt treated by iodine; followed by Toba Samosir district (99.38%), Tarakan municipality (95.12%), Katingan district (88.71%) and district of Bantul (85.92%). Ten out of thirty districts' population have consumed salt without enough iodine.

Table 2 showed that almost 40% of the salt consumed has no iodine according to the program's standard of Indonesia National Standard (SNI). The districts that were still lacking iodine in salt were Grobogan, Jember, Sikka and Jeneponto.

Table 2. Iodine content in salt based on salt quick test (Riskesdas 2007)

No	Districts/Municipality	Salt Quick Test* (Iodine Level in%)		
		Enough	Less	W/o
1	Tapanuli Tengah	100	0	0
2	Toba Samosir	99.38	0.63	0
3	Karo	100	0	0
4	Solok Selatan	42.42	57.58	0
5	Kota Dumai	78.41	11.36	10.23
6	Kota Metro	100	0	0
7	Karawang	36.49	40.54	22.97
8	Grobogan	27.59	13.79	58.62
9	Kabupaten Semarang	71.67	20	8.33
10	Kota Salatiga	63.33	33.33	3.33
11	Kota Semarang	65.67	26.87	7.46
12	Bantul	85.92	12.68	1.41
13	Blitar	41.24	44.33	14.43
14	Jember	26.89	21.01	52.10
15	Bondowoso	47.92	41.67	10.42
16	Nganjuk	-	-	-
17	Kota Pasuruan	77.78	14.29	7.94
18	Kota Tangerang	50	30.26	19.74
19	Klungkung	64.29	35.71	0
20	Sikka	34.31	5.88	59.80
21	Katingan	88.71	9.68	1.61
22	Tapin	79.03	8.06	12.9
23	Balangan	70	20	10
24	Kota Tarakan	95.12	4.88	0
25	Donggala	56	40	4
26	Jeneponto	9.76	14.63	75.61
27	Kota Kendari	44.84	49.78	2.69
28	Konawe	-	-	-
29	Mappi	76.92	15.38	0
30	Kota Gorontalo	-	-	-
TOTAL		60.23	22.79	16.61

Notes: The data available for only 27 out of 30 districts observed.

Based on the salt titration results, only 24.69% salt consumption contain enough iodine (≥ 30 ppm). Indonesian National Standard has the iodine content of 30–80 ppm KIO₃). In other word, 75.31% of the salt consumed had not enough iodine according to SNI. The golden value of salt titration compare to salt quick test is that the former has higher specificity; especially the quick salt test is influenced by the enumerator subjectivity.

Table 3 showed that only 14.4% of the school children (aged 6–12 years old) has UIE lower than 100 mcg/L. Urine Intake Excretion is an indicator that

can be used to show the level of current iodine intake. If more than 50% of school children have iodine urine less than 100 mcg/L indicates lack of iodine intake in the population (5).

Median iodine urine level of the school children is 224 mcg/L indicated that the iodine intake of the population was above the allowance recommended. Thus, this analysis found that the average iodine level of salt consumption in the population based on titration method was 25%, meanwhile for the urine titration was 62%.

Table 3. Percent iodine content for salt titration and urine intake excretion

No	District/ Municipality	Type of examination and Percent iodine content					
		Salt titration (ppm)		Urine Intake Excretion (mcg/L)			
		< 30	> = 30	< 100	100–299	> = 300	Median UIE
1	Tapanuli Tengah	76.60	23.40	14.89	74.47	10.64	225
2	Toba Samosir	67.50	32.50	6.88	88.13	5	230
3	Karo	71.88	28.13	6.25	75	18.75	221
4	Solok Selatan	86.76	13.24	0	91.18	8.82	229
5	Kota Dumai	63.33	36.67	5.56	87.78	6.67	237
6	Kota Metro	60	40	26.67	40	33.33	290
7	Karawang	93.59	6.41	11.54	56.41	32.05	229
8	Grobogan	93.33	6.67	1.67	36.67	61.67	365
9	Kabupaten Semarang	73.44	26.56	9.38	56.25	34.38	244
10	Kota Salatiga	72.58	27.42	6.45	38.71	54.84	304
11	Kota Semarang	82.35	17.65	10.29	33.82	55.88	288
12	Bantul	61.84	38.16	35.53	50	14.47	192
13	Blitar	85.44	14.56	6.80	86.41	6.80	208
14	Jember	87.80	12.20	21.95	55.28	22.76	214
15	Bondowoso	67.35	32.65	28.57	57.14	14.29	164
16	Nganjuk	76.80	23.20	8.90	-	-	246
17	Kota Pasuruan	76.19	23.81	6.35	92.06	1.59	236
18	Kota Tangerang	75.95	24.05	8.86	60.76	30.38	186
19	Klungkung	100	0	64.29	35.71	0	157
20	Sikka	84.91	15.09	18.87	81.13	0	209
21	Katingan	39.39	60.61	3.03	54.55	42.42	296
22	Tapin	59.38	40.63	4.69	50	45.31	257
23	Balangan	59.15	40.85	5.63	53.52	40.85	270
24	Kota Tarakan	59.52	40.48	11.90	88.10	0	219
25	Donggala	88	12	20	60	20	221
26	Jeneponto	98.95	1.05	25.26	74.74	0	181
27	Kota Kendari	84	16	16.44	71.56	12	213
28	Konawe	84.60	15.40	17.20	-	-	187
29	Mappi	61.54	38.46	7.69	23.08	69.23	211
30	Kota Gorontalo	67.10	32.9	20.5	-	-	199
TOTAL		75.31	24.69	14.40	62.17	23.43	244

Note: The data of Districts of Nganjuk, Konawe and Gorontalo municipality was not available for the analysis. The numbers quoted for the salt titration came from Riskesdas 2007 report.

DISCUSSION

Salt enriched the taste of food and people need only a small amount of it. Salt is cheap and salt is considered as a good vehicle for iodine distribution for the community. Usually salt were found in most households. The higher percentage of iodine salt consumption in the urban area is understandable, because the urban population has better education, and awareness of the iodine function in the body, indeed they have better access of information. In addition, the urban population has also more choice and variant when the iodine salt is not available in the

small outlet for example, they can just go to the higher store or supermarket to get the proper item. This situation is one among other reasons why the urban population has better consumption in iodine salt.

Salt titration results also showed that iodine level in the urban area is better than rural area. Nevertheless, the urine titration result showed that either in urban or rural areas the percentage of iodine content in urine excretion of the school children had similar results.

WHO recommended that USI should be achieved (i.e. at least 90% of the households had sufficient

iodine within their salt) by the year 2010, which was last year (ref xxx). According to the analysis', until year 2007, there were only 5 out of 30 districts/ municipalities that reached the target, i.e. Tapanuli Tengah, Toba Samosir, Karo as well as Metro and Tarakan municipalities. There are many things has to be done by the government when the Universal Salt Iodization (USI) wants to be achieved (6, 7).

Results of this analysis can be utilized as for the based point by the government to develop further program; for example, what was the problem and why are there difference achievements among districts? In conversely, when there was inclination in the other districts, especially the districts whose USI's has achieved, what was the trigger? Later, reward system need to be developed due to the decentralization era, so that competitive challenge among districts/ municipalities is expected to have a positive impact in stimulating the community health status. Indeed, to respect the decision that has been stated by the central government that belongs to all stake holders toward globalization.

Political commitment in policy implementation is an important point of all stake holders in the effort of gaining healthy community. Iodine salt policy that has been legalized through President's Statement has to have best implication. Lacking of quality in monitoring by the government as well as lacking in iodine salt distribution has to be more concerned and maintained (8).

Each sector has to do monitoring and evaluation accordingly to its capacity. For example, Ministry of Industry and Trade that has been developing and launching the national quality standard (SNI), should have monitoring system that has never stopped monitoring the salt quality from the producer level to distributor and retailer. Ministry of Internal Affair, on the other hand, needs to be consistently monitoring laws and decrees implementation (e.g. President's Statement about iodine salt consumption) up until district level. In addition, the local government and justice should monitored laws implementation, such as 'Perda', 'UU' No. 23/1992 about health, 'UU' No. 7/1996 about food stuff, 'UU' No.8/1999 about consumer protection, 'PP' No. 69/1999 about labeling and food adds. President's Statement No. 69/1994 about iodine salt production and labeling. **Indonesian Food and Drugs Administration Agency** regularly and continuously do food examination, so that there

would be no illegal salt sold for consumption. Finally **Ministry of Health** do its function to monitor the community health status, in this matter, monitoring the prevalence of diseases related to iodine problems/ disorders.

There still problem in target achievement of iodine salt consumption. There are four districts (Grobogan, Jember, Sikka and Jeneponto) that more than half of the salt consumed by the community was not containing iodine properly according to the salt quick test. Salt titration result showed even worse. Only one out of 30 districts having greater percentage than 50% of households consuming salt with enough iodine that is Katingan District. In Klungkung district (Bali province), considered as salt producing district, all of the salts titrated having less than 30 ppm of iodine. Regarding to this results, it is worth to consider a study of analyzing the quality of salt and its iodine content. It is probable that iodine was there in the salts, but, quantification is the important point for the quality issue. Another thing is about program monitoring and sanction for the deviation of the quality standard, especially when the commitment of Universal Salt Iodization. There should be a followed-up action for the sectors integration; for example, what should be taken when the behavior of the community can not be change, albeit they understand they use un-iodize salt. Their preferences using the local 'non-iodine' salt just because the salt has already well-known, and their habitual. In this case, it has to be suppressing efforts by the local government to make a guarantee that the salt quality is adjusted to the national salt standard.

There was significance difference between the results of salt and urine titration. The iodine intake based on the urine titration much higher than salt titration. It seems there lots of iodine rich food has been consumed by the children; in other word, the iodine intake was not merely come from the salt solely. The main factors prejudice to be influencing this data was iodine in soil. In addition, consumption pattern of the community may contribute significantly. One thing that should be considered for the sample selection that the districts selected are representative for high endemic, mild and non endemic. For that reason, it is recommended to do split study which more specific in the endemic area to evaluate whether this area is still IDD's endemic and whether this area still having problem in iodine salt consumed?

Given the results of this analysis is excellent, especially in looking at the UIE median, the policy of achieving the USI still far from the government target. Therefore, need to do evaluation either USI still be targeted, considering that the gaps is still quite wide (30%); or need policy revision? Furthermore there has to be a relevant reasons if the USI need to be extended; for example, to maintain the intelligential points of the children in spite of preventing the prevalence of IDD problems.

Conclusion

There was still gap in distribution between iodine salt consumption according to education level and urban-rural. The higher the education level the more the iodize salt consumed. The percentage iodine salt consumed is higher in urban than the rural community. The data showed that the current intake of iodine at the school children has appropriately fulfilled and met the standard of 100–299 mcg/L. The proportion of EYU less than 100 mcg/L was only 12.8% which is much lesser than the cut of point of 50%. Ironically, the data confirms that the wide gaps occurs in Klungkung district which more than a half of the school children having iodine level in their urine for less than the standard.

The consumption of iodize salt at the household had decreasing compared to the 2003 survey. More than half of the district/municipality declined the percent consumption of the iodize salt with the proper iodine level.

Salt titration results showed that the iodine content of the salt titrated was only one fourth. This results much differ compare to the results of the salt quick test.

Recommendation

The socialization of iodine salt consumption need to be strengthen through policy empowerment especially at the district level, based on the evidence that there still a wide gaps of iodine consumption by urban-rural and education. Although EYU titration showed that the iodine level of the school children has already been appropriate, the use of the iodine salt need to be maintain as iodine has contribution to the IQ points.

There is a need to conduct a qualitative survey to answer why the consumption level of iodize salt

reducing. What determinants may influence this situation and what maybe the impact of this situation in the future.

Standardization for the titration assessment need to be implemented either the equipments, reagens, or maybe the laborants. The usage of the KIO₃ solution in the community can easily implemented with a valid results. Therefore, the KIO₃ solution has to be easily available and affordable in the community, so that control and monitoring can also be done by the community for the sake of the Intellegintia quality of the children and community.

A special survey need to be design to assess the IDD prevalence and the iodine salt consumption, as well as to find a proper method to combat the IDD problem. For example, Klungkung district is consider encemic to IDD, evendythough it is actually sea-salt producer district. Unfortunately the Riskesdas data has limitation on information of IDDs prevalence, irrespective to the iodine salt consumption.

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