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Determination of Iodine Content in Different Brands of Salt

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Abstract
In many developing countries, however, despite improvements in salt production and marketing technology, the quality of available salt is poor, or salt is incorrectly iodized, or salt that has been correctly iodized deteriorates due to excessive or long-term exposure to moisture, light, heat and contaminants. Under these circumstances, iodine losses can be 50% or more from the moment of salt is produced until it is actually consumed, and median urinary iodine levels could thus fall below the recommended range (100-200 µg/l). In addition, salt consumption is sometimes considerably less than 10 g/person/day. All these factor should be taken carefully into account, particularly when establishing the initial level of iodine in salt.Recent evidence indicates a wide spectrum of disorder resulting from severe iodine deficiency which puts at risk more than 400 million people in Asia as well as millions in Africa and South America. This iodine deficiency disorder (IDD) include goiter at all ages, with associated impairment of mental function; endemic cretinism characterized most commonly by mental deficiency, deaf-mustism and spastic diplegia and lesser degrees of neurological defect related to fetal iodine deficiency; increased stillbirths, parental and infant mortality. Evidence now available from both controlled trials and successful iodization programs that these disorders can be successfully prevented by correction of iodine deficiency. So an effort is made to determine the iodine content in different brands of the salts in India and to compare the quality in terms of iodine content.

Introduction

Iodine is an element that is needed for the production of thyroid hormone. The body doesnot make iodine, so it is an essential part of your diet. If we do not have enough iodine in our body,we cannot make enough thyroid hormone. Thus, iodine deficiency can lead to enlargement of the thyroid hypothyroidism and to mental retardation in infants and children whose mothers were iodine deficient during pregnancy (American Thyroid Association, 2007) Iodine deficiency affects humans at every stage of life and leads to several severe disorders. Iodine deficiency is the leading cause of brain damage and mental retardation in the world. In addition to mental retardation, iodine deficiency causes endemic goiter, cretinism, dwarfism, mental retardation, muscular disorders, spontaneous abortions, sterilization, and stillbirths (Verma and Raghuvanshi, 2001). In the 1990s, 1.6 billion people, one third of the world's population, was at risk for iodine deficiency disorders (IDD); less than 20 percent of people at risk had access to iodized salt. Universal Salt Iodization (USI), the primary strategy to prevent IDD, was adopted in 1993. Since then, more than 90 million newborns are protected each year from learning disabilities caused by IDD (WHO). More than 90 percent of the populations of 21 developing countries use iodized salt. In 1998, nearly 60% of world's edible salt was iodized and there was a significant decrease in number of children born at risk of IDD.The number of cretin births halved to less than 55,000 per year (Kiwanis, 1999) By 2000,70 percent of households in developing countries used iodized salt.UNICEF has declared that 85 million children will be Iodine is an element that is needed for the production of thyroid hormone. The body does not make iodine, so it is an essential part of your diet. If we do not enough iodine in our body, we cannot make enough thyroid hormone. Thus, iodine deficiency can lead to enlargement of the thyroid hypothyroidism and to mental retardation in infants and children whose mothers were iodine deficiency during pregnancy (American Thyroid Association, 2007). Iodine deficiency affects humans at every stage of life and leads to several severe disorders. Iodine deficiency is the leading cause of brain damage and mental retardation in the world. In addition to mental retardation, iodine deficiency causes endemic goiter, cretinism, dwarfism, mental retardation, muscular disorder, spontaneous abortions, sterilization and stillbirths (Verma and Raghuvanshi, 2001) In the 1990s, 1.6 billions people, one third of the world population, was at risk for iodine deficiency disorder (IDD); less than 20 percent of people at risk had access to iodized salt. Universal Salt Iodization (USI), the primary strategy to prevent IDD, was adopted in 1993. Since then, more than 90 millions newborns are protected each year from learning disabilities caused by IDD (WHO). More than 90 percent of population of 21 developing countries used iodized salt. In 1998, nearly 60 % of worlds edible salt was iodized and there was significant decrease in number of children born on risk of IDD. The number ofborn free of iodine deficiency disorder (IDD) this year. Because of the global effort to wipe out IDD it is now estimated that more than 70 percent of the world has access to iodized salt, the most practical vehicle for providing iodine in the diet.Iodized salts stored in atmospheres of relative humidities of 50 percent lose smallerquantities of their iodine than salts stored under similar conditions at other humidities. Iodized salts rendered alkaline by the addition of $NaHCO_3$ lose practically none of their iodine during storage, while neutral salts or salts rendered acid lose appreciable quantities. Salts iodized with KIO3 lose none of their iodine when stored for extended periods. Exposure of iodized salts to sunlight effects a loss of iodine from neutral or acid salts, only a slight Toss from salt rendered alkaline, and practically no loss from salts iodized with KIO_3.Exposure to heat alone effects losses of iodine from acid, neutral ,and alkaline iodized salts and from salt iodized with KIO3 in precisely the same order as did exposure to sunlight .Exposure to light and heat simultaneously effects greater losses of iodine from salts of neutral or acid reaction than exposure to light alone or heat alone. In the case of iodized salts of alkaline reaction the losses of iodine are again insignificant or negligible, even though the salts are exposed to light and heat simultaneously. The quantity of iodine liberated from a neutral salt iodized with KI appears to depend on the quantity of KI present. Universal salt iodization is the recommended intervention for preventing and correcting iodine deficiency . In the past, recommendations for iodine levels in salt were made on the assumption that, from producer to consumer, iodine losses from iodized salt were commonly between 25% and 50%, and that average salt intakes were commonly between 5 and 10 g/person/day. Substantial experience has been gained in the last decade in implementing universal salt iodization and assessing its impact on iodine deficiency disorders (IDD). A major achievement is thespectacular reduction of IDD in countries that have implemented universal salt iodization. The aim of the study is to determine the iodine content in different brands in India.

Present Study

Present study intends to determine the iodine content in different brands of the salts in India and to compare the quality in terms of iodine content.

Material

Eight different brands of salt are taken from the shop. The different brands are,

1. Gaichap Salt
2. Tata Salt
3. i-shakti Salt
4. Nirma Salt
5. Ashirwad Salt
6. Ankur Salt
7. Annapurna Salt
8. Patanjali Salt

Method

Preparation of a 50 ml solution of 0.1N $K_2Cr_2O_7$

0.245 gm of $K_2Cr_2O_7$ was accurately measured on an electronic balance, and placed into a 50ml volumetric flask with the help of a funnel. Distilled water was then added to flask in a small amount and then shaken until the solute dissolved. The flask was then filled with distilled water, up to the 50ml mark.

Preparation of 250 ml of 0.1N $Na_2S_2O_3$

6.25 gm of sodium thiosulfate, was accurately measured on an electronic balance and placed into a 250 ml volumetric flask with the help of a funnel. Distilled water was then added to flask in a small amount and then shaken until the solute dissolved. The flask was then filled with distilled water, up to the 500 ml mark.

Standardization of Sodium Thiosulfate($Na_2S_2O_3$)

1 gm of KI and 1 gm of $NaHCO_3$ were placed in a conical flask. 25 ml of water and 100 ml of potassium dichromate were then added to the flask. The flask was swirled to mix the contents. 5ml of HCl (con.) was then added to the conical flask. The flask was covered with a watch glass and the contents are gently mixed. The Flask was kept in the dark for 7-8 minutes. After the specified time, the flask was taken out of the dark, gently swirled to mix and the sides were rinsed with a small amount of distilled water. The next step was to place the Sodium Thiosulfate in a 50 ml burette, and set it up on a stand using a clamp. The $K_2Cr_2O_7$ was then titrated against $Na_2S_2O_3$. As the titration proceeds, the color of the dichromate solution turned from a deep brown to a lighter color. Once the color started turning lighter, two to three drops of starch solution (1%) was added to the flask. The starch imparted a blue black color to the solution since there was the presence of iodine. At the end point of the titration, the solution in the flask turns light green as all the iodine liberated had reacted with the thiosulfate. To accurately determine the end point of the titration, one or two drops of starch solution (1%) can be added to the conical flask again. Any unreacted iodine will color the solution dark blue. The process was repeated two more times. The average volume of $Na_2S_2O_3$ required for titration was then determined to calculate the strength.

Theoretical Aspect

From the average volume of $Na_2S_2O_3$ determined, the number ppm of iodine in the salt samples was calculated with the following formula:

Iodine ppm = (R×100×1000×0.127×N) Where,
R = Average volume of $Na_2S_2O_3$
100 is to convert the reading for 100gm of salt
1000 is convert gram of iodine to milligram of iodine
0.127 is the weight of iodine equivalent to 1ml of normal Thiosulfate solution N is the normality of Thiosulfate solution (which is 0.005N)
6 is to arrive at the value that corresponds to 1 atom of iodine liberated

Table 1: Comparison of different branded table salts on Iodine content

Sr.No.	Name of brands	Iodine (ppm)
1	Gaichap salt	23.283
2	Tata salt	26.458
3	i-shakti salt	11.641
4	Nirma salt	34.925
5	Ashirwad salt	32.385
6	Ankur salt	21.484
7	Annapurna salt	43.391
8	Patanjali salt	62.441

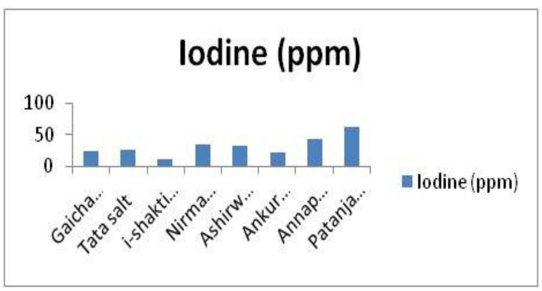

Figure 1: Comparison of different branded table salts on Iodine content

DISCUSSION

IDD control programme in India is one of the success stories of public health in the country. The current 91 per cent household level coverage of iodized salt in India, of which 71 per cent is adequately iodized salt, is a big achievement. A mission approach is required with effective and efficient coordination amongst all stakeholders of IDD control efforts in India to achieve and sustain the IDD control goal. The data reflects that iodine content is highest in patanjali brand than the other seven brands of salt.

Conclusion

The causes, prevention and cure of goiter and cretinism, now included in the more general term iodine deficiency disorders (IDD), have been known for more than half a century; yet their total eradication remains an elusive goal. We now know that iodine deficiency causes a spectrum of effects on growth and development, particularly brain development in the fetus, neonate and child, justifying a much higher priority now for its prevention and control than in the past. Apart from diminishing the toll in human misery, the prevention of IDD would mean improved educability of children, greater productivity, and better quality of life for many millions living in the iodine-deficient regions of the world. It is now clear that iodine deficiency is a major impediment to human development (Hetzel, 1993). India has achieved a commendable progress in reducing prevalence of goiter and iodine deficiency. Progressing at this rate, may bring the target of eliminating IDD from the country closer in no time. Although the study carried out in some widely used braded salt which is too minute to conclude that the rate of IDD is decreasing in the nation, but the results showing that almost all the salts containing iodine above the minimum level make it quite marked. Despite of most of people of our country live below poverty line, it can be seen from the study, that the people are now using iodized salts.

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