

Iodine salt and IDD control

Classification of papers: Salt and Health

Abstract: Iodine is of vital importance to people, and is one of the essential trace elements in the human body. Adding the right amount of iodine in salt can effectively reduce the iodine deficiency disorders (IDD) and young children's goiter rate, so as to improve the level of physical growth and development of juveniles, thereby, to promote the people's quality of life. Since China began the implementation of Universal Salt Iodization strategy to prevent iodine deficiency disorders in 1995, through the continuous monitoring of the implementation and the adjustment of the amount of iodized salt, which has made remarkable achievements in the elimination of IDD and won the recognition of the WHO. This article by stating the correlation of salt iodization and elimination iodine deficiency disorders, which including the general situation about Universal Salt Iodization (USI), the effects of iodized salt on human health, the relationship of USI and iodine quantity, provides more comprehensive understanding of the relationship between salt iodization and elimination iodine deficiency disorders, how to make the salt iodization project be different, diversified, more scientific and reasonable in the course of the reform of the salt industry in China, some opinions and suggestions are put forward at the end of this article.

Keywords: Iodine salt IDD control achievement suggestions

I . An Overview of China's USI

1.The Context and Implementation of USI in China

Iodine is one of the microelements indispensable to the growth and development of human body. Iodine deficiency can cause many diseases. Serious cases may affect brain development. China had a history of serious iodine deficiency. IDD existed extensively in China and involved a huge population. Statistical data from the 1970s show there were 35 million patients of endemic IDD across the country. In the meantime, IDD is also a global problem. In 1990, the United Nations World Summit for Children passed the "World Declaration for the Survival, Protection and Development of Children" and the "1990s Action Plan for the World Declaration for the Survival, Protection and Development of Children". At the same time, the W.H.O. put forward the goal of realizing "Global Elimination of IDD" in 2000. The Chinese government also actively responded to the call. The former Premier Li Peng signed in the above two documents on behalf of the Chinese government.

In 1995, the General Administration of Quality Supervision, Inspection and Quarantine enacted the "Standards for IDD Elimination" (GB16006-1995) and formally approved USI. A number of departments and organizations, including the former China Drug Administration, the former

Ministry of Health and China National Light Industry Council, carried out fixed-point production and supply. In 1996, the State Council enacted the "Table Salt Monopoly Regulations", started a state monopoly on table salt and promoted USI. As a public health policy for promoting iodized salt, eliminating IDD and improving the quality of Chinese population, it marked China's USI entered a new stage of extensive implementation. The enforcement of the "Table Salt Monopoly Regulations" made USI proceed in an efficient and high-quality way, effectively reduced IDD in China and achieved remarkable effect. In 2000, China achieved all the goals our government promised as scheduled and attracted extensive international attention.

As our residents' qualified iodized salt consumption rate rises and our people's living standard improves, iodine supplement sources have become more extensive. Relevant state departments also have adjusted related indicators and standards according to actual monitoring data. In 2008, the Standardization Administration under the former Ministry of Health revised and issued the new "Standards for IDD Elimination". According to official monitoring data, to avoid excess iodine supplementation, relevant departments lowered the iodine content in table salt respectively in 2000 and 2007. In recent years, it has been explicitly pointed out that local governments can control the iodine content in table salt flexibly within the standard range according to the local residents' actual iodine nutritional condition, in order to effectively maintain the achieved results, adjust measures to local conditions, carry out reasonable iodine supplementation.

2.China's Experience and Achievements in USI

Since the introduction of USI, China has gained some experience. By establishing a working mechanism of "government leadership, department cooperation and social participation", responsibilities were made clear; through the salt monopoly policy, fixed-point production and fixed-direction marketing of iodized salt were realized. At the same time, a monitoring system was established for emergency iodine supply; work evaluation was carried out to provide local governments with feedback; extensive health education and publicity were carried out. The central government subsidized the purchase of raw iodine, local finance subsidized poor regions and poor people's purchase of iodized salt, to guarantee the high-quality and stable market share of iodized salt.

Based on "state monopoly on salt", after years of efforts, China has basically built a relatively complete iodized salt supply network covering all urban and rural regions, standardized the order of iodized salt production and marketing, established a relatively sound iodized salt inspection and IDD monitoring systems. USI has been implemented well across the country.

The former Ministry of Health organized national IDD elimination monitoring 4 times, respectively in 1995, 1997, 1999 and 2002. According to the results, since USI was launched in China, the national supply of iodized salt has grown steadily. In 1995, the national supply of iodized salt was about 3.5 million tons; the rate of our residents' qualified iodized salt consumption was 39.9%, which rose to 88.8% in 2002. The results of the 5th national IDD monitoring in 2005 showed the rate of qualified iodized salt consumption was 90.2%. In 2013, the national supply of iodized salt reached 7.9 million tons; the rate of iodized salt penetration in the masses rose to above 95%. In 2014, the rate of qualified iodized salt consumption reached 95.61% (except Tibet); the national

iodized salt coverage also reached 98.62%. Correspondingly, Chinese children's goiter rate has been under effective control. In 1995, the rate of children's goiter was 20.4%; it dropped to 8.8% in 1999 and 5.0% in 2005. Chinese children's median of urine iodine reached 246.3 $\mu\text{g/L}$; Chinese children's average IQ reached 103.5. Relevant indicators all have reached the international standards for the elimination of IDD. In addition, the rate of goiter founded by B-ultrasound dropped from 10.9% in 1997 to 2.4 % in the 6th national monitoring of IDD in 2011. Since 2010, there have been no new cases of endemic cretinism in China.

By the end of 2015, China's 28 provinces (autonomous regions/ municipalities) at the provincial level achieved the goal of eliminating IDD. Tibet, Qinghai, Xinjiang basically achieved the goal of eliminating IDD. 94.2% of China's counties remained IDD-free. Among the 128 countries and regions that have adopted USI, China is leading.

II . The Effect of Iodized Salt on Human Health

1. Iodized Salt and Iodine Nutrition

IDD is a geochemical disease occurs in people who cannot get the iodine supply needed for normal growth. It's also a common trace element deficiency disease in the world. Usually, iodine deficiency, particularly regional iodine deficiency, can cause endemic goiter, cretinism and subclinical cretinism. What's more, iodine deficiency in babyhood and childhood can also affect their normal brain development, easily cause children's physical and mental retardation. Serious iodine deficiency even can cause mental developmental disorders, result in brain damage, bring serious family burdens, and affect the overall quality of our population.

Generally, if our daily iodine intake is continuously lower than 100 μg for some time, it can cause goiter, which mainly occurs to teenagers and adults, and usually can be cured after iodine deficiency is corrected. But iodine deficiency can cause hypothyroidism, inhibit the development of our cerebral nerve, lead to mental retardation and severely damage the brain development of newborn babies and children. Medically, mental deficiency syndrome or hypothyroidism and slow growth accompanied by endemic goiter caused by severe iodine deficiency are collectively known as cretinism. Children's IQ can be significantly improved by early intervening and iodine supplementation.

The damage caused by iodine deficiency can be great. But blind iodine supplementation can also lead to thyroid diseases. However, the mechanisms of thyroid swellings caused by an iodine overdose and iodine deficiency are not the same, and the problems caused by the former are far less serious than those caused by iodine deficiency, which can be controlled by reasonable diet improvement. For example, at present our excess iodine intake mainly exists in regions that have drinking water high in iodine, and the state prohibits the sale of iodized salt in these regions.

In general, iodine deficiency can cause all kinds of diseases, in which endemic cretinism is the most serious and may even affect the overall quality of our population. Therefore, reasonable iodine supplementation is also very necessary. As a daily supplement, our residents have a stable daily intake of table salt. It's a good carrier for iodine supplementation. As a result, adding iodine to salt and promoting USI are of great help and significance to improving our residents' iodine intake problems.

2. Standards for Iodine Content in Table Salt for Different Groups of People

The iodine content in table salt recommended by the W.H.O. is 20-40 mg/kg. When USI was just carried out in China, because Chinese residents' intake of iodine was low as a whole, the iodine content in table salt was 20-60 mg/kg. In 2000, we made preliminary achievements in the national elimination of IDD, so relevant departments lowered the iodine content in table salt to 20-50 mg/kg, 35 mg/kg as the average reference standard. In the new "Standards for Iodine Content in Table Salt" issued by the National Health and Family Planning Commission in 2012, it was adjusted into 20-30 mg/kg; the iodine content uniformity's allowed fluctuation range became $\pm 30\%$; the unified national iodine content in table salt became 3 recommended levels, i.e. 20 mg/kg, 25 mg/kg and 30 mg/kg, which are now chosen by each province (district/city) according to their actual situation. The daily per capita iodine intake recommended by the W.H.O. is $150\mu\text{g} \sim 300\mu\text{g}$. The daily iodine intake recommended by China Nutrition Society is as shown in Table 1.

Table 1 The Daily Iodine Intake Recommended by China Nutrition Society

Age	Recommended daily iodine intake (μg)
0~3 years old	50
4~10 years old	90
11~13 years old	120
14 years old	150 (200 for pregnant and lactating women)

Of course, it is worth mentioning that our residents should follow the iodine intake recommended by their local health departments or nutrition departments and consider each individual's actual situation. For example, people who live in regions with high iodine content for a long time should have a low iodine or no iodine diet, control the intake of iodized salt or consider eating non-iodized salt. For example, the new "Standards for Iodine Content in Table Salt" in 2012 once again affirmed the ban on the supply of iodized salt to residents who drink the high-iodine water. For pregnant women, lactating women, infants, school children and teenagers who are in the key period of physical and mental growth and development, their intake of iodine needs to be a bit higher than ordinary people's average iodine intake, so they must pay attention to the supplement of iodine and have regular checks at the same time, in order to prevent and control the impacts on fetuses or children's intellectual development caused by iodine deficiency.

3. Iodized Salt is an Optimum Iodine Supplement

At present, we can often hear some doubts about the iodine content in our table salt or our residents' iodine supplement. In fact, if we refer to the average iodine content in table salt recommended in 2012, i.e. 25mg/kg, and the resident's daily iodine intake recommended by the W.H.O., i.e. $150\mu\text{g}$ - $300\mu\text{g}$, which is equal to eating about 6g-12g table salt, China's iodine nutritional status in general is reasonable and up to relevant standards, because our per capita salt intake is about 12g each day.

Results of the national IDD monitoring show that 8-10 years old children's median urinary iodine

were respectively 241.2 µg/L, 246.3 µg/L and 238.6 µg/L in 2002, 2005 and 2011, all at the optimum level. After the new “Standards for Iodine Content in Table Salt” was put into effect in March 2012, the monitoring results from Beijing, Shanghai and five eastern coastal provinces show children’s median urinary iodine dropped to 172.7µg/L. It implies China’s present iodine content in table salt is appropriate. In terms of the current diet of most of Chinese residents, iodized salt is still the main source of iodine intake. Therefore, USI should continue and there’s no need to worry about eating iodized salt.

III. Discussion on a Differentiated, Diversified, Scientific, Reasonable Salt Iodization Solution Under China’s Salt Industry Reform

1. The Salt Industry’s Reform in China

In the 10 years from the issuance of the “Table Salt Monopoly Regulations” to 2016, the development of China’s salt industry played a positive and important role in our national IDD control and elimination. However, as our economy developed and our USI got good results, contradictions between the Monopoly Regulations and our current economic system gradually emerged. The state monopoly on salt and the separation of production and marketing caused imperfect regulations, excess salt production capacity and discrepancy with the market. All these hindered the benign development of China’s salt industry.

In order to solve the above problems, improve our salt reserves, supervise the market strictly, promote fair competition, improve enterprise competitiveness, revitalize the enterprise management system, on May 5, 2016, the State Council announced the issuance of “The Salt Industry’s Structural Reform Scheme” [GUO FA (2016) No. 25], made it clear the salt industry’s structural reform would be implemented on January 1, 2017. The scheme emphasizes the reform can release the market’s vitality under the precondition of salt administration by law and salt safety. On the one hand, the scheme requires us to strengthen specialized salt supervision, improve pilot fixed-point production, wholesale monopoly, specialized supervision, ensure salt safety, encourage enterprise cooperation, integrate resources. On the other hand, we should start from salt administration, reform the salt wholesale and production regions, the government pricing mechanism and the experimental reserve system, improve the salt reserve system. In the meantime, the scheme also requires salt enterprises to keep pace with the times, establish a credit mechanism and emergency mechanism, promote scientific iodization, improve relevant laws and regulations, and strengthen the organization and leadership.

2. China’s USI Against a Background of the Salt Industry’s Reform

Lots of data and facts show that USI is necessary in China. China’s performance in USI and IDD control is also obvious to all and thought highly of by the world. However, as our economy develops and our people’s living standards improve, in recent years, in some regions where the economy is relatively developed, our residents’ intake of iodine through food and other channels has grown. Coupled with iodized salt, the accumulated intake of iodine has exceeded the amount recommended by the W.H.O. to a certain extent. We have the problem of excessive iodine intake. As a result, a number of people and even some experts have called for the control and even

cessation of USI.

USI is a big deal concerning our national quality. We can't treat the problems based on some local and specific cases. We should treat the USI problems comprehensively, rationally and scientifically. Many experts also point out that once we stop USI, IDD will come back. At present, some regions in China haven't achieved the goal of IDD elimination; some regions have low iodine coverage due to their regional and cultural factors; some regions even have new cretinism cases. Our professional technology is weak. Our publicity and education are not well done. The impact of non-iodized salt and the resistance against iodized salt have made IDD control in some regions decline and caused rebounds. Thus, the situation for USI is still severe. What's more, from the analysis above we can see China's salt iodization is on an appropriate level. Therefore, it will be a long and arduous task to eliminate IDD and improve our national quality through USI.

Of course, facing the problems we cannot choose to escape. Under the premise that we insist on the state monopoly on salt production, we should face the difficulties, face our current problems, look at the salt industry's reform correctly, treat the resistance against USI correctly, actively take corresponding countermeasures.

First, we should actively promote the salt industry's reform and improve relevant systems. In order to effectively promote USI, there must be a stable and sound system as a guarantee. However, our current system of salt monopoly cannot meet the market demand. Therefore, we should actively respond to the government's call, work and pull together, complete the salt industry's reform, build good relationships between the salt monopoly structure and the market economy, market management, government agencies and sales enterprises, promote the construction of relevant laws and regulations.

Second, we should work with the health sector to strengthen monitoring and publicity. First, government departments and relevant salt companies should attach great importance to it and realize it's a long-term, difficult and important task to eliminate IDD. We should make the best of the IDD Control Day every year for publicity, let the people understand and treat USI correctly. At the same time, the health sector should do real-time monitoring, perfect the relevant IDD monitoring and evaluation system, discover problems and report them, take emergency measures to intervene, ensure the control effect and avoid rebounds.

Third, we should strengthen scientific research and achieve scientific salt iodization. We should focus on the real-time changes in our residents' intake of iodine, face the fact the intake of iodine varies in different regions and the intake of iodine is excessive in some regions, deal with different regions in different ways. Therefore, on the one hand, we should strengthen the training of relevant technical personnel, improve their vocational skills, conduct real-time monitoring and evaluation of IDD control in local places; regions where the intake of iodine is excessive should provide feedback immediately, so that iodized salt production enterprises can adjust accordingly. On the other hand, we can cooperate with universities and scientific research institutions to conduct extensive research on local residents' dietary habits and diet, obtain the data about the reasonable amount of iodine in table salt, and then guide the production of iodized salt on the basis of scientific evaluation and demonstration. In the meantime, we should encourage scientific research on the basis of USI. We should be able to develop new nutritional products for our residents and promote

the improvement of the overall quality of our residents. We should also be able to provide safe and appropriate iodized salt or other iodized food for pregnant women, lactating women, infants, teenagers and other special groups.

IV. Conclusion

At present in China, the resident's nutritional status concerning iodine is good; the amount of iodine in table salt is reasonable; iodized salt is still the main source of iodine to most residents. As a result, in the tide of structural reform in the salt industry, we should stand firm, improve the salt management, storage, supervision and emergency mechanism, improve our professional ability and professional accomplishment, conduct scientific research, strengthen monitoring and evaluation, conduct publicity actively, promote USI correctly, efficiently and safely, completely control and eliminate IDD, make contribution to improving the overall quality of Chinese residents.