



Perspective

Iodine deficiency and thyroid dysfunction: Current scenario in Nepal

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ABSTRACT

Iodine deficiency is a major cause of thyroid disorders worldwide. Nepal lies in the endemic area of iodine deficiency which was previously referred to as Himalayan goiter belt, with high prevalence of iodine deficiency disorders including goiter, cretinism and hypothyroidism. With effective implementation of universal salt iodization program, Nepal has a successful public health story to share having drastically reduced the iodine deficiency disorders. Moreover, challenge has appeared with rising number of excess iodine states. Thyroid dysfunction is growing higher and the increasing proportion of hyperthyroidism is particularly concerning. Time has come for us to suitably review the standards of salt iodization and control the increasing number of cases with thyroid dysfunction by the coordinated efforts of all stakeholders, along with sustaining the optimal level of iodine.

1. Introduction

Iodine deficiency is one of the most important global nutritional problems. Iodine, a micronutrient, plays a vital role in the functioning of thyroid gland; so, its deficiency is the most common cause of thyroid disorders worldwide. Hypothyroidism is a condition resulting from decreased secretion of thyroid hormone from thyroid glands. Thyroid enlargement (goitre) is a classic sign of iodine deficiency but more serious effects are seen in fetus. Severe iodine deficiency causes cretinism in children, characterized by gross mental retardation and brain damage, deaf-mutism, impaired growth and development while stillbirths, miscarriages are common complications in pregnant women. Almost one-third of the world's population lives in areas of iodine deficiency. WHO, in 2007, estimated two billion individuals having an insufficient intake of iodine, including a third of all school-aged children. More than 17 million babies in South Asia were estimated to born every year unprotected from brain damage due to iodine deficiency [1]. The most important risk factor for iodine deficiency is residing in an area with soil and water poor in iodine; while goitrogens in vegetables may also interfere with iodine metabolism. Thyroid disorders are more common in females and the prevalence heavily influenced by geographic location & iodine deficiency pattern.

2. Discussion

Nepal is a mountainous landlocked country in South Asia, situated far away from the sea. It's geographical location and high annual rainfall lead to a low environmental iodine content and thus, a high incidence of iodine deficiency disorders. It lies in the region once referred to as the "Himalayan goiter belt". Goiter was endemic to such an extent in Nepal that it was considered a sign of beauty by many. Entire villages mostly in northern mountains, which relied on Tibetan rock salt used to suffer from goitre and cretinism [2]. The goiter survey in 1965/66 showed the prevalence of goiter in 55% population while the survey in 1998,

assessing urinary iodine levels, showed the overall prevalence of iodine deficiency to be 13.5% with 5.3% population affected by severe deficiency. It showed a significant improvement in the status from severe iodine deficiency (>30% prevalence) in 1965-66 to mild grade deficiency (5-20% prevalence) [3]. Nepal recognized iodine deficiency disorder as a serious public health problem by early 1970s and started its first national control program in 1973, with the Goitre Control Project and the Goitre and Cretinism Eradication Project that distributed iodized oil injections and capsules and coordinated salt iodization activities. Salt iodization was continued as the sole strategy from 1998. In 2001, the standard for iodized salt with minimum 50 ppm at the production level and minimum 30 ppm at the retail level was implemented and significant awareness efforts on using the two-child logo refined salt were started, along with observing February as national iodine month for awareness [4].

It's with a highly successful public health story between the government, Salt Trading Corporation and other aid agencies that worked to eliminate the visible goitre down from 55% in 1965 to only 0.4% in 2007. The proportion of households using refined salt has increased to 88% in 2016 from just 10% in 1998. This benchmark survey, Nepal National Micronutrient Status Survey 2016, also revealed the median urinary iodine concentration among school age children to have increased from 144 to 314 µg/L between 1998 and 2016 which is above 300 µg/L (excess) while it's in "adequate" range in pregnant women and 'more than adequate' in women of childbearing age. Iodine intake was found higher in the central and western parts of the country and the terai region. The mean iodine content for all salt samples was found as 44.1 ppm, and 67.5% samples had more than 40 ppm, well above the expected level at the retail (30 ppm) and household (15 ppm) levels [5].

Although there are no national level epidemiological studies for thyroid disorders in Nepal but there are some hospital-based and screening-based studies. One study from seven places in five districts of Nepal found the prevalence of thyroid disorders in general population to be 4.32%; twice more common in females and among them, 72.41% had

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subclinical hypothyroidism, 13.7% primary hypothyroidism and 13.7% hyperthyroidism [6]. In a tertiary level hospital in Kathmandu, prevalence of thyroid dysfunction was found to be 29.0% among which subclinical hypothyroidism was seen in 17%, hypothyroidism in 8%, hyperthyroidism in 3% and subclinical hyperthyroidism in 1% cases [7]. Another hospital based study showed 35.3% people with thyroid dysfunction with the prevalence of overt hyperthyroidism, subclinical hyperthyroidism, overt hypothyroidism and subclinical hypothyroidism to be 2.5%, 2.4%, 5.6% and 24.8% respectively [8]. A hospital in eastern Nepal also revealed the prevalence of thyroid disorder at 39.3% among which 4.04% had overt hyperthyroidism, 16.49% overt hypothyroidism, 2.9% subclinical hyperthyroidism and 16.06% subclinical hypothyroidism [9]. The prevalence of severe iodine deficiency among the Sherpas of Khumbu reduced significantly from 1960s; total goitre prevalence having decreased from 90% to 31% and more than 90% of households used iodized salt with appropriate storage too [10].

Many studies from Nepal have also shown significantly high prevalence of hyperthyroidism, which is a concerning issue. A study from tertiary level hospital in far western Nepal showed the prevalence of total hyperthyroidism as 24.8% including both overt hyperthyroidism (14.9%) and subclinical hyperthyroidism (9.9%) [11]. Previously, a study from eastern Nepal showed a substantial number of cases (13.68%) of hyperthyroidism among samples sent for thyroid function tests and a higher distribution (27%) of hyperthyroidism in subjects with goiter [12]. The possible reasons for such findings could be the selection bias in a hospital-based study, functional autonomy of thyroid in endemic goiter cases, poorly monitored iodized salt supply program with excessive iodized salt causing thyrotoxicosis. Similarly, 34.4% of school children in eastern Nepal had excess urinary iodine concentration above the WHO recommended levels and 88% of the household salt samples tested were found to have high iodine concentration [13]. Appropriate attention needs to be paid on this increased iodine levels, else the cases of thyroid disorders will keep increasing.

3. Conclusion

Nepal has been able to successfully eliminate the consequences of iodine deficiency disorders with an effective universal salt iodization program. Challenges remain on sustainability of this status; continuous monitoring of salt iodine and periodic assessment of iodine status in the community is needed. We are actually moving on a transition from iodine deficiency state to iodine excess state and the need to address the excess iodine in salt and the use of iodized salt in processed foods cannot be overemphasized. There may be increasing burden of thyroid disorders including hypothyroidism, Graves's disease and goiter in Nepal due to excess iodine supplementation. It's the right time that we work with all relevant stakeholders to review the salt iodization standards and consider reduction in the iodine level for production and retail, along with sustaining the desired outcomes that are already achieved.

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SL, SKA & PL were involved in conceptualization, design, preparation and finalization of manuscript.

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Consent

Not required.

Declaration of competing interest

None.

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