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IODINE DEFICIENCY IN INDIAN MASSES: A STATUS REPORT AFTER FIVE DECADES OF NATIONAL SALT IODIZATION PROGRAM

Home Science

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ABSTRACT

Iodine Deficiency Disorders (IDDs) are partially related to six out of eight millennium development goals. Iodine deficiency (ID), being a major public health problem in our country, affects school age children (SAC), pregnant mothers (PMs) and adolescent girls (AGs) adversely since long time. Moderate to severe endemicity of ID has been observed to be associated with less mean IQ scores of 12-13.5 points than the IQ of normal groups. During 2011-2016, studies documented goitre prevalence from 0.12% to 23.4% in SAC, 0.17% to 42.2% in PMs and 4.8% to 26.7% in AGs. This deficiency results in low human productivity leaving adverse impact on the development of country. Hence, National Iodine Deficiency Disorder Control Program, calls for restrengthening.

In our country, the public health significance of iodine deficiency (ID) has been reported from Himalayan regions [1,2]; sub Himalayan flat lands (Tarai) [3]; deltas [4]; plains [5-7]; and even coastal regions [8]. Iodine Deficiency Disorder (IDD) survey was conducted by Indian Council of Medical Research (ICMR) in 324 out of 582 districts of country. Out of 324 districts, 263 were found to be endemic for ID. Approximately 200 million people have been revealed at risk of ID while more than 70 million people were suffering from goiter and other IDDs. No state has been found to be free from the problem of ID [9]. The most vulnerable groups at risk of iodine deficiency are school age children (SAC), pregnant mothers (PMs) and adolescent girls (Ags).

IODINE DEFICIENCY AMONGST SCHOOL AGE CHILDREN (6-12 YEARS)

Children suffering from moderate/severe ID found to be associated with reduction in mean intelligent quotient (IQ) scores of 12-13.5 points as compared to the IQ of non-ID groups. It is the one of the major causes of mental retardation worldwide. Iodine deiciency was estimated to be ranked third on the list of causes that put back children in their developmental potential. Recently, IQ scores of children born after effective salt iodization were observed from the same school, in Colonel Ganj Tehsil of Uttar Pradesh (UP) Tarai, where children observed with low IQ status earlier. Reassessment showed normalization of IQ scores in a new generation. Laxminah et al conducted a large IDD survey amongst 28,437 SAC in 8 states of India found total goiter rate (TGR) as 3.9% [10]. Toteja et al conducted a study in 15 districts of 10 Indian states where the TGR of 4.8% has been reported. Around forty four percent of households were consuming inadequately iodized salt [11]. In last six years, TGR ranged from 0.12% to 23.4% amongst children. In Himachal Pradesh (HP) and Tamil Nadu, children have been found with inadequate iodine intake (UIC <100µg/l). The detailed description of goitre prevalence in SAC, their median urinary iodine concentration (UIC) and percent consumption of iodized salt are given in Table 1.

TABLE 1 STATUS OF IODINE NUTRITION IN SCHOOL AGE CHILDREN (6-12 YEARS) DURING 2011-2016

Location	Year	TGR (%)	Median UIC (µg/l)	Salt with iodine content <15ppm (%)	References
Aligarh (UP)	2016	5.2	150	49.6	12
USN (UK)	2016	13.2	150	53.3	13
N (UK)		15.9	125	42.3	
PG (UK)		16.8	115	59.6	
Karnataka	2016	21.9	150	26.6	14
Kullu (HP)	2015	23.4	175	48.7	15
Solan (HP)		15.4	62.5	61	
Kangra (HP)		15.8	200	17.7	
Karnataka	2014	0.12	179	0.0	16
Darjeeling (WB)	2014	8.7	156	NA	17
Mysore	2014	8.7	NA	NA	18
Coorg		19.0			
Kashmir	2014	3.7	104*	NA	19
Chamarajanagar (Karnataka)	2013	7.74	NA	28.4	20
Delhi	2013	NA	NA	<17%	5
Ambala (Haryana)	2013	12.6	>100	11.7	21
Bharuch (Gujarat)	2012	23.2	110	7	22
Delhi	2011	NA	198	11.2	23
Chandigarh	2011	13.9	137	98.1**	6

Abbreviations: UK-Uttarakhand, WB-West Bengal
*median UIC of children aged 5-15 years **salt samples collected from overall children of the study aged 6-16 years

IODINE DEFICIENCY AMONGST PREGNANT MOTHERS

Iodine deficiency affects to all age groups but PMs are at risk of marginal ID. Deficiency of iodine during gestation has shown deleterious effects on fetus brain development. Severe ID during pregnancy is associated with increased risk of miscarriages, stillbirths and congenital abnormalities. In our country, studies documented TGR amongst PMs from 0.17% to 42.2% since 2011. A concise view of the magnitude of iodine deficiency amongst PMs is given in Table 1.

TABLE 2 STATUS OF IODINE NUTRITION IN PREGNANT MOTHERS DURING 2011-2016

Location	Year	TGR (%)	Median UIC (µg/l)	Salt with iodine content <15ppm (%)	References
USN (UK)	2016	16.1	124	49.7	13
N (UK)		20.2	117	33	
PG (UK)		24.9	110	42.1	
Kangra (HP)	2015	42.2	200	31.7	15
Kullu (HP)		42.0	149	39.7	
Solan (HP)		19.9	130	51.5	
Bangalore	2014	NA	172	3.1	24
Kolkata	2014	NA	37%*	NA	25
Pune (Maharashtra)	2013	NA	203**	NA	26
			211***		
Vadodara (Gujarat)	2014	NA	297	NA	27
Delhi	2012	NA	304	NA	28
Raipur (Chhattisgarh)	2011	0.17	94	NA	29

Nagpur (Maharashtra)	2011	NA	107**	NA	30
		NA	71***		

*37% of PMs had UIC <150µg/l **13-22 weeks ***33-37 weeks

IODINE DEFICIENCY AMONGST ADOLESCENT GIRLS (13-18 YEARS)

Adolescent girls are equally vulnerable and sensitive to ID. They are going to become future mothers. Mild ID during pregnancy, in initial stages of development of fetus, may impair the neurological development. The status of iodine nutrition among AGs is given in Table 3.

TABLE 3 STATUS OF IODINE NUTRITION IN ADOLESCENT GIRLS IN INDIA DURING 2011-2016

Location	Year	TGR (%)	Median UIC (µg/l)	Salt with Iodine Content <15ppm (%)	References
USN (UK)	2016	6.8	250	59.5	13
N (UK)		8.2	200	44.0	
PG (UK)		5.6	183	42.1	
Kashmir	2014	4.8	NA	NA	19
Chandigarh	2011	26.7	NA	NA	6

*includes both boys and girls

Thus, ID is still significant amongst vulnerable groups in our country. This deficiency results in less human productivity and leaving adverse impact on the development of country. There is a need to revise and strengthen National Iodine Deficiency Disorder Control Program (NIDDCP). Drinking water and food are also deficient in iodine due to insufficient iodine in soil. Despite availability of adequately iodized salt to the consumers, bioavailability of iodine to the body is poor due to loss of iodine during cooking. Therefore, it is equally important to preserve the iodine available in the salt and emphasize on food based approaches to mitigate the ill-effects of iodine deficiency for sustainability and long-term benefits to country's economy.

REFERENCES:

[1] Sareen, N., Kapil, U., Nambiar, V., Pandey, R. M., Khenduja, P. (2016), "Iodine nutritional status in Uttarakhand State, India." Indian J Endocrinol Metab, 20, 171-176.
[2] Kapil. U., Pandey, R. M., Sareen, N., Khenduja, P., Bhadoria, A. S. (2015), "Iodine nutritional status in Himachal Pradesh state, India." Indian J Endocrinol Metab, 19, 602-607.
[3] Chandra, A. K., Bhattacharjee, A., Malik, T., Ghosh, S. (20008) "Goiter prevalence and iodine nutritional status of school children in a sub-Himalayan Tarai region of eastern Uttar Pradesh." Indian Pediatr, 45, 469-474.
[4] Chandra, A. K., Tripathy, S., Ghosh, D., Debnath, A., Mukhopadhyay, S. (2005) "Iodine nutritional status & prevalence of goitre in sundarban delta of south 24-Parganas, West Bengal." Indian J Med Res, 122, 419-424.
[5] Kapil. U., Sareen, N., Bhadoria, A. S. (2013) "Status of iodine deficiency among children in national capital territory of Delhi--a cross-sectional study." J Trop Pediatr, 59, 331-332.
[6] Das, S., Bhansali, A., Dutta, P., Aggarwal, A., Bansal, M. P., Garg, D., Ravikiran, M., Walia, R., Upreti, V., Ramakrishnan,, S., Sachdeva, N., Bhadada, S. K. "Persistence of goitre in the post-iodization phase: micronutrient deficiency or thyroid autoimmunity?." Indian J Med Res, 133, 103-109.
[7] Lohiya, A., Yadav, K., Kant, S., Kumar, R., Pandav, C. S. (2015) "Prevalence of iodine deficiency among adult population residing in Rural Ballabgarh, district Faridabad, Haryana." Indian J Public Health, 59, 314-317.
[8] Rao, R. S., Kamath, R., Das, A., Nair, N. S., Keshavamurthy. (2002) "Prevalence of goitre among school children in coastal Karnataka." Indian J Pediatr, 69, 477-479.
[9] Tiwari, B. K. (2006) "Revised policy guidelines on national iodine deficiency disorders control programme." Directorate of Health Services, Ministry of Health and Family Welfare, Government of India, New Delhi.
[10] Laxmaiah, A., Arlappa, N., Balakrishna, N., Mallikarjuna, R. K., Galreddy, C., Kumar, S., Ravindranath, M., Brahmam, G. N. (2013) "Prevalence and determinants of micronutrient deficiencies among rural children of eight states in India." Ann Nutr Metab, 62, 231-241.
[11] Toteja, G. S., Singh, P., Dhillon, B. S., Saxena, B. N. (20007) "Iodine deficiency disorders in 15 districts of India." Indian J Pediatr, 71, 25-28.
[12] Aslami, A. N., Ansari, M. A., Khalique, N., Kapil, U. (2016) "Iodine Deficiency in School Children in Aligarh District, India." Indian Pediatr, 53, 742-743.
[13] Sareen, N., Kapil, U., Nambiar, V., Pandey, R. M., Khenduja, P. (2016) "Iodine nutritional status in Uttarakhand State, India." Indian J Endocrinol Metab, 20, 171-176.
[14] Manjunath, B., Suman, G., Hemanth, T., Shivaraj, N. S., Murthy, N. S. (2016) "Prevalence and Factors Associated with Goitre among 6-12-year-old Children in a Rural Area of Karnataka in South India." Biol Trace Elem Res, 169, 22-26.
[15] Kapil, U., Pandey, R. M., Sareen, N., Khenduja P., Bhadoria, A. S. (2015) "Iodine nutritional status in Himachal Pradesh state, India." Indian J Endocrinol Metab, 19, 602-607.
[16] Sridhar, P. V., Kamala, C. S. (2014) "Iodine status and prevalence of goitre in school going children in rural area." J Clin Diagn Res, 8, 15-17.
[17] Biswas, A. B., Das, D. K., Chakraborty, I., Biswas, A. K., Sharma, P. K., Biswas, R. (2014) "Goiter prevalence, urinary iodine, and salt iodization level in sub-Himalayan Darjeeling district of West Bengal, India." Indian J Public Health, 8, 129-133.
[18] Ahmed, M., Zama, S. Y., Nagarajarao, V., Khan, M. A. (2014) "Iodine deficiency in children: A comparative study in two districts of south-interior Karnataka, India." J Family Community Med, 21, 48-52.
[19] Masoodi, S. R., Ali, A., Wani, A. I., Bashir, M. I., Bhat, J. A., Mudassar, S., Zargar, A. H. (2014) "Goitre and urinary iodine excretion survey in schoolchildren of Kashmir Valley." Clin Endocrinol, 80, 141-147.
[20] Zama, S. Y., Ahmed, M. N. V. (2013) "Prevalence of goitre in school children of chamarajanagar district, karnataka, India." J Clin Diagn Res, 7, 2807-2809.
[21] Chaudhary, C., Pathak, R., Ahluwalia, S. K., Goel, R. K., Devgan, S. (2013) "Iodine deficiency disorder in children aged 6-12 years of ambala, haryana." Indian Pediatr, 50, 587-589.
[22] Chandwani, H. R.., Shroff, B. D. (2012) "Prevalence of goiter and urinary iodine status in six-twelve-year-old rural primary school children of bharuch district, Gujarat, India." Int J Prev Med, 3, 54-59.
[23] Agarwal, J., Pandav, C. S., Karmarkar, M. G., Nair, S. (2011) "Community monitoring of the National Iodine Deficiency Disorders Control Programme in the National Capital Region of Delhi." Public Health Nutr, 14, 754-757.
[24] Jaiswal, N., Melse-Boonstra, A., Sharma, S. K., Srinivasan, K., Zimmermann, M. B. (2015) "The iodized salt programme in Bangalore, India provides adequate iodine intakes in pregnant women and more-than-adequate iodine intakes in their children." Public Health Nutr, 18, 403-413.
[25] Majumder, A., Jaiswal, A., Chatterjee. S. (2014) "Prevalence of iodine deficiency among pregnant and lactating women: Experience in Kolkata." Indian J Endocrinol Metab, 18, 486-490.
[26] Lean, M. I., Lean, M. E., Yajnik, C. S., Bhat, D. S., Joshi, S. M., Raut, D. A., Lubree, H. G., Combet, E.(2014) "Iodine status during pregnancy in India and related neonatal and infant outcomes." Public Health Nutr, 17, 1353-1362.
[27] Joshi, K., Nair, S., Khade, C., Rajan, M. G. (2014) "Early gestation screening of pregnant women for iodine deficiency disorders and iron deficiency in urban centre in Vadodara, Gujarat, India." J Dev Orig Health Dis, 5, 63-68.
[28] Grewal, E., Khadgawat, R., Gupta, N., Desai, A., Tandon, N. (2013) "Assessment of iodine nutrition in pregnant north Indian subjects in three trimesters." Indian J Endocrinol Metab, 17, 289-293.
[29] Sinha, A., Tripathi, S., Gandhi, N., Singh, A. (2011) "Iodine deficiency disorder control programme impact in pregnant women and status of universal salt iodization." Iran J Public Health, 40, 19-26.
[30] Menon, K. C., Skeaff, S. A., Thomson, C. D., Gray, A. R., Ferguson, E. L., Zodpey, S., Saraf, A., Das, P. K., Pandav, C. S. (2011) "The effect of maternal iodine status on infant outcomes in an iodine-deficient Indian population." Thyroid, 21, 1373-1380.