Original Article

Prevalence of goitre and iodine deficiency among school-age children (6–12 years) in southern district of Kashmir

Kouser Sideeq[1], Misbah Kawoosa[2], Labeeb Mir[3], S. M. Salim Khan[4], Shahroz Nabi[2], Musadiq Hussain[6], Aashkar Bashir Wani[7], Mehvish Ahsan[8]

[1]Assistant Professor, Department of Community Medicine Government Medical College, Srinagar, Jammu and Kashmir, India. [2]Senior Resident, Department of Community Medicine Government Medical College. Srinagar, Jammu and Kashmir, India. [3]Senior Resident, Department of Community Medicine SKIMS Medical College, Srinagar, Jammu and Kashmir, India. [4]Professor, Department of Community Medicine, Government Medical College, Srinagar, Jammu and Kashmir, India. [5]Resident, Department of Neurosurgery Maharishi Markandeshwar University, Ambala, Haryana, India. [6]Resident, Department of Medicine Government Medical College, Handwara, Jammu and Kashmir, India. [7]Resident, Department of Ophthalmology Government Medical College Srinagar, Jammu and Kashmir, India

Abstract

Background: Iodine deficiency disorders (IDDs) remain among the most prevalent micronutrient deficiency disorders worldwide and continue to pose a significant public health challenge, particularly in mountainous regions. India continues to bear a considerable burden despite implementation of the National Iodine Deficiency Disorders Control Programme. Kashmir Valley has historically been recognized as an endemic region. The present study assessed the prevalence of goitre among school-going children aged 6–12 years in Shopian district. **Material and Methods:** A community-based cross-sectional study was conducted among 2,700 school children selected through a two-stage cluster sampling technique from 30 schools. Thyroid examination followed WHO/UNICEF/ICCIDD criteria. Household salt (n=557) and urine (n=298) samples were analysed using iodometric titration and the Sandell–Kolthoff method. **Results:** The Total Goitre Rate (TGR) was 25.9% (95% CI: 24.2–27.5). Grade I goitre was present in 24.2% and Grade II in 1.8%. Prevalence was almost similar among males (26.1%) and females (25. 8%).Conclusion**:** IDDs remain a significant public health problem among school children in Shopian district. Strengthened universal salt iodization and periodic surveillance are recommended.

Keywords: Goitre; Iodine deficiency disorders; School children; Urinary iodine; Universal salt iodization; Kashmir; Shopian.

Received: 05 June 2026 **Revised: 19 June 2026** **Accepted: 09 July 2026** **Published: 14 July 2026**

Introduction

One of the first non-communicable diseases known to humankind, endemic goitre is a major global public health concern that has been known to occur in hilly regions of the Himalayas.[1] When a significant portion of the population is affected—roughly 5% of preadolescent or preadolescent children—we refer to the illness as endemic.[2]

Over 600 million individuals worldwide suffer from goitre, and 20 million have some form of brain damage, which is a result of iodine shortage during pregnancy.[3] It is also very common in India, with varying rates of prevalence reported by state. In our nation, around 200 million people are at risk of IDD. The Central and State Health Directorates, the ICMR, and the Medical Institutes conducted the survey have unequivocally shown that not even one State or UT is clear of the Iodine Deficiency Disorders issue.[4]Goitre and other iodine deficient illnesses are thought to affect 71 million people worldwide. It is well acknowledged that fortifying salt with iodine is an effective prophylactic measure against IDD. Numerous investigations conducted in India have revealed a high incidence rate of goitre. Acknowledging the severity of the issue, the Indian government initiated the National Goitre Control Programme (NGCP) in 1962 with 100% central assistance.[6,5]

The National Iodine Deficiency Disorders Control Programme (NIDDCP) was established in August 1992 to address a broad range of Iodine Deficiency Disorders, including mental and physical retardation, deafness, mutism, cretinism, stillbirths, and abortions.[7,8] The original name of the programme was the National Goitre Control Programme (NGCP). For the entire population, the programme is being implemented in all States and UTs.For normal human growth and development, 100–150 micrograms of iodine must be consumed daily. Iodine is an essential micronutrient. Iodine deficiency can lead to cretinism, miscarriages, stillbirths, squinting, deaf mutism, and other kinds of goitre in addition to physical and mental disability.(9)(10) According to surveys carried out by the Indian Council of Medical Research, State Health Directorates, Directorate General of Health Services, and Health Institutions, 337

Address for correspondence: Dr. Kouser Sideeq, Assistant Professor, Department of Community Medicine, Government Medical College, Srinagar, India.
E-mail: kausar0664@gmail.com

DOI:
10.21276/amit.2026.v13.i2.826

How to cite this article: Sideeq K, Kawoosa M, Mir L, Khan SMS, Nabi S, Hussain M, Wani AB, Ahsan M.Prevalence of goitre and iodine deficiency among school-age children (6–12 years) in southern district of Kashmir. Acta Med Int. 2026;13(2):1075-1078.

districts out of 414 surveyed in all 29 States and 7 UTs are endemic, meaning that more than 5% of the districts have an incidence of Iodine Deficiency Disorders (IDDs).[11]

The government decided in 1984 to iodate all edible salt in the nation by 1992, following the Central Council of Health's recommendations. The programme was implemented graduallybeginning in April 1986. As of right now, our nation produces 65 lakh metric tonnes of iodized salt annually.[12]

Materials and Methods

District Shopian served as the study's location. There were 2700 subjects screened. Six to twelve-year-old subjects from the Shopain district participated. The study sample was chosen by a two-stage cluster sampling process. A total of thirty clusters, or schools, were chosen in the first step using a probability distribution that took into account the target population's size in each of the zones. In order to guarantee a reliable estimation of the problem's prevalence, thirty clusters were chosen. Within each cluster, 90 children were selected (45 boys, 45 girls). Based on an expected prevalence of 20% with a 95% confidence interval, a relative margin of error of 10%, and a design factor of 2, the number of children per cluster was determined. The sample size was determined using the following formula:

Final Sample Size = design effect x N

No of clusters = 30

Sample size per cluster=Total sample size/30

A specially created questionnaire was used to gather data, which included the child's particulars - name, age, school, zone, and sex. Each child's thyroid gland was clinically examined by inspection and palpation. Goitre grading was classified using the following standards, which are approved by the World Health Organisation, the United Nations Children's Fund, and the International Council for the Control of Iodine Deficiency Disorders:

Table 1: Classification of goiter as per World Health Organisation

WHO Goiter Grade	Description
Grade 0	No palpable or visible goiter.
Grade 1	Goiter is palpable but not visible when the neck is in the normal position. It is larger than the distal phalanx of the subject's thumb.
Grade 2	Goiter is clearly visible with the neck in the normal position and is also palpable.

The total goitre rate was calculated as the sum of grades 1 and 2.

Collection of urine and salt samples: Every fifth and every tenth child was selected for the collection of salt and urine respectively. As a result, from each cluster, nine urine samples and eighteen salt samples were collected. 557 samples of salt and 298 samples of urine were evaluated. The SandellKolthoff method was utilised to estimate the amount of iodine in urine samples, and the amount of iodine in salt samples was measured quantitatively by using the iodometric titration method that was carried out in the Multidisciplinary Research Unit (ICMR) and Public Health Laboratory of the Department of Community Medicine, Government Medical College Srinagar.

The prevalence of Goitre was reported as a percentage with a goitre grade > 0 and the median urinary iodine concentration was estimated to identify the severity of IDD as public health problem using the following criteria:

Table 2: Severity of Public Health Problem (Iodine Deficiency)

Indicators	Mild	Moderate	Severe
Goiter grade > 0	5–19.9%	20–29.9%	≥30%
Median UIE (µg/L)	50–99	20–49	<20

Ethical consideration: With the ethical approval number IRBGMC/21-10psm dated October 21, 2022, the Government Medical College, Srinagar's institutional review board approved the study.

Results

A total of 2,700 school children aged 6–12 years were examined from 30 school clusters in District Shopian, with 90 children assessed from each cluster. The study population comprised approximately 1,352 boys and 1,348 girls. As shown in Table 3, the overall Total Goitre Rate (TGR) was 25.9% (95% CI: 24.2–27.5). Among male children, 351 (26.1%; 95% CI: 23.6–28.3) were found to have goitre, while 348 (25.8%; 95% CI: 23.4–28.1) female children had goitre. The prevalence of goitre was nearly identical among boys and girls, indicating no appreciable gender difference.

The distribution of participants according to goitre grade is presented in Table 4. Of the 2,700 children examined, 2,001 (74.3%) had Grade 0 (no goitre), 656 (24.2%) had Grade 1 goitre, and 43 (1.8%) had Grade 2 goitre. Thus, the majority of children were free from goitre, while Grade 1 constituted the predominant form among those affected. The iodine concentration in household salt samples is summarized in Table 5. The iodine content ranged from 0 to 9.81 ppm, with a median value of 4.90 ppm. The 25th and 75th percentile values were 4.31 ppm and 5.29 ppm, respectively, indicating that the iodine content of most household salt samples was considerably below the recommended level for adequately iodized salt. Urinary iodine concentration (UIC) was estimated in 271 children, and the findings are presented in Table 6. Based on the WHO classification, 65 (24.0%) children had urinary iodine concentrations <100 µg/L, indicating mild-to-moderate iodine deficiency. Fifty-one (18.8%) children had adequate iodine

intake (100–199.9 µg/L), 39 (14.4%) had urinary iodine levels above requirements (200–299.9 µg/L), while 116 (42.8%) had excessive urinary iodine concentrations (≥300 µg/L). These findings demonstrate substantial variability in iodine nutrition status among the children studied.

Table 3: Distribution of goitre cases according to Gender

Children	Total goitre rate		Total Goitre Rate (95%Cl)
	Males n (%)	Females n(%)	
SCREENED	95% CI		
2700	351(26.1%) (23.6-28.3)	348(25.8%) (23.4-28.1)	25.9(24.2-27.5)

Table 4: Distribution of participants according to goitre grade

GOITRE GRADE	n(%)
0	2001(74.3)
1	656(24.2)
2	43(1.8)
Total	2700

Table 5: Iodine Levels (In Ppm) In Salt Samples Collected

SALTIODINELEVELS(ppm)	
Minimum	0
25th percentile	4.31
50th percentile	4.90
75th percentile	5.29
Maximum	9.81

Table 6: urinary iodine levels according to who classification.

URINARY IODINE LEVEL (ppm)	n(%)
<99.9Mild-moderate deficiency	65(37.5)
100-199.9Adequate intake	51(37.1)
200-299.9Above requirement	39(26)
300 and aboveExcessive	116(18.2)
Total	271(24.7)

Discussion

Iodine stands as a micronutrient crucial for typical human growth and maturation. Although endemic goitre showcases the apparent outcome of iodine insufficiency, its most consequential impacts occur within the developing brain. The deficiency of iodine can yield a range of severe mental and physical ailments, termed collectively as IDD. Despite its eradication in several nations, iodine deficiency persists in various degrees across numerous regions worldwide.[13]

IDDs impact the entire population, yet employing a school-based sampling method is advised for UI and TGR. This approach proves to be the most efficient and practical means of monitoring IDD, as schools typically offer easy accessibility and serve as a representative for the broader population.[14]

In this research, the Total Goitre Rate (TGR) was determined to be 25.9%. TGR exhibited a higher prevalence among boys (26.1%) than girls (25.8%). Of the total, 25.88% were diagnosed with goitre, primarily consisting of grade 1 (24.2%) followed by grade 2 (1.8%). The goiter prevalence shown by different studies across different parts of Kashmir over the years have shown varied results with the total goiter rate ranging from less than 5 percent to more than 30 percent.[15-17]Goitre prevalence was similar among boys and girls, suggesting environmental and dietary factors play a greater role than sex differences. Most cases were Grade I goitre, indicating persistent but generally mild disease.

Household salt analysis suggested inadequate iodine content, while urinary iodine findings showed variation in iodine intake. These observations support continued surveillance, quality control of iodized salt, and public awareness activities.

These findings of our study are comparable to the results to some recent studies in other districts of Kashmir Valley, a study led by Muhammad Salim Khan et al.[18] (2014), focusing on school-going children aged 6-12 years in the Kulgam district of the Kashmir valley, found that the Total Goitre Rate (TGR) was 18.9% among the study participants.This comprised Grade 1 goitre at 18.5% and Grade 2 goitre at 0.4%.In contrast a study by RuqiaQuansar, Iqra N. Chowdri, and S. M. Salim Khan(2023),[19] conducted in the Ganderbal district of Kashmir, revealed Grade 1 goiter in 90 (3.3%) children and Grade 2 goiter in 6 (0.3%), yielding a total goitre rate of 3.6%. Possible explanations include geographical variation, dietary habits, availability of crystalline salts and inconsistent availability or use of adequately iodized salt.

Conclusion

Prevalence of TGR in District Shopian of Kashmir valley was 25.9%, which is quite high and amounts to a serious public health problem. Continuous monitoring and regular surveys, such as the current one, are essential to understand the iodine status of our population. These surveys provide crucial insights into the direction our society is heading in terms of iodine

status.

Recommendations:

The high prevalence of TGR in District Shopian of Kashmir Valley found in our study warrants robust measures needed to be adequately applied by the concerned authorities to ensure and strengthen the system under following steps.

1. Ensure universal availability of adequately iodized salt.
2. Conduct regular district-level IDD surveillance.
3. Strengthen health education regarding iodized salt.
4. Introduce routine school screening for goitre.
5. Improve quality assurance under NIDDCP.
6. Undertake further analytical studies in Kashmir Valley.

Public Health Implications

Persistent iodine deficiency adversely affects growth, cognition, and educational performance. Strengthened surveillance and sustained public health interventions are essential for elimination of iodine deficiency disorders.

Financial support

Funding was provided by National Iodine Deficiency Disorder Control Programme

Conflicts of interest

There are no conflicts of interest.

References

1. World Health Organization United Nations Children's Fund, International Council for Control of Iodine Deficiency Disorders. Assessment of iodine deficiency disorders and monitoring their elimination. A guide for programme managers.
2. Yusuf HK, RahmanAM, Chowdhury FP, Mohiduzzaman M, Banu CP, Sattar MA, Islam MN. Iodine deficiency disorders in Bangladesh, 2004-05: ten years of iodized salt intervention brings remarkable achievement in lowering goitre and iodine deficiency among children and women.
3. Zargar AH, Shah JA, Mir MM, Laway BA, Masoodi SR, Shah NA. Prevalence of goiter in schoolchildren in Kashmir Valley, India. Am J ClinNutr 1995; 62(5):1020-1021
4. Aslam M., Iqbal H., Amanullah M., Akbar A., Altaf S. The cluster analysis, BMI status and dietary habits of the patients with thyroid disorder in Pakpattan, Pakistan. Pak J Nutr. 2013;12(7):642.
5. Sundaram J, Sugunammani BK, Chandrashekar K. Goitre prevalence in Karnataka. Indian J Community Health. 1997;3:98–105
6. Hayat J, Srivasthava VK, Udai M, Jain VC. Prevalence of iodine deficiency disorders in rural population of Lucknow. Indian J Community Med. 1987;12:84–90.
7. Sundarlal, Adarsh, Pankaj . Text book of community medicine. New Delhi: CBS Publishers and Distributors; 2007.
8. Pandav CS, Karmarkar MG, Kochupillai N. Recommended levels of salt iodation in India. Indian J Pediatr. 1984;51:53–4
9. Chakraborty I, Mazumdar P, Chakraborty PS, Chattopadhyay G, Bhowmick K. Iodine deficiency disorder among pregnant women in a tertiary care hospital of Kolkata, India. Southeast Asian J Trop Med Public Health. 2010;41:989–95.
10. Choudhury D, Baruah R. Knowledge and practices regarding use of iodised salt and iodine deficiency disorder among the population of Rani, Kamrup(R), Assam. Indian Journal of Basic and Applied Medical Research. 2016; 5(4): 467-474.
11. Sarah NA, Prince AK, Yao AS, Geoffrey AA, Wisdom TK, Margaret K. Knowledge on Iodized Salt Use and Iodine Content of Salt Among Households in the Hohoe Municipality, Volta Region – Ghana. Central African Journal of Public Health. 2016; 2(1): 1-10
12. Elmanssury AE, Dafaalla SA. Knowledge, attitudes and practices about goitre among population in Shendiprovence. River Nile state of Sudan. International. Journal of Community Medicine and Public Health. 2017; 4(4): 916-922
13. Anderson, M., de Benoist, B., Darnton-Hill, I. et al. (2007) Iodine Deficiency in Europe: A Continuing Public Health Problem. World Health Organization, Geneva, 1–70.
14. World Health Organisation. Assessment of the Iodine Deficiency Disorders and Monitoring Their Elimination. Geneva: World Health Organisation; 2007. p. 1-107
15. Masoodi S R et al. Goitre and urinary iodine excretion survey in schoolchildren of Kashmir Valley. ClinEndocrinol (Oxf) 2014;80(1):141–7.
16. Zargar AH, Shah JA, Masoodi SR, Laway BA, Shah NAMM. Prevalence of goitre in school children in Baramulla (Kashmir Valley). Indian J Pediatr 1997; 64: 225–30.
17. Kousar J, Hamid S, Nazki SG, Bashir A, Dangroo S, Khan MS, et al. Assessment of the magnitude of goiter in the age group of 6-12 years children in district Kargil region (Jammu & Kashmir). Sch J App Med Sci 2013; 1: 406–14.
18. Khan SMS, Mahjabeen R, Masoodi MA, Kauser J, Nabi S. Prevalence of goiter among primary school children of Kulgam district, Jammu & Kashmir, India. Acad Med J Inida2014;II: 18-21.
19. Quansar R, Chowdri IN, Salim Khan SM, Khan MA, Lone AA, Tahir M, et al. Goiter prevalence and iodine deficiency disorder among school-age children (6–12 years) in district Ganderbal of Kashmir valley. J Edu Health Promot2023;12:192.