

## Prevalence of goiter in schoolchildren in Kashmir valley, India

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Endemic goiter, one of the earliest noncommunicable diseases known to mankind, is an important public health problem of worldwide distribution, including parts of Europe. The mountainous slopes of the Himalayas, Alps Pyrenees, and Andes have been the world's most notorious foci of endemic goiter (1). It is widely prevalent in countries of Southeast Asia, with the Himalayan belt being one of the world's most severe endemic areas (2). In Kashmir Valley no extensive survey of endemic goiter has been done yet. Because of the major health importance of this problem, the present survey was conducted to determine the prevalence of goiter in schoolchildren and to quantitate the degree of iodine deficiency or sufficiency by estimating the urinary iodine in the survey population.

The survey was conducted on schoolchildren from Kashmir Valley who were aged 5-15 y; students of both sexes were included. A multistage sampling procedure was adopted for conducting the survey. The selected schools were visited during working hours. We started examining students by sitting on a chair in the open or in the well-lighted classroom or office. Subjects were asked to walk single file from a distance of 10 m and were keenly observed. This enabled us to look at the child's gait, body proportion, and enlarged thyroid gland if any (grades III and IV). The subjects stopped walking and faced the examiner at a close distance so that the front of the subject's neck was well exposed to light; the presence of a visible goiter was thus detected with the neck in a normal position (grade II). The thyroid gland was palpated after the standing subjects turned their backs to the examiner. The consistency and nodularity of the gland assessed by four fingers with hands along the trachea. Thyroid enlargement was graded as suggested by Stanbury et al and accepted by the WHO (3).

A urine sample was collected from every 50th child examined during the survey. Random urine samples of >20-70 mL were collected into 100-mL capacity screw-capped, wide-mouthed, iodine-free plastic bottles with a well fitting inner lid. The samples were immediately processed for creatinine estimation and stored at 4 °C to be processed every 3-4 d for iodine estimation. The urine samples were diluted 1 in 50 with double-distilled water before estimation for creatinine. Urinary creatinine was estimated by Jaffe's reaction without deproteinization on a Boehringer Mannheim System 4030 (Mannheim, Germany). Urinary iodine was estimated by a method based on arsenic acid reduction of ceric ions as recommended by Karmarkar et al (4) and expressed as mg/g creatinine. Statistical analysis was done by chi-square test.

The study was conducted in 210 randomized villages. A total of 10 196 students (5676 boys and 4520 girls) aged 5-15 y

were studied. Of the 10 196 students studied, 4609 had different grades of goiter with an overall prevalence of 45.2% (Table 1): 21.66% of the children had grade I goiter, 16.08% had grade 0b goiter, and 7.44% had evidence of grade II goiter. There were two cases of grade III goiter and no cases of grade IV goiter. Overall goiter prevalence was higher ( $P<0.001$ ) in children aged 11-15 y than in children aged 5-10 y (Table 1). Overall goiter was more prevalent in males (46.23%) than in females (43.9%). Male predominance was statistically significant ( $P<0.025$ ). A total of 202 urine samples were analyzed for iodine estimation. The iodine excretion ranged from 6.25 to 103.6 µg/g creatinine, with a mean ( $\pm$ SEM) value of  $49.60 \pm 3.55$  µg/g creatinine. Of the total number of urine samples analyzed, iodine excretion was > 50 µg/g creatinine in 49.50% of the children, 25-50 µg/g creatinine in 44.06% of the children, and < 25 µg/g creatinine in 6.44% of the children.

There are two traditional means of assessing the severity of iodine deficiency in a given area: prevalence of goiter and urinary iodine estimation. Iodine deficiency is the most common preventable cause of mental deficiency in the world today. The WHO has estimated that the elimination of iodine deficiency would prevent the brain damage that has caused irreversible mental handicap to 3 20 million people in the world today. Studies of schoolchildren living in iodine-deficient areas from several countries indicate impaired school performance and IQs compared with similar groups from iodine-replete areas (5). Elimination of iodine deficiency disorders (IDD) confers an overwhelming benefit for human development and social well-being. Goiter remains a significant problem in many areas of Europe, though its incidence has decreased with the consumption of iodized salt (6, 7). Iodine deficiency continues to be a great challenge in developing countries, particularly in Asia, Africa, and Latin America (8). Recently, the WHO summarized the data on IDD prevalence with brief notes on various national and international programs aimed at eradicating this major health problem (9).

Iodine deficiency is the principal etiological factor in endemic goiter and excretion of iodine per gram creatinine in a single specimen of urine has been successfully used in the estimation of iodine deficiency or sufficiency (10). In our study the mean  $\pm$  SEM urinary iodine excretion was  $49.60 \pm 3.55$  µg/g creatinine. In Western countries sonographic measurement of thyroid volume is being used for epidemiologic purposes and has shown that palpation is less reliable in younger subjects (11). Because of our limited resources, we used manual palpation to check for goiter, which when combined with urinary iodine estimation gave us some basic information about the magnitude of one of the important public health problems in Kashmir Valley.

TABLE 1

Overall prevalence of goiter in Kashmir Valley, by age<sup>1</sup>

Age group	Grade of goiter				Total number with goiter
	0b	I	II	III	
5-10 y (n = 5899)	959 (16.26)	1131 (19.17)	347 (5.88)	0	2437 (41.31)
11-15 y (n = 4297)	681 (15.85)	1077 (25.06)	412 (9.59)	2 (0.02)	2172 (50.55)
Total (n = 10 196)	1640 (16.08)	2208 (21.66)	759 (7.44)	2 (0.02)	4609 (45.20)

<sup>1</sup> Percent of subjects with goiter in parenthesis. Overall prevalence of goiter was significantly greater in children aged 11-15 y,  $P < 0.001$  ( $X^2df_3=85.61$ )

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