Identification of Iodine Deficiency in the Field by the Rapid Urinary Iodide Test: Comparison with the Classic Sandell-Kolthoff Reaction Method

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The two traditional methods for the assessment of iodine deficiency in a given area are the estimation of urinary excretion of iodine, and the prevalence of goiter. In field studies, the estimation of urinary iodine excretion (UIE) in random urine specimens provides an adequate assessment of a population’s iodine nutrition. The recommended method is the classic one, based on Sandell-Kolthoff reaction (Method A). Recently, a new semi-quantitative method has been introduced (rapid urinary iodide test [RUIT]). We performed a field study in a developing country (Azerbaijan) in order to compare the classic Method A to RUIT. The study included 942 schoolchildren, to whom UIE was estimated by RUIT. Comparing the two methods, \( n = 260 \), the sensitivity of RUIT using as gold standard Method A, was 96% and the specificity was 61%. The correlation between median values UIE estimated by RUIT and by Method A was excellent \(( r = 0.98, p < 0.001)\). An agreement in iodine deficiency classification according to the World Health Organization-United Nations Children’s Fund-International Council for the Control of Iodine-Deficiency Disorders (WHO-UNICEF-ICCIDD) between the two methods was observed in eight of nine areas. In conclusion, RUIT is a suitable method for UIE estimation in field studies of suspected iodine deficiency. The test is relatively inexpensive, easy to perform, and does not require sophisticated instruments.

Introduction

The traditional methods applied to assess the severity of iodine deficiency (ID) in a given area are the urinary iodine excretion (UIE) and the prevalence of goiter (1). In field studies, for the estimation of UIE, urine spots are readily available whereas 24-hour urine collection are not. The iodine concentration in morning or other random urine specimens provides an adequate mode of assessment of a population’s iodine nutrition (2). Many techniques are available for urinary iodine measurements varying from precise methods with rather sophisticated instruments, to semiquantitative low-technology methods that can be used in region, country, or local laboratories. Criteria for selection include acceptability, technical feasibility, cost, performance, and availability of reference data (3).

Recently, a conference was held in Zurich under the auspices of the World Health Organization (WHO), the International Council for the Control of Iodine-Deficiency Disorders (ICCIDDD) and UNICEF (4). The objectives of this conference were to provide guidelines on standardized methods for measurement of thyroid volume by ultrasonography and for measuring urinary iodine by simplified methods. The stages of iodine nutrition were classified according to median iodine concentration in urine. In the consensus of this conference it was stated that the spectrophotometric method called Method A, based on Sandell-Kolthoff reaction after digestion of the urine with chloric acid at 110°C for 1 hour (5) is, at present, the best method to estimate the iodine intake and to monitor the compliance of the population to iodine supplementation program.

Because of difficulties of iodine measurements in the field, new and simple techniques were discussed in the above-mentioned conference, including the method of Rendl et al. (6). This is a qualitative colorimetric method based on iodide catalyzed oxidation of 3,3’,5,5’-tetramethylbenzidine by peracetic acid/H₂O₂. The method is easy to perform and does not require sophisticated equipment or apparatus. However, this test has not been evaluated in the field in a population with iodine deficiency.

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