

Development and validation of a food frequency questionnaire to assess habitual iodine intake in women of childbearing age

L. Kelliher^{1,2}, M.E Kiely^{1,2} and A. Hennessy^{1,2}

¹Cork Centre for Vitamin D and Nutrition Research, School of Food and Nutritional Sciences, University College Cork, Republic of Ireland and

²INFANT Research Centre, University College Cork, Republic of Ireland

Iodine intake in Irish women is concerning with 34% not meeting the Institute of Medicine (IOM) estimated average requirement (EAR)⁽¹⁾. As half of all pregnancies are unplanned, ensuring adequate iodine status in this group is important to support foetal brain development and prevent lasting adverse neurological outcomes. Urinary iodine concentration (UIC), used to assess iodine status at a population level, reflects recent intake of iodine containing foods and is subject to large intra-individual variation. Assessing habitual iodine intake over a longer period using an efficient, low burden, dietary assessment method could help identify those at risk of iodine deficiency.

The aim of this study was to develop and validate an iodine-specific food frequency questionnaire (I-FFQ), using a four-day weighed food diary (FD) as the “reference” dietary assessment method. Due to the considerable overlap between the food sources of iodine and vitamin D, we chose to modify an existing 72-item vitamin D FFQ⁽²⁾. National food consumption data⁽¹⁾ were used to identify key dietary sources of iodine in women of childbearing age (WCBA) (18–50 y) and foods that contributed to 90% of daily iodine intake were included in the resulting 43-item, interviewer-administered I-FFQ.

A total of 100 non-pregnant WCBA with no known thyroid disorder completed the online validation study. The I-FFQ was administered, and participants recorded and returned a 4-day weighed food diary and spot urine sample to the Human Nutrition Studies Unit at University College Cork. UIC was assessed using the Sandell-Kolthoff method⁽³⁾ in line with CDC EQUIP procedures. Median (IQR) iodine intakes calculated by the I-FFQ and FD were compared using the Wilcoxon signed-rank test. Iodine intakes estimated by the I-FFQ and the FD were divided into thirds of the distribution and cross-classified. Validity coefficients were calculated using the method of triads⁽⁴⁾. Statistical analyses were performed in SPSS Version 28 (IBM SPSS).

Median (IQR) intakes for the I-FFQ and FD were 161 (111) µg/d and 130 (88) µg/d, respectively (P = 0.001). Median (IQR) UIC was 83 (89) µg/L, indicating mild-to-moderate iodine deficiency. The I-FFQ and FD classified 91% of participants into the same or adjacent third of the iodine intake distribution. The estimates from the I-FFQ (Q) and FD (D) were strongly correlated (r_{QD} = 0.571), while the correlation between dietary assessment methods and UIC (U) were similar between the two dietary assessment methods (r_{QU} = 0.123; r_{DU} = 0.199). The validity coefficients for the I-FFQ (p_{QT}) and FD (p_{DT}) were 0.594 and 0.961, respectively.

The I-FFQ validity coefficient (0.594) indicated good validity. The I-FFQ is effective at classifying WCBA into broad categories of intake distribution, and represents an efficient, cost-effective tool for assessment of habitual iodine intake, as a first step to identify those at risk for deficiency.

Acknowledgments

This work was supported by a Science Foundation Ireland Starting Investigator award to ÁH [Functional indicators of iodine status in pregnancy – an outcome-driven, personalised nutrition approach (18/SIRG/5575)]

References

1. McNulty BA, Nugent AP, Walton J *et al.* (2017) *Br J Nutr* **117**(3), 422–431.
2. Kiely ME, Collins A, Lucey AJ *et al.* (2016) *J Hum Nutr Diet* **29**(4), 495–504.
3. Sandell EB & Kolthoff IM (1937) *Microchimica Acta* **1**, 9–25.
4. Kaaks RJ (1997) *Am J Clin Nutr* **65**, 1232S–1239.