Development and Validation of a Semi-quantitative Food Frequency Questionnaire to Assess Dietary Intake of Adult Women Living in New Zealand

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Abstract

Background: There has been an increase in diet-related disease over the last decade (University of Otago & Ministry of Health, 2011). Food frequency questionnaires (FFQ) are commonly used to investigate the dietary intake of large populations, due to ease of administration and cost effectiveness. At present in New Zealand (NZ), an up-to-date, culturally appropriate food frequency questionnaire (FFQ) for assessing dietary intake is lacking.

Objectives: To develop and validate a culturally appropriate, computerised, semi-quantitative food frequency questionnaire to assess the dietary intake of young adult women living in New Zealand; to assess the dietary intake of this population using the questionnaire.

Methods: Participants (n = 110) were women (16 - 45 years) of Māori, Pacific or European ethnicity. They completed the New Zealand Women's Food Frequency Questionnaire (NZWFFQ) assessing dietary intake over the previous month, and a four-day weighed food record. Validity was evaluated by comparing nutrient intakes from the FFQ with the food record using paired t-tests, Pearson's correlation coefficients, cross-classification, weighted kappa and Bland-Altman analysis. Validity was assessed for raw data, and data adjusted to account for fruit and vegetable intakes.

Results: Nutrient intakes were significantly higher from the NZWFFQ data compared with the food record for all nutrients except monounsaturated fat, polyunsaturated fat and alcohol ($p < 0.05$). Pearson's correlation coefficients ranged from 0.10 (iron) to 0.80 (vitamin A) with an average of 0.39 ± 0.14. Correct quartile classification ranged from 22% (phosphorus) to 47% (saturated fat). Correct classification into same and adjacent quartiles ranged from 62% (iron) to 86% (saturated fat). Gross misclassification into opposite quartile ranged from 3% (saturated fat) to 10% (iron). For weighted Kappa, saturated fat had moderate agreement ($\kappa = 0.41 - 0.6$), and other nutrients had fair agreement ($\kappa = 0.21 - 0.4$). These findings only differed marginally following fruit and vegetable adjustment, with the exception of vitamin A in which validity measures decreased.

Conclusion: The NZWFFQ had good relative validity for ranking individuals by dietary intake, and was able to categorise participants with higher or lower intake than reference ranges. Similarly to previous literature, The NZWFFQ overestimated dietary intake. Therefore, it is not suitable for assessing absolute dietary intakes.

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Abbreviation List

4DFR	Four-day Food Record
AARP	American Association of Retired Persons (Cohort)
AI	Adequate Intake
AMDR	Acceptable Macronutrient Distribution Range
BF%	Body Fat Percentage
BIA[1]	Bioelectrical Impedance Analysis
BMI	Body Mass Index
BMR	Basal Metabolic Rate
BOD POD[1]	Air Displacement Plethysmography
CI	Confidence Interval
CVD	Cardiovascular Disease
DEXA[1]	Dual Energy X-ray Absorptiometry
EAR	Estimated Average Requirement
EXPLORE study	Examining Predictors Linking Obesity Related Elements
FFQ	Food Frequency Questionnaire

κ	Kappa statistic
LER	Low Energy Reporter (of dietary intake)
LOA	Limits of Agreement
NHMRC	National Health and Medical Research Council
NRV	Nutrient Reference Value
NZ	New Zealand
NZANS	New Zealand Adult Nutrition Survey
NZEU	New Zealand European
NZRD	New Zealand Registered Dietitian
NZWFFQ	New Zealand Women's Food Frequency Questionnaire
p	p-value (statistical analysis)
PAL	Physical Activity Level
$Pr(a)^2$	Relative observed agreement
$Pr(e)^2$	Hypothetical probability of chance agreement
r	Correlation coefficient (statistical analysis)
RDI	Recommended Daily Intake

RMR	Resting Metabolic Rate
SD	Standard Deviation
SOP	Standard Operating Procedure

Note. [1]Are methods of measuring body composition (BIA, BOD POD and DEXA); [2]Are components of Goldberg's cut-off method measuring under-reporters of dietary intake.