References


4. Woolf AD, P


age to determine whether published data are likely to apply across the age range.

Methods

Participants comprised two samples of healthy people, 20 aged 19–32 years and 60 aged 56–86 years. Exclusion criteria were pregnancy, taking medication for diabetes mellitus and diagnosed chronic disease including diabetes mellitus, cardiovascular disease, cancer and diseases of the digestive system. Three of the younger group (15%) and 12 of the older group (20%) reported a family history of diabetes. All of the younger and most of the older group (95%) were of European descent with four people in the older group identifying themselves as Maori (2), Chinese (1) and Indian (1). Most participants were non-smokers; one person in the younger and nine people in the older group were past-smokers; two people in the older group were current smokers. On one morning during the test period, fasting blood was taken by venipuncture for the determination of glucose, insulin and triglycerides on a Cobas instrument using Roche diagnostic kits (Roche Diagnostics GmbH, Mannheim, Germany). Two Australian cereals with 150 ml trim milk were tested for GI, Kellogg’s Sustain and Cornflakes. Sustain is a cereal with a high- wholegrain content (53%) that also contains dried fruit (13%). In the younger group, we tested the cereals once and the glucose beverage three times while in the older people we minimised the number of tests to avoid participant burden (glucose reference tested twice) and recruited a large sample. The tests were conducted over 10-weeks and the order of consumption was randomised to each participant. Before each test day participants were instructed to consume their evening meal and to refrain thereafter from food or beverage intake (water permitted). They were asked to report to the clinic the next morning following an overnight fast of at least 10 h. Baseline capillary blood samples were collected twice before food consumption and postprandially at 15, 30, 45, 60, 90 and 120 min. Food was consumed at an even pace over 15 min and participants remained seated throughout the test period. Blood glucose was measured using Hemocue Glucose 201 Analyzers (HemoCue AB, Angelholm, Sweden). The cereals were tested for starch content (Boehringer Mannheim, Germany) and sugars by chromatography [12]. Cornflakes comprised 80.4 g/100 g and Sustain 69.6 g/100 g available carbohydrate. The cereal and trim milk provided a total of 50 g available carbohydrate and the glucose beverage contained 50 g glucose (Lomb Scientific, NSW, Australia). The Homeostasis Model Assessment (HOMA-IR) was calculated by:

\[
HOMA - IR = \frac{\text{Fasting glucose (mmol/l)} \times \text{Fasting insulin (\mu U/ml)}}{22.5}
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iAUC was calculated using the trapezoidal method [13]. The iAUCs were log transformed and an individual’s GI calculated. A mixed model accounting for correlations among the measures was used to estimate group mean GI including an interaction term between food and group. The characteristics of the samples were compared using t- or chi-squared tests. The University of Otago Human Ethics Committee approved the study.

Results

The mean (SD) ages of the older and younger groups were 70.3 (8.8) and 24.2 (3.7) years with a between-group difference of 46 years. The younger group was shorter than the older group (1.66 (0.07) compared with 1.75 (0.10) metres; \( P < 0.001 \)). Body mass was not different being 74.6 (13.6) and 72.6 (13.9) kg in the older and younger groups, respectively (\( P = 0.28 \)). The older group had a higher BMI than the younger, 27.1 (4.6) compared with 23.4 (2.6) kg/m², respectively. Forty-seven per cent of the older and 25% of the younger group were overweight or obese. Fasting plasma glucose was 4.9 (0.6) and 4.5 (0.4) mmol/l in the older and younger groups, respectively (\( P < 0.001 \)). There were no differences between groups for fasting plasma insulin, triglycerides or HOMA-IR. The iAUC and GI values are shown in Table 1. Repeat tests on the reference foods had coefficients of variation (CV) in the younger and older groups of 21.9 and 17.2%, respectively. The iAUCs of the three test foods were higher in the older compared with the younger group (\( P < 0.001 \)). The iAUC responses to the breakfast cereals in the older group were approximately double that of the younger group, whereas for the glucose beverage the iAUC difference was not as large, being 59% higher in the older compared with the younger group. The incremental glycaemic response curves for the two test meals are shown in Figure 1. There was no discernible between group difference in blood glucose increments over the initial 30 min while the older group tended to reach a slightly higher peak value and had an extended time to return to baseline compared with the younger group. Compared with the younger participants, the GI of Cornflakes was 25% higher in the older group (\( P = 0.008 \)). The GI of Sustain also tended to be higher in the older group (\( P = 0.052 \)).

Discussion

Consistent with age-related changes in glucose tolerance, postprandial glycaemia was higher in the older compared with the younger group [14, 15]. Additionally, the GI of cornflakes was higher in the older group. This is somewhat unexpected given that the GI concept was intended to take account of differences in individual’s glucose tolerance status by indexing a test food to a reference food [16]. However, the GIs of Cornflakes in our younger and older groups were substantially different, being 64 and 81, respectively. Hence, according to a commonly used GI classification system (low ≤55, medium 56–69, high ≥70)
the GI of cornflakes was ‘medium’ in the younger group and ‘high’ in the older group. To what extent age-related differences in GI occur is unclear. There was no statistically significant difference in GI for Sustain being 56 and 66 in the younger and older age groups, respectively, although the trend towards a higher GI in the older group was evident.

Age-related differences in GI have not previously been reported. Age-related differences in GI were 56 and 66 in the younger and older age groups, respectively, although the trend towards a higher GI in the older group was evident. Much GI testing is published in the International Tables [18]. It has been argued that these values, normally tested in young to middle-aged people, are generally applicable [6]. Our data indicate otherwise, that the GI of a food may be dependent upon the group in which it is tested. These findings have practical implications. For example, if one is offering nutritional advice then it is confusing to suggest that a product is suitable in one group but not in another.

Strengths of this study are the use of larger samples than is usual for GI testing and relatively low CVs for repeat tests compared with other published values [9, 19]. A low CV together with a large sample resulted in small 95% confidence intervals for our estimates of GI and a highly significant difference in GI for one of the test foods. Higher postprandial glycaemia in the older compared with the younger group suggests that additional care should be taken by older people not to consume foods that are likely to lead to prolonged hyperglycaemia, a risk factor for cardio-vascular disease [20]. The GI on a food package should be representative of the glycaemic potential of that food among all possible consumers.

**Key points**

- Higher postprandial glycaemia in elderly.
- Care needed by elderly when making food choice based on GI.
- GI values need to be representative among population groups.

**Conflicts of interest**

TP is an unpaid Director and SR is a part-time co-ordinator of Glycaemic Index Otago. Glycaemic Index Otago is a not for profit testing facility operated by the University of Otago, Dunedin, New Zealand.

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References