

**DIETARY FIBRE AND PROTEIN INTAKES AS FACTORS AFFECTING
BIOAVAILABILITY OF ZINC IN ELDERLY AUSTRALIAN FEMALES**

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There is a growing recognition that zinc status might be compromised in the aged in developed countries such as Australia (1) and the U.S.A. (2).

Our own work amongst elderly Australians indicates that 20 per cent of community based and 29 per cent of institutionalised elderly have plasma zinc concentrations of less than $12.2 \mu\text{mol/l}$. To what extent low plasma zinc is a reflection of poor dietary zinc intake and to what extent it reflects an interaction between other nutrients is worthy of consideration. Energy and protein (3), polyunsaturated fat (4), dietary fibre (5), phytate (6), ferrous iron (7), tin (8) and phosphate (9) have all been suggested as possible determinants of zinc homeostasis.

In the present work, we have had the opportunity to examine dietary fibre and protein intakes as factors which might influence zinc status in elderly Australian women. Different relationships between these nutrient intakes were found in different categories of aged Australians - community based or institutionalised and of different functional status. Knowledge of plasma zinc concentrations in the face of these different sets of nutrient intakes allows deductions to be made about intake determinants of plasma zinc.

SUBJECTS AND METHODS

Elderly females, 70 years of age and over, who were free from acute illness were selected from the community and a long term geriatric institution. The community based elderly were selected by a two stage cluster sampling technique (10) while the institutionalised subjects were randomly selected from those who had been institutionalised for three months or more. Each subject was categorised as to functional capacity according to the criteria of Steinbrocker et al. (11).

Dietary intake data on community elderly were assessed by the method of Burke (12). Institutionalised elderly dietary intake data were assessed by three days of weighed food intake. Although different dietary methods were used to assess the intakes of both groups, all interviews were conducted by the one skilled dietitian, thereby keeping observer bias to a minimum. McCance and Widdowson's Food Composition Tables (13) were used to estimate the nutrient intake. Plasma zinc was analysed by flame atomic absorption spectrophotometry (Varian Technicon Model AA6) by the method of Meret and Henkin (14).

Comparisons of community and institutionalised elderly, as well as comparisons of functional status categories were made with Student's t-test.

RESULTS AND DISCUSSION

When the plasma zinc concentrations of community (C) and institutionalised (I) elderly females of functional status (FS) I were compared, it was found that I had higher values than C ($p < 0.01$) (Figure 1). However zinc intakes were actually less in I compared with C ($p < 0.01$) (Figure 2). This suggests that factors other than zinc intake influence plasma zinc and these might include other dietary variables. One such variable might be dietary fibre (DF). DF intake was greater in the C; 21.0 g (43.0 per cent cereals, 57 per cent fruit and vegetables) than in I; 15.3 g (35.5 per cent cereals, 63.5 per cent fruit and vegetables) ($p < 0.01$) (Figure 3). This would be consistent with an effect of DF to decrease zinc bioavailability, although other factors associated with dietary fibre such as phytate might be incriminated. Calcium intakes in C also tended to be greater which might have contributed to a lower zinc bioavailability. Diuretic usage tended to be greater in I and this would have been expected to decrease plasma zinc, whereas it is actually greater.

Protein intake was also significantly greater in C than I of FS 1 ($p < 0.01$) (Figure 4), but in elderly Australians, the greater the protein intake, the greater the zinc intake (1). Thus, unless the effect of protein intake on zinc loss is greater than the associated increase in zinc intake, it is more likely to have favourably affected zinc bioavailability. Presumably an adverse effect of DF has exceeded a beneficial effect of zinc associated with protein.

Another opportunity to examine the interaction of dietary variables which might affect zinc was provided by the categorisation of institutionalised elderly females according to functional status (11). The lower the functional status, the lower the plasma zinc concentration ($p < 0.001$) (Figure 1). However, zinc intake was not different between the individuals of different functional status (FS 1 vs FS 4) (Figure 2). This suggests that an alteration in zinc bioavailability has occurred. Protein intake was significantly less in those with lower functional status ($p < 0.001$; FS 1 vs FS 4) (Figure 4). Dietary fibre intake was also less in those with lower functional status ($p < 0.005$; FS 1 vs FS 4) (Figure 3). If anything the lower dietary fibre intake might have increased zinc bioavailability in those with lower functional status where not only was protein intake less, but also diuretic use greater.

A unifying hypothesis for our findings on plasma zinc and dietary intakes of zinc, dietary fibre and protein is that dietary fibre decreases and protein increases zinc bioavailability in elderly Australian women. The extent to which dietary fibre or protein intake is operative would, however, need to be accounted for by interaction with additional factors such as dietary phytate and calcium and diuretic usage. It is also possible that low plasma zinc contributed to decreased functional status.

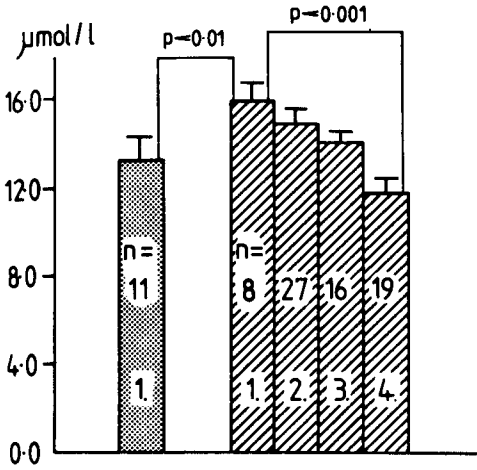


FIG. 1

Plasma zinc concentration of community and institutionalised elderly Australian females

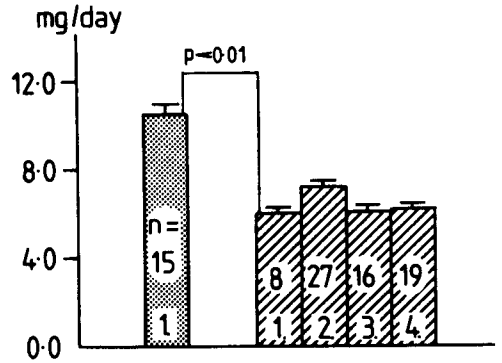


FIG. 2

Zinc intake of community and institutionalised elderly Australian females

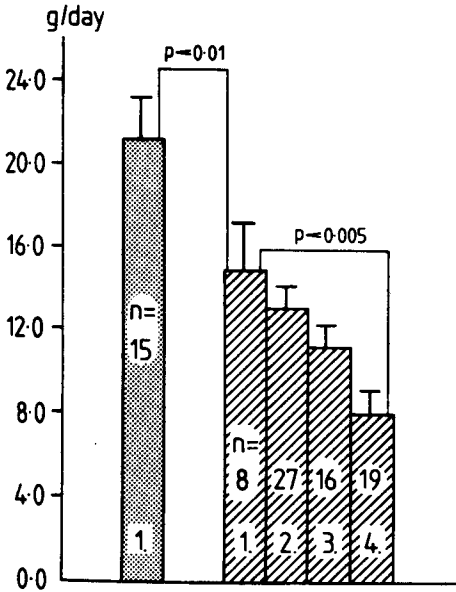


FIG. 3

Dietary fibre intake of community and institutionalised elderly Australian females

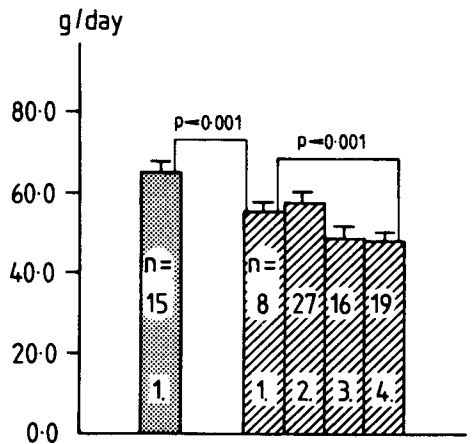


FIG. 4

Protein intake of community and institutionalised elderly Australian females

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