The relationship between dental diseases and nutrient values in the elderly

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ABSTRACT

The purpose of this study was to assess whether tooth loss or periodontal disease is related to the intake of selected nutrients, and to the amounts of key nutrients found in urine. We evaluated the number of present teeth and the mean probing attachment level in 57 subjects randomly selected, aged 74 years. All food intake was measured by a precise weighing method for three consecutive days. Multiple regression coefficient for each nutrient was estimated based on a continuous scale adjusted by gender. The number of present teeth was significantly associated with the presence of 5 minerals (sodium, potassium, magnesium, phosphorus, iron) and 8 vitamins (D, E, B_1, B_2, niacin, B_6, folic acid, pantothenic acid). Ca/Mg and ln {(Ca*ip)/(Mg*Cre)} were significantly associated with both the number of present teeth and the mean probing attachment level. This study might suggest that there is a significant relationship between mineral and vitamin intake, and especially tooth loss.

KEY WORDS: Nutrient intake, Dental disease, Elderly people

INTRODUCTION

In recent years in the field of clinical dentistry, and particularly in gerodontics, there has been a growing awareness in the importance of nutrition. A number of diet and nutrition surveys, including the National Health and Nutrition Examination Surveys (NHANES) I, II, and III in the USA and the National Diet and Nutrition Survey in Britain, found inadequate intake of many nutrients in high percentages of elderly people (Briefel *et al.*, 2000; Wright *et al.*, 2003; Finch *et al.*, 1998). In the reports of theses studies, it was pointed out that the factors contributing to nutritional inadequacy in older people included physiological decline, age-related diseases, medications, insufficient food consumption, and low income.

Previous reports have suggested an association between edentulousness and a low intake of nutrients (Sheiham *et al.*, 2001; Krall *et al.*, 1998; Papas *et al.*, 1998; Joshipura *et al.*, 1996), but the evidence that a poor diet is common in the edentulous population is not convincing when carefully examined, and the association was unclear. Especially, there are very few reports providing detailed data about nutrient intake. Many of the studies conducted to date have been plagued by relatively small sample sizes without restricting the age, and only a questionnaire was utilized to determine quantitative food intake,.

In addition, some studies on nutrition-periodontal relationship suggest that while periodontitis is not necessarily a nutritional deficiency disorder, inadequate intake of some nutrients may aggravate already existing periodontal status (Woolfe *et al.*, 1984; Rubinoff *et al.*,

1989). In this context, it is worthy to evaluate the relation between nutrients and dental disease such as tooth loss and periodontal disease.

The purpose of this study was to assess whether tooth loss and periodontal disease is related to the intake of selected nutrients measured by a precise weighing method, and is related to the amounts of key nutrients found in urine.

MATERIALS & METHODS

Subjects. In 1998, a longitudinal interdisciplinary study of aging was initiated to evaluate the relationship between general health status, including nutrient intakes and anthropometry, and dental diseases. Initially, questionnaires were sent to all 4,542 residents aged 70 years (born in 1927) in Niigata City, Japan. Among them, after dividing by gender, 600 people were selected randomly in order to have approximately the same number of each gender for the baseline survey. The participants agreed to undergo medical and dental examinations and signed informed consent forms regarding the protocol, which was approved by the Ethics Committee of Niigata University School of Dentistry. The study was carried out according to the rules of the Helsinki Declaration. Follow-up surveys have been carried out every year in June using the same methods as in the baseline survey. Among the participants (n=436, screened population) in this follow-up survey conducted in June 2001, sixty-two volunteers took part after receiving a full explanation of the purpose of this detailed nutrient survey.

Complete three-day food intake data were obtained from 57 subjects randomly selected, 31 males and 26 females. All subjects were 74 years old. For the screened population, body height, weight, body fat rate, bone mineral density (stiffness), number of present teeth and mean probing attachment level were measured, and body mass index (Kg/m^2, BMI) was calculated.

Dietary intakes and urine specimen. This nutritional survey was conducted from November 5 to December 5, 2001, to avoid seasonal changes in food intake. Trained dietitians visited the subjects on the day before the survey started. The subjects had been fully instructed on how to record all consumed foods, including drinking water (green tea and so on) and usage of nutritional supplements. Each food consumed by the subjects was weighed using the same model of scales (Tanita, Japan) for three consecutive days. The dietitians checked the records of dietary intakes weighed by the subjects twice, on the second of three consecutive days and after three consecutive days. Food consumption data were obtained at the homes of the subjects by 12 trained dietitians. Finally, two dietitians checked the data of all the food intake. After that, nutrient intake was calculated based on the Standard Tables of Food Composition in Japan (5^{th} ed) (Resources Council, 2000). Items that were unregistered in the food tables were calculated as similar kind of food using the same ingredients. Special care was paid to the cooking condition of food for calculation according to the Standard Tables of Food Composition. In case in which "the composition value of cooked food" was listed in the

Standard Tables, the values were used for calculation. Alcohol-derived energy was included in total energy intake. The data presented on vitamin and mineral intake referred to food consumption only; intake through nutritional supplements was not taken into account. Finally, the dietary intake of 5 macro nutrients, 9 minerals, 12 vitamins, 3 fatty acids, cholesterol and 3 dietary fibers were calculated based on the Japanese Standard Food Tables.

Furthermore, the selected components of partition urine excretion were measured. Concentrations of uric acid, zinc, calcium, creatine, phosphorus, magnesium were tested in a commercial laboratory.

Teeth conditions.

Four dentists performed clinical evaluations on the following items: (1) number of teeth present, (2) probing attachment level (PAL). Mouth mirrors with a light, and pressure-sensitive plastic periodontal probes, set to give a constant probing force of 20g and graduated at 1mm intervals (VIVACARE TPS PROBE®), were used. All functioning teeth, including third molars, were assessed, except for partially erupted teeth. PALs were measured at six sites per tooth (mesio-buccal, mid-buccal, disto-buccal, mesio-lingual, mid-lingual and disto-lingual) and rounded to the nearest whole millimeter. In cases where a restorative margin was apical to the cemento-enamel junction (CEJ), PAL was measured taking into account the anatomical features of the teeth and, if present, the CEJ of the adjacent tooth/teeth.

17 volunteer patients were examined by each of the four examiners in the Faculty Hospital of Dentistry, Niigata University and their results were compared. The percentage of agreement ranged from 70.0 to 100% for PAL. The kappa ranged from 0.62 to 1.00 for PAL.

Statistics. The total energy per body weight per day was calculated. The percentages of energy of protein, lipid and carbohydrates for total energy were calculated. The percentages of energy of animal and vegetable proteins for total protein were calculated. Ash, minerals, vitamins, fatty acids and dietary fiber intake were calculated per 1000 kcal energy intake per day. According to the concentration of mineral specimens in the urine, uric acid/Cre (g/g), Zn/Cre (ug/g), Ca/Mg (mol/mol), ln {(Ca*ip)/(Mg*Cre)} were calculated. All data were expressed as mean ± standard division (SD). After controlling for gender, multiple linear regression analysis was performed to assess the relationship between the number of present teeth and mean probing attachment level, and intake of nutrients per day and the ratio of mineral specimens in the urine. In the case, the mean probing attachment level was calculated by dentate subjects (n=53). Furthermore, after dividing the subjects into two groups according to the number of present teeth (0-19, 20-), we evaluated the difference in the intake of nutrients, the ratio of mineral specimens in the urine, amount of food consumption per day by Student's *t*-test. The level of significance was set at $p<0.05$ for these tests.

RESULTS

Physiological characteristics and dental status are presented in Table 1. The mean number of remaining teeth of the subjects in the study was 18.9±9.7 for males, and 17.5±9.1 for females. The mean probing attachment level of the subjects in the study was 3.5±1.2 for males and 3.1±0.9 for females. There were no significant differences in each variable including body height, weight, BMI, body fat rate and bone mineral density (stiffness) between the screened population and the subjects in the study.

As shown by the data of Table 2, the number of present teeth was significantly associated with energy, the presence of 3 macro nutrients (protein, animal protein, ash), 5 minerals (sodium, potassium, magnesium, phosphorus, iron), 8 vitamins (D, E, B_1, B_2, niacin, B_6, folic acid, pantothenic acid) and cholesterol by correlation coefficients after adjusting for gender. R^2s (%) were 21.3% for energy, 11.0-23.1% for macro nutrients, 11.9-17.7% for minerals, 8.6-26.7% for vitamins and 9.7% for cholesterol. All the values increased linearly with the number of present teeth. However, there was no value associated with the mean probing attachment level except the intake of energy, carbohydrate and monounsaturated fatty acid.

Furthermore, the number of present teeth was significantly associated with Ca/Mg ratio ($p<0.05$, $R^2=8.6\%$) and ln {(Ca*iP)/(Mg*Cre)} ($p<0.05$, $R^2=8.3\%$) in the partition urine excretion. The mean probing attachment level was significantly associated with Zn/Cre ratio ($p<0.05$, $R^2=11.5\%$), Ca/Mg ratio ($p<0.01$, $R^2=16.4\%$) and ln {(Ca*iP)/(Mg*Cre)} ($p<0.05$, $R^2=11.3\%$).

Table 3 shows the mean intake of nutrients per day or mineral specimens in the urine in the two groups divided by the number of present teeth. We found significant differences in protein, animal protein, ash, sodium, vitamin D, B1, niacin, B6, pantothenic acid. The mean intake of several nutrients in the subjects who had less than 20 teeth was significantly lower than that in members with 20 or more teeth. In addition, there were significant difference in the Ca/Mg ratio and ln {(Ca*iP)/(Mg*Cre)} between the two groups. The both ratios in the subjects who had less than 20 teeth was significantly higher than that in members with 20 or more teeth.

Table 4 shows the mean intake of food per day by number of teeth. Results indicated that the intake of total vegetables, other vegetables and fish, shellfish and products were significantly lower among subjects with 0-19 teeth. The consumption of total vegetables per day was 350.3±102.9 g for the 0-19 group and 437.6±157.1 g for the 20+ group ($p<0.05$, t-test). The consumption of fish, shellfish and products per day was 124.1±67.2 g for the 0-19 group and 191.0±127.3 g for the 20+ group ($p<0.05$, t-test).

DISCUSSION

In this study, the nutrient intake of older people was associated with dental status. The number of teeth present had a significant relationship with the intake of several key nutrients. The subjects with fewer present teeth consumed a significantly lower amount of energy,

protein, ash, sodium, potassium, magnesium, phosphorus, iron, Vitamin D, E, B1, B2, B6, niacin, folic acid, pantothenic acid and cholesterol. Data from the present study indicated that the average daily intake of magnesium, iron, vitamins E, B1, B2, B6 and niacin for subjects with less than 20 teeth was deficient compared with the subjects who had 20 or more teeth. In addition, subjects with fewer teeth consumed fewer vegetables and fish, shellfish and products. The subjects with less than 20 teeth consumed 350g of vegetables per day.

Daily intake of fresh fruit and vegetables, in an adequate quantity (400-500g per day), is recommended to reduce the risk of coronary heart disease, strokes and high blood pressure (World Health Organization, 2003). In the previous reports, the difficulties in chewing fruit and raw vegetables such as using dentures could cause a low intake of dietary fiber and vitamins (Angus *et al.*, 2000; Nowjack-raymer and Sheiham, 2003).

Especially vitamin C, E and carotene which are found in vegetables and fruit are known as antioxidants, and adequate intake of these are thought to prevent cardiovascular disease and gastro-intestinal disease (Joshipura *et al.*, 1999; Ripsin *et al.*, 1992; Risch *et al.*, 1985; Thun *et al.*, 1992; Cheng *et al.*, 1996). Poor chewing ability might be a risk factor for these diseases. The relationship between tooth loss and food intake found in this study supports the dental profession's emphasis on prevention of tooth loss.

On the other hand, we could not find a significant relationship between mean attachment level and intake of nutrients. Undoubtedly the primary aetiological agent of periodontal disease is bacterial plaque. However, it is also multifactorial in origin and hence the

pathogenesis of periodontal disease depends on the balance between exogenous environmental factors such as smoking, gingival and tooth morphology and the endogenous host defence mechanisms, which are affected by hereditary, hormones or nutrition, including local factors.

In addition, Ca/Mg ratio and ln {(Ca*iP)/(Mg*Cre)} in urine were significantly associated with both the number of present teeth and the mean probing attachment level. Calcium is a bone mineral and is supplied from the bone to the plasma. However, magnesium is both a bone mineral and an intracellular mineral, and it is not clear from which tissue it is released (Nishimuta, 2000). As Ca/Mg ratio and ln {(Ca*iP)/(Mg*Cre)}, a relation with bone mineral density is admitted (Fuchi *et al.*, 1994). General bone mineral density might influence the alveolar bone loss directly in some cases. This was the reason that there was significant relationship between both Ca/Mg ratio and ln {(Ca*iP)/(Mg*Cre)}, and not only the number of present teeth but also mean attachment level.

It is conceivable that associations found in cross-sectional studies may reflect a reverse causation; that is, the results may reflect the effect of diet on dental caries or periodontal disease and consequently on tooth loss, rather than the effect of tooth loss on diet. However, there is little evidence to suggest that the foods and nutrients examined in this study would influence development of dental caries or periodontal disease. In addition, in this study, there was no significant relationship between periodontal disease and nutrient intake. These findings suggest nutrient intake might not influence periodontal disease which is a major

factor of tooth loss. Thus, it is highly unlikely that the associations found in the cross-sectional analysis are due to the effect of dietary factors on tooth loss. Tooth loss might alter food choice, resulting in lower intake for key nutrients. However, this is further confirmed by the longitudinal analyses, which showed that tooth loss is associated with detrimental changes in diet and nutrient intake.

Finally, we should keep in mind the limitation of the present study. According to the results of our study, there were no significant differences in general health and dental conditions between the screened population and the subjects in the study. Therefore, we thought that the subjects in this study were representative of the community. However, the small sample size of this study may not have detected potential weak association. Further studies should be undertaken to confirm the observation in this study.

In conclusion, this study suggests that there is a significant relationship between nutrient intake such as mineral and vitamin from foods and tooth loss. The general bone mineral value in urine is associated with both tooth loss and periodontal disease.

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Table 1. The comparison in selected characteristics of the subjects between the screened population and the subjects in the study.

Variables	Males			Females		
	Screened population (n=235)	Subjects in the study (n=31)	p	Screened population (n=201)	Subjects in the study (n=26)	p
Height (cm)	162.3 ± 5.5	161.9 ± 5.2	NS	149.1 ± 4.9	148.5 ± 5.1	NS
Weight (Kg)	58.7 ± 8.4	56.2 ± 7.3	NS	51.0 ± 7.8	52.1 ± 7.3	NS
BMI (Kg/m^2)[a]	22.3 ± 2.8	21.5 ± 2.8	NS	22.9 ± 3.3	23.6 ± 2.6	NS
Body fat (%)[b]	19.4 ± 4.9	18.5 ± 5.7	NS	28.4 ± 6.4	29.3 ± 5.0	NS
Stiffness (%)[c]	71.7 ± 11.0 [d]	71.9 ± 10.2	NS	58.6 ± 8.2 [e]	61.1 ± 9.0	NS
Dental condition						
Present Teeth	17.0 ± 9.7	18.9 ± 9.7	NS	16.7 ± 9.2	17.5 ± 9.1	NS
Probing attachment level	3.6 ± 1.6 [f]	3.5 ± 1.2 [g]	NS	3.1 ± 1.7 [h]	3.1 ± 0.9 [i]	NS

All the values are means ± SD.

NS: not significant.

a BMI: Body mass index.

b Body fat rate was measured by bio-electrical impedance analysis (TANITA, Body composition analyzer/scales ™).

c Bone mineral density (BMD) of the heel was measured using an Ultra-Sound Bone Densitometer (Lunar, Achills ™). The stiffness is a clinical index combing the velocity (speed of sound; SOS) and frequency attention (broadband ultrasound tention (dB/MHZ;BUA), and is indicated by the monitor of the bone densitometor as the percentage of the value of the normal younger generation.

The number of subjects for analysis were d:231, e:200, f:207, g:29, h:184, i:24.

Table 2. The relationship between nutrient specimens and the number of teeth present and probing attchment level.

a) Intake of nutrients per day

Independent variables (per day)	Dependent variables					
	Probing attachment level			Present Teeth		
	Coef.[a]	R2(%)	p	Coef.[a]	R2(%)	p
Energy (Kcal/kg)	2.20E+00	16.7	p <0.05	-2.41E-01	21.3	p <0.05
Protein (E%)	-4.33E-01	3.8	NS	1.34E-01	23.1	p <0.001
Animal(%)	-2.48E+00	12.7	NS	4.10E-01	15.9	p <0.01
Vegetable(%)	7.37E-01	9.6	NS	-2.84E-01	12.7	NS
Lipid (E%)	-8.87E-01	5.8	NS	-5.04E-02	2.6	NS
Carbohydrates (E%)	1.97E+00	17.9	p <0.05	-1.64E-01	11.2	NS
Ash (g/1000kcal)	5.71E-02	3.1	NS	2.16E+00	11.0	p <0.01
Minerals						
Sodium (mg/1000kcal)	1.73E-04	3.2	NS	5.19E-03	13.6	p <0.01
Potassium (mg/1000kcal)	2.80E-04	2.4	NS	1.52E-02	17.7	p <0.01
Calcium (mg/1000kcal)	1.15E-04	1.9	NS	7.32E-03	1.0	NS
Magnesium (mg/1000kcal)	4.58E-03	3.7	NS	1.06E-01	11.9	p <0.05
Phosphorus (mg/1000kcal)	-1.03E-03	2.7	NS	3.99E-02	15.0	p <0.01
Iron (mg/1000kcal)	1.01E-01	3.1	NS	3.08E+00	13.5	p <0.01
Zinc (mg/1000kcal)	3.97E-02	3.4	NS	4.55E-01	2.8	NS
Copper (mg/1000kcal)	6.82E-01	4.6	NS	8.76E+00	5.6	NS
Manganese (mg/1000kcal)	1.79E-01	3.4	NS	2.29E+00	3.4	NS
Vitamins						
Retinal (mcg/1000kcal)	2.81E-04	2.7	NS	4.95E-03	3.3	NS
VitaminD (mcg/1000kcal)	-3.75E-02	6.5	NS	5.08E-01	10.1	p <0.05
VitaminE (mcg/1000kcal)	-1.20E-01	3.8	NS	2.18E+00	8.6	p <0.05
VitaminK (mcg/1000kcal)	7.06E-04	2.3	NS	2.22E-02	4.8	NS
VitaminB1 (mg/1000kcal)	-2.13E-01	2.0	NS	3.42E+01	13.6	p <0.01
VitaminB2 (mg/1000kcal)	-2.90E-01	2.1	NS	2.15E+01	12.2	p <0.01
Niacin (mg/1000kcal)	-7.93E-02	5.1	NS	1.66E+00	17.5	p <0.01
VitaminB6 (mg/1000kcal)	-1.47E+00	13.0	NS	2.77E+01	26.7	p <0.001
VitaminB12 (mcg/1000kcal)	2.16E-02	5.0	NS	2.24E-01	4.4	NS
Folic acid (mcg/1000kcal)	5.67E-04	2.1	NS	4.91E-02	12.7	p <0.01
Pantothenic acid (mg/1000kcal)	-8.76E-02	2.2	NS	5.55E+00	14.9	p <0.01
VitaminC (mg/1000kcal)	3.04E-03	2.8	NS	2.87E-02	1.6	NS
Fatty acids						
Saturated (g/1000kcal)	-8.26E-02	3.4	NS	-1.03E+00	4.2	NS
Monounsaturated (g/1000kcal)	-1.78E-01	13.5	p <0.05	-4.33E-01	1.5	NS
Polyunsaturated (g/1000kcal)	-6.15E-02	2.7	NS	-6.52E-01	1.7	NS
Cholesterol (mg/1000kcal)	-1.80E-03	3.4	NS	4.10E-02	9.7	p <0.05
Dietary Fiber						
Total (g/1000kcal)	2.61E-02	2.2	NS	3.99E-01	1.4	NS
Water-soluble (g/1000kcal)	6.48E-02	2	NS	2.64E+00	3.1	NS
Water-insoluble (g/1000kcal)	2.90E-02	2.2	NS	2.87E-01	0.8	NS

b)Mineral specimens in the urine

Independent variables	Dependent variables					
	Probing attachment level			Present Teeth		
	Coef.[a]	R2(%)	p	Coef.[a]	R2(%)	p
Uric acid/Cre (g/g)	6.17E-01	2.6	NS	-7.93E+00	5.3	NS
Zn/Cre (ug/g)	-1.68E+00	11.5	p <0.05	1.68E+00	5.3	NS
Ca/Mg (mol/mol)	6.34E-01	16.4	p <0.01	-4.05E+00	8.6	p <0.05
ln {(Ca*iP)/(Mg*Cre)}	3.88E-01	11.3	p <0.05	-3.06E+00	8.3	p <0.05

a: adjusted by gender.

Table 3. The relationship between nutrient specimens and the present teeth groups.

a) Intake of nutrients per day

Variables (per day)	Present Teeth 0-19 (n=24) Mean	SD	≥20 (n=33) Mean	SD	p
Energy (kcal/kg)	43.70	9.20	40.30	7.90	NS
Protein (E%)	15.10	2.10	17.10	2.40	p <0.01
Animal (%)	51.40	11.00	56.90	8.70	p <0.05
Vegetable (%)	46.30	13.80	43.20	8.60	NS
Lipid (E%)	22.50	4.50	22.00	4.60	NS
Carbohydrates (E%)	61.30	6.80	58.20	6.50	NS
Ash (g/1000kcal)	22.99	3.79	25.85	6.15	p <0.05
Minerals					
Sodium (mg/1000kcal)	2147.50	386.78	2552.20	755.05	p <0.05
Potassium (mg/1000kcal)	1651.64	291.08	1773.94	248.92	NS
Calcium (mg/1000kcal)	350.65	79.86	336.92	88.93	NS
Magnesium (mg/1000kcal)	162.58	32.89	174.41	28.81	NS
Phosphorus (mg/1000kcal)	600.71	90.54	645.47	85.04	NS
Iron (mg/1000kcal)	4.65	1.18	5.16	1.09	NS
Zinc (mg/1000kcal)	5.28	3.43	5.64	2.85	NS
Copper (mg/1000kcal)	0.79	0.24	0.85	0.25	NS
Manganese (mg/1000kcal)	2.36	0.63	2.49	0.75	NS
Vitamins					
Retinal (mcg/1000kcal)	585.24	237.06	625.36	361.10	NS
VitaminD (mcg/1000kcal)	5.97	2.84	9.53	6.73	p <0.05
VitaminE (mcg/1000kcal)	4.95	1.30	5.48	1.13	NS
VitaminK (mcg/1000kcal)	157.61	81.98	180.23	93.21	NS
VitaminB1 (mg/1000kcal)	0.48	0.84	0.57	0.10	p <0.01
VitaminB2 (mg/1000kcal)	0.71	0.16	0.77	0.14	NS
Niacin (mg/1000kcal)	7.98	2.03	9.84	2.23	p <0.01
VitaminB6 (mg/1000kcal)	0.70	0.13	0.85	0.17	p <0.01
VitaminB12 (mcg/1000kcal)	7.69	8.22	9.59	8.15	NS
Folic acid (mcg/1000kcal)	215.03	54.03	242.10	75.14	NS
Pantothenic acid (mg/1000kcal	3.42	0.50	3.79	0.71	p <0.05
VitaminC (mg/1000kcal)	96.54	38.99	99.16	29.97	NS
Fatty acids					
Saturated (g/1000kcal)	6.95	1.77	6.26	1.71	NS
Monounsaturated (g/1000kcal)	7.99	2.22	7.97	2.16	NS
Polyunsaturated (g/1000kcal)	6.04	1.38	5.92	1.68	NS
Cholesterol (mg/1000kcal)	171.05	62.09	189.53	73.90	NS
Dietary Fiber					
Total (g/1000kcal)	11.22	2.87	11.08	2.45	NS
Water-soluble (g/1000kcal)	2.34	0.64	2.48	0.68	NS
Water-insoluble (g/1000kcal)	8.35	2.20	8.14	1.79	NS

b)Mineral specimens in the urine

variables	Present Teeth 0-19 (n=24) Mean	SD	≥20 (n=33) Mean	SD	p
Uric acid/Cre (g/g)	0.63	0.28	0.51	0.26	NS
Zn/Cre (ug/g)	0.45	0.23	0.46	0.20	NS
Ca/Mg (mol/mol)	1.31	0.77	0.89	0.55	p <0.05
ln {(Ca*iP)/(Mg*Cre)}	1.00	0.75	0.48	0.92	p <0.05

Table 4. The relationshp between the number of present teeth and food.

Foods (g/day)	Present Teeth				p
	0-19 (n=24)		≥20 (n=33)		
	Mean	SD	Mean	SD	
Cereals	432.8	150.4	421.4	122.1	NS
Nuts and seeds	4.0	6.2	5.2	9.9	NS
Potatoes and starches	74.0	52.0	82.1	46.4	NS
sugars and sweeteners	14.8	10.0	10.6	6.7	NS
Confectionaries	45.5	42.3	28.7	37.6	NS
Fats and oils	13.5	7.7	11.8	7.6	NS
Beans (Pulses)	66.9	37.4	70.1	42.0	NS
Fruits	382.2	261.8	342.1	173.5	NS
Total vegetable	350.3	102.8	437.6	157.1	p <0.05
Dark green and yellow vegetables	120.4	74.3	123.9	74.4	NS
Other vegetables	229.9	84.7	313.7	123.1	p <0.01
Fungi	16.8	15.1	22.7	17.7	NS
Seaweeds	8.3	15.1	12.5	14.6	NS
Seasoning taste food	715.5	388.6	774.5	431.3	NS
Fishes, shellfishes and products	124.1	67.2	191.0	127.3	p <0.05
Meats and the products	33.2	26.7	43.1	26.9	NS
Eggs and the products	38.7	25.7	36.5	33.0	NS
Milk and the products	212.8	128.1	147.7	119.2	NS

A．宛名：分担研究者　宮崎秀夫　殿

B．指定課題名：　平成15年度医療技術評価総合研究事業

「口腔保健と全身的な健康状態の関係について、高齢者の追跡調査」

C．研究協力課題名

「アンケート調査による口腔関連の項目と日常身体活動状況との関連　—1年間の変化をみて—」

D．研究協力者：　八木　稔，清田義和，葭原明弘，宮崎秀夫

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E．研究目的：

これまでにも，いくつかの観点から口腔と身体活動との間に関連があることが報告されている。このたびは，「新潟市高齢者コホート調査」によって得られたアンケートにおける口腔関連の項目と日常身体活動状況との関連を調べることにした。

F．研究方法：

1．対象

解析対象者は，2002（H14）年度および2003（H15）年度「新潟市高齢者コホート調査」に参加した，それぞれ432名 および402名のうち，両年度とも共通して参加した人々378名であった。

2．アンケートから得られたスコアの算定

まず，この調査において採取されたアンケート項目のうち，「日常身体活動状況編」23項目の質問に対するそれぞれの回答を「あり（+1点）」「なし（-1点）」に分類し，それら得点の合計を個人の「日常身体活動スコア」とした（附表1）。

つぎに，アンケート項目「口腔に関する訴え」のうち「歯そのものの状態についてどう感じているか」についての回答を同様に算定した後，「改善」（変化が+）「不変」（変化が0）「悪化」（変化が-）に分類した。

また，調査直前1カ月に経験した口腔の症状に関する9つの質問それぞれについてその症状があれば-1点を与え，それら得点の合計を個人の「口腔症状スコア」とした（附表2）。

さらに，記載された15種類の食品について「かめる」とこたえた食品にそれぞれ1点を与え，それら得点の合計を個人の「かめる食品スコア」とした（附表3）。

歯みがきに関する7つの項目それぞれについて行っている場合は1点を与え，それら得点の合計を個人の「歯みがきスコア」とした（附表4）。調査までの1年間に受けた歯科的な処置を11項目あげ，それぞ