Original Article

Health characteristics of older Australian dietary supplement users compared to non-supplement users

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The aim of this study was to measure the prevalence of dietary and health supplement use among Australians aged 65 years and over, and to contrast the health differences between supplement users and non-supplement users. Data was obtained from 1,263 randomly selected older Australians, who provided general demographic data, in addition to information related to their health, symptoms experienced and uses of medication, including dietary supplements. Supplement use was reported by 43% of the sample (52% of females and 35% of males). This investigation has revealed distinct differences in the health profile of older supplement users compared to non-users. Although there was no difference in the number of visits to medical doctors or self-rated health status between supplement users and non-supplement users, supplement users were more likely to report arthritis and osteoporosis, and experience more symptoms and consume more medication than non-supplement users. In contrast, there was a reduced likelihood of taking a supplement for those with hypertension and by those using blood pressure medication and heart tablets. These results suggest that older dietary supplement users may benefit from education and professional advice to assist them make appropriate and informed choices, particularly if they expect these preparations to attenuate their health concerns.

Key Words: ageing, dietary supplementation, elderly, Australians

Introduction

It is well established that among the general adult population supplement users can be characterised on the basis of several demographic and lifestyle features, including gender, ethnicity, level of education, income, self-rated health status, weight status, nutrient intake, cigarette and alcohol consumption.[1-13]

Compared to non-supplement users, supplement users also appear to hold contrasting beliefs about the nutritional adequacy of the food supply; the extent of chemical contamination of foods; the role of supplemental intakes of nutrients (e.g vitamin and mineral preparations) and their perception of their nutritional status.[14,15]

Worsley[14,15] found that in a sample of females (mean age 42 years) living in Adelaide, supplement users expressed a higher level of concern about the quality and purity of the food supply than non-supplement users. Supplement users also reported higher levels of medication usage, alcohol intake, and work-related stress and were more inclined to practice some form of relaxation activity, such as meditation. In comparison to what is known about the demographic and attitudinal profile of general adult Australian supplement users, the patterns and prevalence of supplement use by older individuals in this country is not as well understood.

Since the 1980s, there have been several attempts in the United States to assess rates of supplement usage by individuals aged 65 years and over, and to profile the characteristics of supplement users. In older individuals supplement use tends to be a marker for a number of positive health related behaviours. These individuals report higher levels of education and healthier lifestyle practices than older non-supplement users.[11,16-18] Gender is the most predictive determinant of dietary supplement use across all age groups, including older individuals.[1,6-9,16,17,19-26] The use of dietary supplements in this group is commonplace. Depending on the population studied and the method of data collection, rates of usage for individuals aged 65 years and over range from 33% to 46%.[1, 6, 8, 9, 11, 16, 19-22] There is a lack of information about the health profile of older supplement users and what data does exist is conflicting. Some studies have found that although there was no significant relationship between supplementation and self-rated health status[16,22] supplement use was higher among those with poor self-rated health status.[22] In contrast, data from a large sample (n=3,939) of Americans aged 65 years and over suggested that supplement use was significantly less likely for those with poor self-rated health status.[18]

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One study found that the relationship was gender specific; according to Wallstrom *et al*., (1996) female supplement users had worse perceived health than female non-users, while no such association was observed for males.[27]

Compared to the United States, surprisingly little is known about the dietary supplement practices of older Australians. The most reliable estimates of supplement use by older Australians are based on a small number of national and regional investigations, namely the National Health Survey[28], the National Nutrition Survey[29], the Blue Mountain Eye Study[12] and an earlier investigation conducted by Horwath and Worsley (1989).[30] According to these studies, 20%-40% of Australians aged 60 years and over report the use of some form of dietary supplement. Supplement use was positively associated with gender (female),[12,28,29] higher levels of education,[12,30] socio-economic status[12,30] and weight status.[12]

Only one study, a regional investigation of South Australian residents (N = 2,195), has specifically explored the relationship between health status and dietary supplement use among individuals aged 65 years and over.[30] In this study, dietary supplement users and non-users did not suffer from different medical conditions, nor did they vary significantly in the number of bouts of illness or visits to their general medical practitioner.

The current investigation was designed to address the paucity of data on this topic in Australia. The aims of the study were threefold; firstly, to quantify the extent of dietary supplement use in a representative sample of older Australians; secondly, to examine the association between supplement use and self-rated health status and lastly, to determine if older supplement users differ from older non supplement users in regard to the total number and types of health conditions reported, symptoms experienced and medication used.

Methods

Survey implementation

In January 2001 a letter outlining the nature of the investigation and inviting participation was posted to a proportionally random selection of 2,457 older Australians stratified by State and Territory from the 2000 Australian Electoral Commission roll. Two weeks later the 12-page questionnaire was posted. A reminder to complete the survey card was posted to all participants 4 weeks after the original letter had been mailed. Each respondent received the initial letter, questionnaire and follow-up postcard and a pre-paid envelope in which to return the completed survey. Completed surveys were received from 1,263 elderly Australians. This represents a response rate of 62% after allowing for confirmed non-deliveries.

The survey instrument was designed to obtain information about health and lifestyle practices of older Australians, including their use of dietary supplements. The development of the survey involved two in-depth focus groups and survey pre-testing by residents in an aged care facility and individuals aged 65 years and over living independently. In total, 70 participants contributed to the construction and modification of the instrument. Southern Cross University Human Research Ethics Committee approved the project. A copy of the survey is available upon request.

Definition of supplement user

In this study a supplement user was defined as someone who ticked 'yes' to the following question. "Do you take any of the following types of supplements; vitamins, minerals, herbal preparations or other health products?" Examples of each type of supplement were included in the questionnaire. 'Other health products' referred to such preparations as garlic tablets, fish oils, evening primrose oil, phytoestrogen formulas etc.

Data analysis

The Statistical Package for the Social Sciences for Windows (SPSS Inc, Chicago, version 10.0, 1999) was used to conduct the data analysis. Chi-square tests were conducted to determine the relationships between the supplement use and primary health variables. Two-way analysis of variance was used to examine the impact of gender and supplement use on the total number of conditions reported, symptoms experienced and medication used. Breslow Day Homogeneity of Odds Ratios for gender and Mantel-Haenszel Common Odds Ratio were used to estimate the probability of supplement use according to conditions, symptoms and medication used after controlling for gender. For all statistical tests, a significance level of P <0.05 was used.

Results

General features

The demographic profile of the sample – age, gender, living arrangements, education, present income and ethnicity (as determined by place of birth) – has been reported elsewhere.[31] Gender divided the sample into almost two equal groups i.e. 51% males (N=641) and 49% females (N=622). Respondents were aged between 65 and 98 years. For males, ages ranged from 65-98 years with a mean age of 73 years (SD 6.21). For females, ages ranged from 65-95 years with a mean age of 74 years (SD 6.76). The majority of males (64%) and females (63%) were aged between 65-74 years. Twenty-nine percent of males and 27% of females were aged between 75-84, 7% of males and 10% of females were aged between 85 and over.

Health features: according to gender and supplement use

Supplement use was unrelated to the number of visits to medical doctors (GP's and specialists) in the six months prior to survey for males (χ^2 (df:3) = 0.208, P = 0.996) and females (χ^2 (df:3) = 0.957, P = 0.812); the number of days ill enough to restrict activity in the six months prior to survey for males (χ^2 (df:3) = 5.272, P = 0.153) and females (χ^2 (df:3) = 3.863, P = 0.277) and self-rated health status for males (χ^2 (df:2) = 2.299, P = 0.317) and females (χ^2 (df:2) = 0.379, P = 0.827). Table 1 shows the relationship between gender, supplement use and these health variables.

Table 1. Health features of the sample, gender and supplement use

Variable	Total				Any Supplement		No Supplement	
			M	F	M	F	M	F
	N	%	*N* =641 %	*N* =622 %	*N* =221 %	*N* =324 %	*N* =417 %	*N* =297 %
Visits to doctor (during the past 6 months)								
No visits	124	10	12	8	10	9	11	7
1-4 visits	730	58	53	59	58	58	57	60
5-9 visits	292	23	25	22	22	22	24	22
10+ visits	115	9	10	11	10	11	8	11
P value			0.121					
Days ill enough to restrict activity (during the past 6 months)								
No days	991	78	79	79	80	76	77	81
1-9 days	200	16	16	15	17	16	16	14
10-49 days ill	58	5	4	5	3	6	5	5
50+ days ill	13	1	1	1	0	2	2	1
P value			0.613					
Health status								
Fair to poor	286	23	24	22	25	22	23	22
Good	487	39	38	40	34	39	40	41
Very good to excellent	474	38	38	38	41	39	37	37
P value			0.807					

* *P* value significant at *P*=<0.05, ** *P* value significant at *P*=<0.005

Table 2. Types of supplements utilised by survey sample

Supplement		
	N	% of supplement users *N*=548
Vitamin C + bioflavonoid	141	26
Multivitamin/mineral	97	17
Fish oil	95	17
Vitamin E	89	16
Calcium (+/- vitamin D)	73	13
Garlic (capsules or oil)	60	11
Vitamin B (single or mixed)	53	9
Single vitamin or single mineral*	43	7
Zinc	34	6
Gingko biloba	28	5

* = other than those listed

Use of health and dietary supplements

Forty-three percent of the sample (*N* =548, 224 males and 324 females) reported using at least one dietary or health supplement at the time of survey. More than half (52%, *N* = 324) of all females reported the use of at least one health or dietary supplement compared to just over one-third (35%, *N* = 224) of men. For all types of supplements, females were heavier users than males.

The usage of health and dietary supplements by this sample is shown in Table 2. The supplements used most often were vitamin C and bioflavonoids (26%), multivitamin/mineral preparations (17%), fish oils (17%), vitamin E (16%), calcium (+/- vitamin D) (13%), garlic capsules or oil (11%), vitamin B (single or mixed) (9%), single vitamin or single mineral – other than those listed (7%), zinc (6%) and *Gingko biloba* (5%). Not shown on this table are those preparations taken by fewer than 5% of the subjects.

ANOVA results - total numbers of health conditions, symptoms experienced and medication used

Square root transformations of a) total number of health conditions reported, b) total number of symptoms experienced and c) total amount of medication used was undertaken to improve the normality requirements for two-way ANOVA. Two-way ANOVA were conducted to explore the impact of gender and supplement utilisation on the transformed total number of health conditions, total number of symptoms experienced and total amount of medication used.

For the total number of health conditions supplement use was not significant (*P* = 0.454) and gender was close to significant (*P* = 0.089) with the mean number of total health conditions for females (mean 2.21) greater than males (mean 2.00). For the total number of symptoms there was no significant gender effect (*P* = 0.116) but a significant supplement utilisation effect (*P* = 0.000) with mean number of symptoms for supplement users (mean 6.19) significantly higher than for non-supplement users (mean 5.22). For purposes of data analysis the frequency of medication use was dichotomised (no or yes which included daily, regularly and occasionally). For total number of medications used both factors supplement use and gender were statistically significant, *P* = 0.021 and *P* = 0.001 respectively. The total number of medications used by supplement users (mean 7.03) was significantly higher compared to non-supplement users (mean 6.19). Overall, females (mean 7.25) were higher users of medication than males (mean 5.98).

Odds ratios results - health conditions, symptoms and medication used

Mantel-Haenszel Odds Ratio was conducted to provide estimates of the probability of using supplements according to the type of health conditions reported, symptoms

Table 3. Odds of taking a supplement according to health conditions, symptoms experienced and medication used

			Common Odds Ratio	Confidence Intervals	*P*
	% who take supplements	% who take supplements			
Health conditions	Yes	No			
Arthritis	50	38	1.48	1.18-1.87	0.000**
Hypertension	40	46	0.77	0.61-0.96	0.024*
Osteoporosis	64	41	2.16	1.47-3.17	0.000**
Symptoms experienced	Yes	No			
Anxiety	51	40	1.44	1.12-1.84	0.004**
Constipation/diarrhoea	50	41	1.44	1.11-1.85	0.006*
Fatigue	49	39	1.43	1.14-1.80	0.002**
Lack of motivation	48	42	1.32	1.02-1.69	0.031*
Sore throat	54	41	1.73	1.25-2.40	0.001**
Trouble with neck, back or spine	49	38	1.58	1.26-1.98	0.000**
Urinary problems	49	41	1.42	1.09-1.85	0.009*
Medication used	Yes	No			
Allergy or hay fever	57	41	1.86	1.11-2.60	0.000**
Antacids	50	42	1.46	1.11-1.95	0.009*
Antibiotics	53	40	1.66	1.28-2.17	0.000**
Blood pressure tablets	41	45	0.78	0.62-0.98	0.034*
Cold and flu tablets	51	42	1.47	1.05-2.08	0.027*
Cough medication	52	42	1.52	1.08-2.13	0.016*
Eye drops or eye preparations	50	41	1.39	1.08-1.80	0.011*
Haemorrhoids or piles ointments	54	42	1.61	1.08-2.39	0.019*
Heart tablets	37	45	0.74	0.55-1.00	0.050*
Pain relievers	48	40	1.34	1.07-1.69	0.012*
Rheumatism/arthritis preparations	50	41	1.44	1.12-1.86	0.005*

**P* value significant at *P*=<0.05; ** p value significant at *P*=<0.005
All odds ratios for supplement use by health conditions, symptoms experienced and medication used were homogenous over gender.

symptoms experienced and use of medication after controlling for gender. The odds of taking a supplement were significantly higher for those with arthritis (OR 1.48, CI 1.18-1.87) and osteoporosis (OR 2.16, CI 1.47-3.17). The odds of taking a supplement were significantly lower for those with hypertension (OR 0.77, CI 0.61-0.96). The odds of taking a supplement were significantly higher for those experiencing anxiety (OR 1.22, CI 0.97-1.53), constipation/diarrhoea (OR 1.44, CI 1.11-1.85), fatigue (OR 1.43, CI 1.14-1.80), lack of motivation (OR 1.32, CI 1.02-1.69), sore throat (OR 1.73, CI 1.25-2.40), trouble with the back, neck or spine (OR 1.58, CI 1.26-1.98), urinary problems (OR 1.42, CI 1.09-1.85).

The odds of taking a supplement were significantly higher for those using allergy or hay fever medication (OR 1.86, CI 1.33-2.60), antacids (OR 1.46, CI 1.11-1.95), antibiotics (OR 1.66, CI 1.28-2.17), cold and flu tablets (OR 1.47, CI 1.05-2.08), cough medicines (OR 1.52, CI 1.08-2.13), eye drops or eye preparations (OR 1.39, CI 1.08-1.80), ointments or suppositories for haemorrhoids (OR 1.61, CI 1.08-2.39), pain relievers (OR 1.34, CI 1.07-1.69) and rheumatism/arthritis preparations (OR 1.44, CI 1.12-1.86). The odds of taking a supplement were significantly lower for those individuals taking blood pressure medication (OR 0.78, CI 0.62-0.98) or heart tablets (OR 0.72, CI 0.53-0.95). Table 3 details the odds of taking a supplement according to health conditions, symptoms experienced and medication used (only significant findings reported).

Discussion

Using a self-administered mail questionnaire data was obtained from 1,263 Australians aged 65 years and over proportionally selected (across all States and Territories) from the 2000 Australian Electoral Commission roll. This study has two unique features. Firstly, it is one of the largest surveys ever conducted in Australia aimed at examining the supplement practices of predominantly independently-living older individuals. Secondly, this study represents the most recent attempt in Australia to comprehensively profile the health differences between older supplement users and older non-supplement users.

Supplement use was reported by 43% of the sample. This is consistent with international prevalence studies which show that supplement use in the range of 33% - 46% is typical among individuals of this age group.[1, 6, 8, 9, 11, 16, 19-22] Results from our study conflict with an earlier finding,[30] which reported that supplement users and non-users did not suffer from different medical conditions. Overall, 42% (n=534) and 11% (n=135) respectively, of our sample suffered from arthritis and osteoporosis. Individuals with these conditions were significantly more likely to use dietary supplements, than those without these conditions. However the types of supplements used by these individuals does not accord with current evidence. For example, recent studies have confirmed that glucosamine sulphate is effective in relieving joint pain and may retard the progression of arthritis.[32-35] Interestingly, half of those who experienced arthritis reported the use of

supplements, yet less than 5% specifically used glucosamine preparations. In regard to osteoporosis, a similar observation was noted. Whereas almost two-thirds (64%) of those with osteoporosis used supplements, fewer than 15% specifically used calcium (with or without vitamin D) preparations.

Houston *et al*.,[21] and Yu *et al*.,[12] revealed that persons with hypertension were less likely to take supplements than those without hypertension. This is consistent with the results of our study which also found that conditions such as heart disease, stroke, diabetes, and cancer appear to act as impediments to supplement use. A number of factors might explain this finding. For example, individuals with these conditions may consider supplements ineffective to mitigate against these potentially life-threatening illnesses. They might be concerned about the cost, inconvenience and safety of taking dietary supplements concurrently with prescription medication.

Although supplement users experienced more symptoms (such as anxiety, constipation or diarrhoea, fatigue, lack of motivation, sore throats, trouble with their back, neck or spine and urinary problems), than non-supplement users, there was no significant difference in the way they perceived their health – 77% of both supplement users and non users considered their health as good to excellent. The total number of symptoms experienced was unrelated to gender.

Physicians are often cited as the most influential source of information used by the elderly in making their decision to use nutritional supplements[22,36,37] yet there was no difference in the number of visits to doctors or medical specialists between supplement users and non-users.

Two other studies have measured the relationship between supplement and medication use and both found that there was no significant difference in the total number of medicines used by supplement users compared to non-supplement users.[24,38] Neither study however examined whether the types of medicines taken varied between supplement users and non-supplement users. In our study, higher levels of medication use were recorded for supplement users compared to non-supplement users, and females compared to males. Overall, women reported a significantly higher usage of prescription and over-the-counter medication, including health and dietary supplements (52%). Supplement users were more likely to report the use of antacids, antibiotics, cold and flu tablets, cough medicines, eye preparations, ointments for haemorrhoids, pain relievers, medication for rheumatism/ arthritis and sleeping tablets compared to non-supplement users. In contrast, there was a reduced likelihood of taking a supplement for those with hypertension and by those using blood pressure medication and heart tablets. Because elderly people are at increased risk of adverse drug reactions[38] it is important that studies designed to measure the use of dietary supplements in the elderly also obtain information about the use of prescription and over-the-counter medication.

There is consensus within the international literature, that among older individuals poor dietary intake coupled with physiological changes associated with ageing, leads to inadequate levels of several nutrients including protein, calcium, zinc and B-group vitamins (including vitamin B12, B6 and folate) and vitamin D.[39-47] Current patterns of supplement usage reveal that although older individuals consume a range of products, they favour preparations that are of limited value in addressing these known nutrient inadequacies. Our study, and many others,[6,11,12,16,17,19-24,28,30,38,48,49] have shown that among older individuals, the most popular supplements are preparations which contain vitamin C, multivitamin/ minerals, fish oils, vitamin E, calcium, B group vitamins, zinc and iron. Older individuals frequently cite 'the desire for more energy' and 'the prevention of coughs and colds' as reasons for using supplements containing vitamins B12, C, D and E.[17,22,23,48] In the absence of deficiencies, the impact on energy and immunity of supplemental amounts of these nutrients is probably of little benefit. Older supplement users may have unrealistic expectations of what can be achieved by taking additional amounts of certain nutrients.

The popularity of some particular nutrients raises concern about the safety of their use by older individuals. Single nutrient preparations, such as vitamin C and vitamin E, often contain the highest multiples of the recommended dietary intake, compared to multi nutrient preparations. Therefore users of single nutrient supplements are at greatest risk of developing potentially adverse effects of taking excess doses of nutrients. Care needs to be taken since vitamin C supplements may interfere with diagnostic tests such as occult blood stool tests and urine glucose tests. Examination of the faeces for occult blood is used to screen for gastrointestinal pathology, including neoplasms. The presence of vitamin C in the faeces can inhibit occult blood tests, producing false negative results, which mask the true prevalence of blood in the stool.[50] At supplementation above 400 IU/day, vitamin E may decrease platelet adhesion and increase clotting time. Individuals consuming vitamin E whilst on anticoagulants are well advised to have periodic monitoring of their clotting times.[51]

Numerous investigations have evaluated the relationship between dental status,[26] marital status,[2,24,26,30,37] alcohol intake,[8,16,27] dietary adequacy,[30,54,53] seasonal variation,[27] membership to health insurance[18] and supplement utilisation among predominantly older individuals. These variables were unaccounted for in this study, limiting the extent to which our findings can be compared to the existing literature and the general population of older supplement users.

In conclusion, these results extend the current understanding of the contrast between supplement users and non-supplement users. We have been able to show distinct differences in the health profile of older supplement users compared to non-supplement users. Possibly supplement users view these products as a means to minimise their suffering, arrest deterioration and prolong functional independence. If so, older supplement users may need assistance to make informed, appropriate choices. Future research efforts need to establish the motives that maintain the widespread use of supplements by the elderly population; identify the sources of information, which guide the choices made by older supplement users and measure the contribution dietary supplements make to the nutritional status of older

individuals. Until such data is available, the potential for benefit or harm associated with supplement use by older individuals cannot be established.

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