

Prevalent dietary supplement use in older New Zealand men

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Abstract

Aims Because of a lack of recent data from New Zealand older men, we examined dietary supplement use in this demographic.

Methods We surveyed men aged >40 years who were participating in a trial of calcium supplementation on bone and cardiovascular outcomes.

Results Forty-seven percent reported using at least one supplement and 30% of users took more than two different supplements. Amongst users, median monthly expenditure on these products was NZ\$20 (interquartile range: \$10–\$45). The most common supplements used were vitamins or minerals (49%), followed by nutritional oils (22%) (including fish oils, 13%) and glucosamine/chondroitin preparations (13%). Supplements were mainly taken for reasons of non-specific prophylaxis or health maintenance (58% of reasons), although 21% of reasons cited treatment or symptom alleviation for a medical condition. Daily requirements for vitamins A, D and E were exceeded, from supplement intake alone, by 12%, 10% and 40% of supplement users respectively.

Conclusions Many older New Zealand men spend substantial amounts of money on dietary supplements despite uncertain health benefits. Health professionals should remain alert to supplement use by their patients, including males.

Dietary supplements include a vast quantity and variety of over-the-counter pills, liquids or powders containing vitamins and minerals, herbal and other botanical products, amino acids, a range of other enzymatic or potentially nutritive substances, and mixtures of these.

Around the turn of the millennium, New Zealand surveys reported a prevalence of regular dietary supplement use of 18–28%,^{1–3} although use by both young and older males was 62–65% that of females.^{1,3} Longitudinal United States data supports an increasing use of dietary supplements by older people in the late 1990s,⁴ and it is possible that there has been a similar rise in use in New Zealand in recent years.

Whilst many supplements are claimed to improve health or nutrition, there is often a lack of published evidence to support these benefits⁵. For those taking supplements, intakes of some nutrients may exceed recommended upper intake levels,^{6,7} a daily intake level judged safe for almost all individuals.⁸ Furthermore, potentially harmful interactions may arise from concurrent use of herbal preparations and prescription medications,^{4,5} or toxicity from contaminants in supplements, including those derived from fish oils and other marine products.^{9–11}

In a recent trial of calcium supplements conducted in middle-aged and older men living in Auckland,¹² we were surprised by the number of men who reported dietary

supplement use in a baseline questionnaire of medication use. Therefore, we asked participants to complete a more detailed questionnaire at a later visit.

We sought to determine the number of different supplements used, the number of doses taken each day and the estimated expenditure on these products. Dietary intakes of vitamins A, D, and E from supplements were calculated and compared with daily intake recommendations. We also investigated the importance of various information sources and the reason for using each product.

Methods

Participants—323 men took part in a two-year randomised controlled trial of calcium supplements investigating skeletal and cardiovascular endpoints, the methods and results for which have been previously detailed.^{12, 13} Men were aged >40 years, were free of major medical conditions, had 25-hydroxyvitamin D >25 nmol/L, and were not taking therapy for hyperlipidaemia, osteoporosis, or vitamin D supplements at a dose of >1000 IU/day.

Baseline measurements—Smoking history and a record of physical activity were obtained at a screening visit prior to baseline, and measurements of height and weight were obtained at baseline.

Supplement questionnaire and analysis—Men were asked to complete a questionnaire describing their use of supplements, vitamins or similar, their reasons for taking each supplement and the importance of 11 listed and other participant-specified sources of information in their decision to take them. Importance was rated on a 5-point scale with 0 indicating that the source was of no importance in their decision and 4 indicating that it was very important. This questionnaire was completed between April 2006 and July 2007 when participants were in the second year of the study.

Baseline differences between supplement users and non-users were compared using t-tests. The number of different supplements listed and the number of daily doses taken by each man was quantified. A single dose was defined as one tablet, or the recommended dose for liquid preparations. Men were asked to estimate the monthly cost of each supplement.

Monthly cost data were incomplete for 21 men and, in these cases, were estimated from the cost of purchasing the same or similar products from online pharmacies on the Internet. To ascertain whether there were differences in supplement use between older and younger men, those above and below 60 years were compared using Mann-Whitney tests.

Intakes of vitamins A, D and E from supplements were computed using information provided by manufacturers. Vitamin A was expressed as retinol activity equivalents (RAE), which equates to the amount of precursor or preformed vitamin A that must be consumed to equal 1 mcg of retinol, calculated using the formula $RAE = mcg \text{ retinol} + 0.083 mcg \text{ beta-carotene}$.⁸

Statistical analyses were performed using SPSS version 15.0 software (SPSS Inc. Chicago, IL, USA).

Results

Participants and supplement use—305 men returned the supplement questionnaire. There were no significant differences in the general characteristics of the 142 men (47%) who reported taking supplements compared to those who did not (Table 1). Supplement users took a median of 2 different dietary supplements (Figure 1a) or 2 doses/day (range: 2 doses/week—10 doses/day). 16 (11%) men reported taking supplements prescribed by their doctor and 4 (3%) took only supplements prescribed by their doctor.

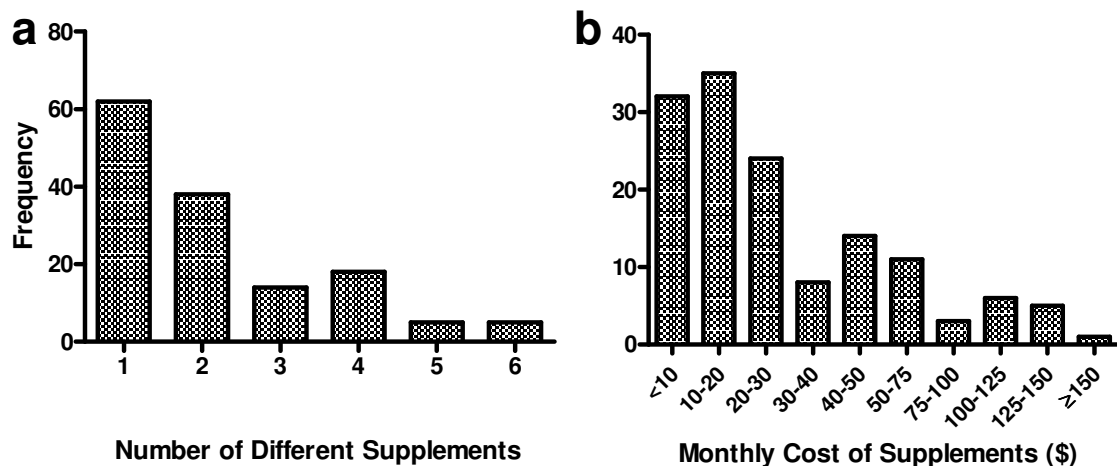
The median monthly estimated cost reported by participants who took supplements was NZ\$20 (interquartile range: \$10—\$45; maximum \$268). A fifth spent more than \$50/month on supplements (Figure 1b). There was no difference between younger and older men in the number of different supplements, the total daily dose and the total monthly cost.

Table 1. General characteristics of respondents at baseline (n=305)

| Variables | Supplement users* (n=142) | Non-users (n=163) |
|--------------------------------------|------------------------------|----------------------|
| Age (years) | 57.1±10.5 | 56.2±9.8 |
| Weight (kg) | 82±11 | 84±13 |
| Body Mass Index (kg/m ²) | 26±3 | 27±3 |
| Physical Activity (MET.h/day) | 32±5 | 32±6 |
| Smoking status (%) | | |
| Current | 4 | 3 |
| Previous | 46 | 39 |

Data are mean±SD; * Positive response to questions asking whether men were currently taking prescription or non-prescription supplements, vitamins or similar.

Figure 1a and 1b. The number of different dietary supplements and monthly expenditure on dietary supplements for supplement users (n=142)



Sources of information—The information sources reported to be of greatest importance in decision making were scientific or medical publications, their own doctor, and health professionals other than their doctor, which all scored an average of 2.0-2.3 out of 4 on the level of importance. Magazines, news articles and people other than health professionals were also rated as moderately important (average score between 1.7 and 1.8). Older men (≥ 60 years) compared to those below this age attributed lesser importance to news articles ($P=0.02$), the Internet ($P=0.01$), health professionals other than their own doctor ($P=0.006$), and gyms, fitness centres or health clubs ($P=0.006$), and a greater importance to people other than health professionals ($P=0.02$).

Types of supplements and reasons for use—A total of 307 different products were taken. 49% were vitamins or minerals, either a single nutrient or combined multivitamin/multimineral preparation with or without other herbal ingredients.

Nutritional oils such as evening primrose or fish oils (22%, with 13% specifically branded as fish oil derivatives), preparations of glucosamine, chondroitin and/or methylsulfonylmethane (13%), and individual herbal products (8%) were also commonly taken.

Other products included bee pollen (3%), dietary fibre (1%) and co-enzyme Q10 (1%). One man reported taking a multivitamin/multimineral supplement formulated for horses. The most common reason provided for taking supplements was for non-specific health maintenance or prophylaxis (58%). Twenty-one percent cited treatment or relief of symptoms as the primary reason for use, 16% nutritional benefits, and 2% athletic performance.

Vitamin intake from supplements (Table 2)—Seventeen men (12% of supplement users) had a total intake of vitamin A from supplements alone in excess of the US recommended daily allowance (RDA). Because high intakes of beta-carotene are not toxic, the upper daily intake limit deemed tolerable (Upper Limit) for vitamin A (3000 mcg) applies to intake of preformed retinol only. The supplemental retinol intakes for two men were high enough that they would be very likely to exceed this amount if additional retinol intakes from food were taken into account. One individual combined two halibut liver oil tablets (total 3000 mcg), and the other took a total of 2940 mcg from supplements manufactured by a US company that are distributed in New Zealand through personal contacts.

For vitamin D, 14 men (10% of supplement users) exceeded a daily intake of 400 IU vitamin D from supplements alone, although only one exceeded the Upper Limit of 2000 IU/day (2400 IU/day).

Fifty-seven men (40% of supplement users) exceeded the US RDA for vitamin E from supplements alone, but none approached or exceeded the Upper Limit.

Table 2. Daily vitamin intakes from dietary supplement in men taking supplements containing these

| Variables | n | Mean±SD | Median | 75th Percentile | Maximum | US RDA* or AI | US UL* |
|-------------------------------|----|---------|--------|-----------------|---------|---------------|----------|
| Vitamin A (RAE [#]) | 80 | 504±645 | 275 | 750 | 3000 | 900 | none set |
| Retinol (mcg) | 68 | 476±197 | 197 | 750 | 3000 | none set | 3000 |
| Vitamin D (IU) | 85 | 226±363 | 100 | 400 | 2400 | 200-400 | 2000 |
| Vitamin E (mg) | 67 | 82±138 | 42 | 100 | 826 | 15 | 1000 |

* The US recommended daily allowance (RDA) is defined as the level of an intake sufficient to meet the nutrient need of almost all healthy men in this age group. Insufficient data is judged to exist to set this level for vitamin D. Instead, an adequate intake (AI), defined as the approximate average nutrient intake that appears to sustain a desired indicator of health, has been set. The tolerable upper intake level (UL) is defined as the maximum daily intake by an individual that is unlikely to pose risks of adverse health effects to almost all men in this age group.⁸

[#] Retinol activity equivalent (RAE) is the amount of precursor or preformed vitamin A that must be consumed to equal 1 mcg of retinol.⁸

Discussion

Almost half of men in our study reported taking dietary supplements, supporting previous surveys suggesting that many older New Zealand men take dietary supplements.^{2,3} This proportion is substantially higher than that of men >45 years reporting either regular or occasional use in New Zealand in the late 1990's (around 30%),³ and higher than the prevalence reported in young New Zealand men (13%).¹ This may reflect increasing use amongst men, or may reflect the study population of healthy middle-aged and older men who volunteered for a clinical trial of a calcium supplement.

Men here had a low body mass index and low prevalence of smoking, both of which have been associated with increased supplement use⁷. The present study also suggests that many men spend substantial sums of money on these products. A fifth of men spent an estimated NZ\$50/month or more on these products, and the true value may be higher since some estimates were based on the prices from online pharmacies which may be less expensive than other sources.

Although individual income data were not available, this figure represents approximately 2% of the average monthly income in New Zealand [Statistics New Zealand <http://wdmzpub01.stats.govt.nz/wds/ReportFolders/ReportFolders.aspx> (accessed December 8, 2009)]. This amount may have represented a higher percentage of income in this cohort, many of whom were retired.

The most commonly used supplements were multivitamin/multiminerals, followed by nutritional oils, over half of which were fish-derived, and glucosamine/chondroitin preparations.

Data from the 1997 New Zealand National Nutrition Survey show that almost all older men already meet recommended intakes of Vitamin A³. Similarly, when observed supplement intakes in our study were added to age- and gender-specific average vitamin E intakes from the national survey³, all but five of the men taking supplemental vitamin E and 44% of all supplement users exceeded recommended levels of vitamin E.

Recommended levels of intake of vitamins and minerals are based on available evidence. Thus, by definition, there is no demonstrated benefit for healthy individuals taking levels of these nutrients in excess of the RDA. Furthermore, there is minimal evidence for specific benefits of vitamin supplementation in the literature.

Meta-analyses of antioxidant interventions (including vitamins A, C and E but excepting those providing selenium), report a lack of effect on cancer outcomes,^{14, 15} and one large trial reported an increased mortality risk with high dose vitamin A (7500 ug retinol and 30 mg beta-carotene, total 9990 RAE).¹⁶ The effects of glucosamine and/or chondroitin are also equivocal.

Recent systematic reviews of randomised trials report an effect of glucosamine sulphate, but not other salts, on osteoarthritic pain and disease progression, with most of the existing data for knee osteoarthritis.^{17, 18} However, effects are considerably greater for trials that are industrially funded, particularly those of a single manufacturer.¹⁷

Similarly, evidence for the numerous reported benefits of fish oils is conflicting,¹⁹⁻²¹ although there is growing evidence from several randomised controlled trials of a beneficial effect of omega-3 fatty acids, supplied by fish oils, on cardiovascular risk indices.²²⁻²⁴

Previous studies which combine food and dietary supplement consumption have noted nutrient intakes in excess of tolerable upper intake levels for a range of nutrients, including niacin, vitamin C, iron, magnesium and zinc.^{6,7}

Upper intake levels are conservative estimates of a sustained level of intake that can probably be tolerated by most individuals and, in the case of both vitamins A and D, have been criticised for being too low.^{25,26} Combined use of multivitamins and fish-liver oil products may result in potentially harmful intakes of pre-formed vitamin A or other fat soluble vitamins.

For a few individuals here, such use was associated with sizeable intakes of vitamins A and D. However, because the 3 men who approached or exceeded tolerable upper intake levels would be unlikely to exceed this level by a very large margin, even if intake from food was taken into account, the present data do not suggest a high likelihood of risk. Similarly, no men in this study approached the UL for vitamin E, and no adverse events have been noted in randomised trials of vitamin E doses around or below this level²⁷.

Men in the present study claimed that information from scientific or medical publications, their own doctor and other health professionals were the most important factors in their decisions about supplement use, though few products were actually prescribed by a physician.

Although the specific role that health professionals had in supplement use decisions is unclear, these findings may be in contrast with past studies which report that individuals are unlikely to seek medical advice or inform their doctors of their use of dietary supplements.^{28,29}

Regulations prevent dietary supplements being marketed as treatment or for alleviation of symptoms of specific medical conditions. It is therefore not surprising that most men noted non-specific prophylactic reasons for taking supplements. Compensating for dietary insufficiencies may be a justifiable reason, although relatively few men cited this.

Over one-fifth of reasons for taking a supplement cited symptom alleviation or treatment for an existing specific medical condition. Given the lack of evidence of a benefit arising from almost any ingredient in these products, it is alarming that so many men in the present study took dietary supplements for this reason.

In summary, many men who volunteered to take part in a clinical trial of calcium supplementation reported spending substantial amounts of money on dietary supplements. This is despite a lack of evidence supporting benefits of their use, and some evidence of associated risk. As a whole, this cohort purported to be most strongly influenced by health professionals and the results of scientific studies with respect to their decision to take supplements. Although these factors may not have ultimately driven men's behaviour, their high ratings suggest an acknowledgement of the authority of these sources of information.

So that sound and convincing advice may be provided, it is important that health professionals maintain up to date knowledge of available dietary supplements, evidence surrounding their use, as well as common claims made by their manufacturers and suppliers.

Competing interests: None.

This study was funded by the Health Research Council of New Zealand.

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