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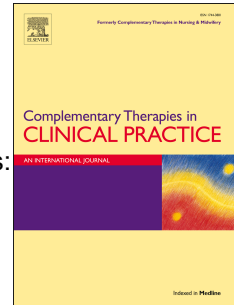
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# Accepted Manuscript

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*Title:* Attitudes, beliefs and behaviours of Australia dietitians regarding dietary supplements:  
a cross-sectional survey

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## Abstract

### *Background*

The aim of this study was to investigate the attitudes, beliefs and behaviors of Australian dietitians regarding dietary supplements.

### *Methods*

An online survey was disseminated through the mailing lists of multiple healthcare organizations. There were 231 Australian dietitians that replied to the online survey.

### *Results*

The results indicate that Australian dietitians are interested in dietary supplements (65%); however, the results also indicate that Australian dietitians are tentative about integrating dietary supplements into their dietetic practice. Concerns regarding potential drug-nutrient/herbal interactions were reported as the primary barrier (67%) to utilizing dietary supplements as part of clinical practice. In addition, there was a strong interest in additional training in dietary supplements (79%).

### *Conclusions*

In summary, Australian dietitians are interested in the use of dietary supplements; however, due to current barriers, few dietitians utilize dietary supplements as part of dietetic practice.

## Introduction

Complementary and Alternative Medicines (CAM) has been defined as “a group of diverse medical and health care systems, practices, and products that are not presently considered to be part of conventional medicine”.<sup>[1]</sup> Dietary supplements can be classified as a type of CAM; however, while the use of certain types of CAM have demonstrated negligible benefits (e.g. homeopathy),<sup>[2]</sup> the use of dietary supplements for an extensive range of specific conditions including, but not limited to, hypertension, antibiotic-associated diarrhea, morning sickness, and in the critically ill have shown promise.<sup>[3-7]</sup> However, while there has been a significant amount of published literature investigating the attitudes and levels of knowledge of healthcare practitioners regarding CAM <sup>[8-12]</sup>, dietary supplements alone have not been well explored.

The use of dietary herbal and vitamin and/mineral supplements to treat or prevent chronic diseases has gained considerable interest both in academic research and amongst the general public. A large proportion of the population regularly use dietary supplements such as multivitamins and fish oil to help manage chronic conditions (e.g. arthritis, osteoporosis and heart health).<sup>[12, 13]</sup> Up to 72% of the general public within Australia consume dietary supplements and similar trends have been reported in other western countries.<sup>[12, 14, 15]</sup> Hence, the rapid uptake of supplements by the public has created the potential for misinformation, underestimation of side-effects, and drug-nutrient/herbal interactions.

There have been numerous reports that have highlighted the potential risks associated with inappropriate use of dietary supplements such as high dose green tea extracts and vitamin formulations.<sup>[16]</sup> In a study of 171 patients who were recently prescribed warfarin, 43% were found to be taking dietary supplements that have previously been reported to interact with anticoagulation therapy.<sup>[17]</sup> Toxicity associated with inappropriate use of dietary

supplements has been documented in numerous case-reports.[16, 18, 19] There is also evidence that the long-term use of antioxidant supplements may increase the risk of cancer in specific populations.[20] These issues are compounded by reports suggesting that a significant percentage of certain patient populations are not discussing use of dietary supplements with their physician.[21]

In Australia, dietitians are in a key position to advise patients and the general public about the evidence and limitations of specific dietary supplements[22]. However, there is currently no published literature that has investigated: the usage of dietary supplements in dietetic practice; barriers and enablers for their use; and the level of research interest, confidence and general knowledge regarding dietary supplement-related issues. Hence, the current study aims to elucidate existing gaps in knowledge and provide information on how dietary supplements are perceived and utilized in current Australian dietetic practice.

## **Methods**

The study sample was limited to Australian dietitians who consult directly with patients and/or clients at the time of their participation in the study. Between August 2014 and March 2016, the survey was advertised online through the mailing lists and forums of the Dietitians Association of Australia, Dietitian Connection, the Multinational Association of Supportive Care and Cancer, and the Cancer Council Queensland. This study was approved by the Bond University Human Research Ethics Committee (RO1852).

The survey format was designed and face validated by three senior dietitians in positions relevant to the study aim. The survey included 27 items to assess participants' attitudes towards specific issues related to dietary supplements (e.g. efficacy, safety, and feasibility/current usage), respondents' perception of professional and public perceptions, barriers and enablers for use, level of individual confidence and knowledge regarding dietary

supplements. A pilot study (n=10) was conducted to detect feasibility issues with the survey. These issues were addressed in a revised version of the survey. Complete as well as partial responses were included in the results

This study used the following definition of a dietary supplement based on the definition provided by USA Federal Drug Administration: a vitamin, mineral, herb or other botanical, amino acid, or combination of those and/or other substances or constituents; intended to be ingested by mouth; and found in forms such as tablets, capsules, softgels, gelcaps, liquids, or powders.[23] The term “nutraceutical” is a related term and has been defined as “any substance that may be considered a food or part of a food and provides medical or health benefits, including the prevention and treatment of disease. Such products may range from isolated nutrients, dietary supplements and diets to genetically engineered "designer" foods, herbal products and processed foods such as cereals, soups and beverages.”[24] As this term includes foods and diets, the term “dietary supplements” was selected for this study instead of nutraceuticals in order to improve the homogeneity of responses.

In order to limit responses to those that address the aims of this study, respondents were asked to disregard the following types of dietary supplements when completing the survey: high energy, high protein oral nutritional supplements used to treat malnutrition or undesired weight loss; and vitamin or mineral supplements used to correct diagnosed deficiencies caused by insufficient dietary intake in order to meet established recommended daily intakes.

## **Results**

### *Demographic*

There were 231 Australian dietitians that replied to the survey. The majority of respondents were aged less than 30 years old (48%) and working within the acute care setting (37%) for between two and five years (29%; Table 1).

*Table 1. Respondent demographics**Interest and perceived importance of dietary supplements*

When asked if they were interested in dietary supplements, the majority (67%) said that they agreed or strongly agreed. When asked if dietary supplements were important to improving health outcomes, 46% agreed or strongly agreed while 36% said they were neutral.

*Perceived efficacy and safety of dietary supplements*

When asked if dietary supplements are safe, 60% stated that they were neutral with 17% and 23% saying they agreed and disagreed, respectively. When asked if they felt that dietary supplements are effective, similar trends were found with 51% stating they were neutral.

*Personal use of dietary supplements*

Respondents predominantly reported that they either never (35%) or occasionally (35%) consumed dietary supplements. A small proportion (4%) of respondents also indicated that they sold dietary supplements as part of their clinical practice.

*Sources and perceived access to information*

Fifty-two percent of respondents stated that they have access to reliable information regarding dietary supplements. When asked about where respondents access information regarding dietary supplements, over half of respondents listed the following sources: evidence-based databases (such as the Practice-based Evidence in Nutrition library; 89%), guidelines published by their professional body (68%), academic journals (62%), and their colleagues (54%). The majority of respondents said that in order for them to utilize a particular dietary supplement as part of their clinical practice, they required at least two to four favorable randomized controlled trials to be published.

*Adequacy of training*



In response to the statement “I was well trained in dietary supplements”, 55% said they either disagreed or strongly disagreed. The majority (87%) of respondents indicated that they were interested in more training regarding dietary supplements and that universities should offer more training in this area (88%).

In response to the statement “I am knowledgeable about dietary supplements”, 60% said they either agreed or strongly agreed. Approximately half (52%) of respondents felt that they were confident in answering questions about supplements. Respondents cited a wide variety of areas in which they would like to improve their knowledge. These included drug-nutrient/herbal interactions and adverse effects of dietary supplements (78%), reliable sources of information regarding dietary supplements (74%), and the usage of dietary supplements for specific diseases or goals (69%).

#### *Perceived barriers for use*

Respondents listed a wide selection of barriers to recommending supplements (Table 2). Concerns regarding potential interactions with other treatments (65%) was the most commonly indicated barrier for use.

#### *Perceived public and organizational opinions*

The majority of respondents believed that their viewpoints regarding dietary supplements would be similar to the viewpoints of their professional governing body (77%), and doctors (51%). The groups they believed were least likely to agree with their position were naturopaths (71%), followed by pharmacists (35%) and the general public (32%).

Respondents believed that the general public should primarily source dietary supplement-related information from dietitians (95%), doctors (73%), and pharmacists (75%). When respondents were asked who they believed the general public currently considers their primary source for information regarding dietary supplements, the most common responses

were naturopaths (83%), the internet (72%), pharmacists (68%), and friends and family (66%).

## Discussion

This study is the first to explore the attitudes, beliefs and behaviors of Australian dietitians in regards to how dietary supplements are perceived and utilized. The results demonstrate that dietitians are interested in dietary supplements; however, due to the large number of barriers, they are tentative about integrating dietary supplements into their clinical practice.

In terms of personal usage and interest in dietary supplements, our study reported that 65% of respondents personally used dietary supplements at least occasionally. This is similar to previous studies that have reported 51-84% of dietitians and Australian health professionals reporting personal use of dietary supplements.[25-28] Despite the high level of personal use, only 4% of respondents sold dietary supplements as part of clinical practice and 27% stated that they regularly recommended dietary supplements to patients.

Concerns regarding potential interactions with other treatments was reported as the number one barrier (66%) to utilizing dietary supplements as part of clinical practice. From a perusal of the evidence-base for various supplements, it is understandable how this may pose a significant concern. Many dietary supplements have potential safety concerns that have been identified through *in vitro* or animal studies but few have adequate clinical data that has explored the real-world impact of these concerns. A pertinent example of this is the data regarding the potential anticoagulant effect of ginger consumption. *In vitro* data has consistently shown this to be a possible effect but clinical data has been inconsistent and has suffered from numerous limitations.[29] An additional limitation in the current literature is that the majority of studies on dietary supplements have been focused on the efficacy of the intervention while safety data has not been as thoroughly investigated. Furthermore, a

possibly related finding was that 73% of respondents stated they would like to learn more about reliable sources of information regarding dietary supplements. Previous surveys have found other healthcare professionals to be unable to find useful resources for dietary supplements.[30, 31] For example, a survey of military physicians found similar results with 65% stating that they did not feel they had reliable sources of information in this area.[31] Similarly, low levels of dietary supplement-related knowledge have been reported in surveys of other Australian healthcare professionals, particularly in regards to adverse effects and contraindications.[28, 30, 32, 33] There are a number of evidence-based databases that are aimed at informing clinicians about the effects of dietary supplements, promotion of these resources would provide an easily-accessible source of information that would aid in addressing this barrier.

Due to the potential concerns regarding the safety and contraindications that come with dietary supplement use, there is a need to ensure that the public is able and willing to access reliable information on this topic. Respondents believe that the general public do not prioritize dietitians as their primary source of information regarding dietary supplements. Surveys that have specifically surveyed the general public's primary sources of dietary supplement-related information have reported healthcare professionals to be one of the common sources of information.[34, 35] However, large use of other potentially less reliable sources such as the internet and magazines have also been reported.[34] Previous studies that have investigated the potential reasons for the public seeking other sources for dietary supplement-related information have found that patients generally feel that their physicians are unsupportive of dietary supplement use or that a conversation about dietary supplements does not occur during consultation.[36]

Our survey found that only half (52%) of respondents considered themselves to be confident in this area, a figure that has been reported in similar surveys.[26, 31, 37, 38] For example, a

previous survey of healthcare professionals also found that respondents were moderately confident in answering a set of questions regarding dietary supplements.[37] This level of confidence might be related to the large proportion of respondents that indicated that more tertiary training is required (88%) and the high level of interest in further education (87%). This is supported by previous studies which reported similarly high levels of interest in further training.[26, 39, 40] For example, in a study of 162 American dietitians, Lee et al.[26] reported that 75% of respondents were interested in further training. The introduction of evidence-based training to university curriculum would provide a reputable and widely-accessible avenue for reliable information regarding dietary supplements and would inform healthcare professionals regarding effective and responsible use of dietary supplements. The results of this survey suggest that future interventions are required in order to evaluate the adequacy of current training regarding dietary supplements and investigate ways of improving education that is targeted towards dietitians. In addition, future studies should explore the reasons that individuals access particular information sources over healthcare professionals so that approaches can be designed to address this.

## **Conclusion**

In summary, dietitians are needed to effectively manage the widespread use of supplements by the general public. This survey study investigated the attitudes, beliefs, and behaviors of Australian dietitians and identified multiple barriers, implications for practice, and areas of future research. Primarily, future studies should evaluate current training approaches and investigate ways of improving training and education that is targeted towards healthcare professionals. In addition, strategies to improve the confidence of dietitians regarding this area should be investigated.

## **Declarations**

**List of abbreviations**

None

**Ethics approval and consent to participate**

This study was approved by the Bond University Human Research Ethics Committee (RO1852). All participants consented before starting the survey.

**Consent for publication**

There is no data included in this study from individual participants. All responses are pooled averages with no identifying characteristics.

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**Authors' contributions**

WM lead the development and dissemination of the study and manuscript. NK and DM provided expertise on the development of the study and interpretation of the data. LI provided expertise on all stages of study and manuscript development. All authors were involved in the dissemination of the survey study.

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None

**Competing interests**

No authors have competing interests to declare

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*Table 1 Respondent demographics*

	Total
Responses (n)	231
Age	
<30	110(48)
31-40	59(26)
41-50	32(14)
51-60	24(10)
>61	5(2)
Years worked in current profession	
0-2	36(16)
2-5	68(29)
5-10	52(22)
10-15	28(12)
15-25	25(11)
>25	22(10)
Highest level of education	
Diploma	5(2)
Bachelor	105(45)
Master's Degree	112(48)
PhD	9(5)
Area of practice	
Acute care	83(37)
Community	65(29)
Private Practice	25(25)
Industry	3(1)
Other	19(8)

All values presented as n (column%)

Table 2 Respondent attitudes, behaviors and use regarding dietary supplements

	Agree or Strongly Agree	Neutral	Disagree or Strongly Disagree
I am knowledgeable about dietary supplements.	60(127)	26(54)	14(30)
I am interested in dietary supplements.	68(143)	24(50)	8(18)
People in your profession are knowledgeable about dietary supplements	51(107)	32(69)	17(35)
I was well trained in dietary supplements.	17(35)	28(60)	55(116)
This area is important to improving health outcomes.	46(97)	36(76)	18(38)
Dietary supplements are effective.	38(80)	51(107)	11(24)
My profession should be knowledgeable about dietary supplements.	97(204)	2(6)	1(1)
My profession should be considered an authority on dietary supplements.	81(171)	14(29)	5(11)
There is a high demand for dietary supplements.	77(162)	17(37)	6(12)
I am often asked about dietary supplements by patients or clients.	82(174)	9(19)	9(18)
I feel confident in answering questions regarding dietary supplements.	52(110)	28(58)	20(43)
I am interested in further training on dietary supplements.	87(183)	8(17)	5(11)
Dietary supplements are safe.	17(37)	60(126)	23(48)
My profession should play a greater role in the prescription of dietary supplements.	69(145)	19(41)	12(25)
My profession should play a greater role in the education regarding the use of dietary supplements.	92(193)	5(11)	3(7)
My profession should play a greater role in research regarding the use of dietary supplements.	91(192)	8(16)	1(3)
I think universities should offer more training in these areas as part of their curriculum.	88(185)	9(20)	3(6)
I am able to access trustworthy information regarding dietary supplements.	52(109)	29(62)	19(40)
I regularly recommend dietary supplements to clients/patients.	28(58)	24(51)	48(102)

All values presented as row%(n)

*Table 3 Perceived Barriers for use of dietary supplements by respondents*

	%(n)
Concerns regarding potential interactions with other treatments	66(126)
A lack of training in this area	60(115)
Concerns about the regulation of dietary supplements	53(102)
A lack of confidence in this area	48(93)
Perceived lack of efficacy of dietary supplements	48(93)
Concerns regarding potential negative effects of dietary supplements	44(84)
Concerns regarding financial burden on patient	37(72)
Lack of authority to recommend dietary supplements to patients/clients	33(65)
Perceived Lack of quality dietary supplements on the market	20(39)
It may conflict with the advice of other members from the patient's/client's medical team	19(37)
A lack of interest in this area	3(6)

- Only 52% of respondents indicated that they were confident in this area
- Australian dietitians are highly interested in further training in this area
- Concerns regarding drug-nutrient/herbal interactions was the primary barrier for use

ACCEPTED MANUSCRIPT