

NUTRITION KNOWLEDGE, HEALTH BELIEFS AND USE OF
NUTRITION SUPPLEMENTS AMONG
OLDER ADULTS IN NORTHWESTERN WISCONSIN

By

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A Research Paper
Submitted in Partial Fulfillment of the
Requirements for the
Master of Science Degree
With a Major in

Food and Nutritional Science

Approved: 2 Semester Credits

Thesis Advisor

The Graduate College
University of Wisconsin-Stout

August 2000

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ABSTRACT

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**Nutrition Knowledge, Health Beliefs and Use of Nutrition Supplements
(Title)**

Among Older Adults in Northwestern Wisconsin

Food and Nutritional Science Dr. Karen Zimmerman August, 2000 74
(Graduate Major) (Research Advisor) (Month/Year) (Pgs.)

**American Psychological Association (APA) Publication Manual
(Style Manual)**

The research instrument was designed to answer the following questions:

1. Does nutrition knowledge have an effect on the use of vitamin and mineral supplements in older adults?
2. Do health beliefs affect the usage of vitamin and mineral supplements of the seniors?

The survey was developed by researcher and was divided into three sections. Section I asked elderly persons to record demographic information and nutritional supplement use. Section II included 13 true/false questions and 7 multiple choice items to identify elderly persons' nutrition knowledge. Section III included 9 attitude statements regarding nutrition supplements.

The sample for this study were 82 elderly persons who participated in Title III Nutrition Program of the Elderly in Eau Claire County and Trempealeau County, Wisconsin. There were 25 males and 57 females. Fifty-three subjects (64.6%) reported they consumed some type of vitamin or mineral supplements: 44 of them consumed supplements daily, 2 persons weekly, and 3 persons took supplements less than once per week. Among all supplement users, calcium was the most commonly used supplement (31.7%), followed by multivitamins and minerals (30.5%), vitamin E (29.3%) and vitamin C (28.0%).

The mean score on the nutrition knowledge test was 10.87 ± 3.20 for supplement users and 10.24 ± 3.05 for non-users. There was no significance difference on nutrition knowledge scores between supplement users and non-users.

The mean score of the health belief statements was $3.37 \pm .62$ for supplement users and $2.93 \pm .42$ for non-users. There was a significant difference in the usage of vitamin and mineral supplements based on health beliefs of

seniors ($t = 3.08, p < .005$). In addition, there were significant differences of the following health belief statements between supplement users and non-user: (1) taking vitamin and mineral supplements contribute to their overall health ($t = 2.32, p < 0,05$); (2) they feel better when taking supplements ($t = 2.14, p < 0.05$); and (3) they can not fill all the nutrients needs by food alone ($t = 2.84, p < 0.01$).

Responses to the nutrition knowledge quiz indicated that nutrition knowledge did not account for the use of vitamin and mineral supplements in elderly subjects. However, there was a statistically significant difference on health belief scores between supplement users and non-users. The overall health belief score was significantly lower ($p < 0.01$) for those who did no take vitamin and mineral supplements than for those who used supplements. Therefore, it was concluded that older adults were more likely to be supplement users if they revealed a more favorable attitude and stronger beliefs toward supplements use.

ACKNOWLEDGMENTS

This project would not have been possible without the generosity, wisdom, patience, and grace of many individuals. First, I would like to extend my many thanks to Dr. Karen Zimmerman for her patience and ever-present willingness to provide invaluable assistance during the completion of this project. I would also like to thank Pam VanKampen for her encouragement and help in coordinating this study between Eau Claire County and Trempealeau County. I would also like to thank Chris Ness at UW-Stout for all her time and energy spent organizing the results of my survey.

I can not express enough gratitude to my parents, Jui-Chi Yeh and Ho-Chih Lee, for their continuing faith in my abilities and for their never-ending love during this time in my life. I am also thankful to Chen-Yi Liang for his encouragement and support during the completion of this project.

I could not have accomplished my goal of obtaining my master degree without the help of each and every one of you. I cannot thank you enough for being there for me when I needed you most.

TABLE OF CONTENTS

ABSTRACT.....	i
ACKNOWLEDGMENTS.....	iv
TABLE OF CONTENTS.....	v
LIST OF TABLES.....	viii
CHAPTER ONE: INTRODUCTION.....	1
Statements of the Problem.....	3
Objectives.....	3
Population.....	3
Where and When.....	4
Research Questions.....	4
Hypotheses.....	4
CHAPTER TWO: LITERATURE REVIEW.....	5
Vitamins and Vitamin Recommendations for Elderly.....	5
Minerals and Mineral Recommendations for Elderly.....	12
Elderly and Supplementation.....	17
Nutrition Knowledge and Supplement Use.....	20

Health Beliefs in Supplement Use.....	21
Conclusion Based on the Literature Review.....	25
CHAPTER THREE: METHODOLOGY.....	27
Subjects.....	27
Instrumentation.....	28
Procedure.....	30
Statistical Analysis.....	31
Limitation of the Study.....	32
CHAPTER FOUR: RESULTS AND DISCUSSION.....	33
Results.....	34
Demographics.....	34
Supplement Use.....	37
Nutrition Knowledge.....	37
Health Beliefs Statements.....	41
Discussion.....	47
CHAPTER FIVE: SUMMARY, CONCLUSIONS, EDUCATIONAL IMPLICATIONS AND RESEARCH RECOMMENDATIONS.....	52
Summary.....	52

Conclusions.....	55
Educational Implications.....	56
Research Recommendations.....	57
REFERENCES.....	58
APPENDIX A: Questionnaire.....	62
APPENDIX B: Informational Letter.....	67
APPENDIX C: Educational Tool.....	69

LIST OF TABLES

Table 1: Demographic Information.....	35
Table 2: Self-Reported Nutritional Supplement Use.....	36
Table 3: True/False Nutrition Knowledge Item Results.....	39
Table 4: Multiple Choice Nutrition Knowledge Item Results.....	40
Table 5: T Value on Nutrition Knowledge: Supplement Users vs. Non-users.....	41
Table 6: Mean Scores on Health Beliefs Scales Results.....	42
Table 7: T Scores on Health Beliefs about Vitamins and Minerals: Supplement Users vs. Non-users.....	45
Table 8: T Score Mean Differences of Health Beliefs Statements: Supplement Users vs. Non-users.....	46

CHAPTER ONE

INTRODUCTION

The elderly segment of the population is the fastest growing group in the United States. By the year 2030, an estimated 22 percent of the population will be over the age of 65 (Weddle, Wellman and Shoaf, 1996). In 1972, nutrition programs for the elderly, providing congregate or home-delivered meals designed to meet one-third of the Recommended Dietary Allowance (RDA), were established by the Older Americans Act. Of the one-third of these older adults who have accessed these federal program established to ameliorate hunger and food insecurity, a significant proportion are considered at-risk for malnutrition (Coulston, Craig and Voss, 1996; Stevens, Vrivetti and McDonald, 1992).

As illustrated by the most recent Nutrition and Health Examination Survey III, no subjects in any of the older age group meet the caloric energy requirement of the RDA for adult 51 and older, which dramatically reduces their chances of obtaining adequate daily intake of vitamin and mineral. Such diminished food consumption among older adults, widely referred to as the “anorexia of aging”, is often due to social isolation, depression, decreased physical activity, physical disability, poverty, and chronic illness (Morley & Miller, 1992; Weddle et al.,

1996). Other factors having a profound impact on vitamin and mineral requirements in the aging area are use of multiple medications, decreased capacity of the liver and kidneys, slowed gastrointestinal motility, elevated gastric pH, insufficient secretion of digestive enzymes, and changes in body composition (Fiatarone, 1990). These age-specific nutritional problems compel the investigation of nutrient supplement use among older adults.

A number of surveys reflect the scope of nutrient supplement use in the senior population. Overall, about 30 to 40 percent of Americans 60 years of age and older consume vitamin and mineral supplements (Bende, Levy, Schucker and Yetley, 1992; Slesinski, Subar and Kahle, 1995). Supplement use by all age groups has raised from 40 percent in the early to mid-1980 to 70 percent in the early 1990s (Hunt, 1996). The elderly may be more susceptible to using food supplements since individuals at this age often become more concerned about their health. An older adult's decision of whether or not to consume vitamin and mineral supplement might be based on personal knowledge and health beliefs. Since the effect of nutrition knowledge and health beliefs on supplement use has rarely been a variable included in research with the elderly, the present study is conducted to determine food supplement use and its relationship to nutrition knowledge and health beliefs.

The fundamental hypothesis of this study was that the use of vitamin and mineral supplements among older adults would be mediated by their nutrition knowledge and health beliefs. The main independent variable was current use versus nonuse of any type of vitamin and mineral supplements. Explanatory dependent variables were nutrition knowledge and health beliefs.

Statement of the Problem

Objective

The objective of this study is to assess nutrition knowledge and health beliefs of the elderly and correlate them with their use of vitamin and mineral supplements. The research focuses on the type and frequency of supplement use; nutrition knowledge related to vitamin and minerals and health beliefs.

Population

The subjects in this study were recruited from elderly persons 60 years of age and over who participate in congregate meal programs in northwestern Wisconsin communities.

The data were obtained through the use of a questionnaire regarding usage of vitamin and mineral supplementation. The questionnaire developed

consisted of three separate sections. Section one includes demographics and information about supplement use. A nutrition knowledge quiz made up section two, and the third section was a health beliefs scale.

Where and when

All participants in the study were from Eau Claire County and Trempealeau Counties, Wisconsin. The questionnaires were distributed in April 2000.

Research Questions

1. Does nutrition knowledge have an effect on the use of vitamin and mineral supplements in older adults?
2. Do health beliefs affect the usage of vitamin and mineral supplement of the seniors?

Hypotheses

1. There is no significant difference on the usage of vitamin and mineral supplements based on nutrition knowledge of seniors.
2. There is no significant difference on the usage of vitamin and mineral supplements based on health beliefs of seniors.

CHAPTER TWO

LITERATURE REVIEW

The review of literature provides insight into the vitamin and mineral supplement use of seniors. This review contains the following five sections: 1) vitamins and vitamin recommendations for elderly, 2) minerals and mineral recommendations for elderly, 3) elderly and supplementation, 4) nutrition knowledge and supplement use, 5) health beliefs in supplement use and, and (6) conclusion based on the literature review.

Vitamins and Vitamin Recommendations for Elderly

Vitamins and minerals are classified as micronutrient: chemical substances required for normal growth and metabolism. Although macronutrients are found in all body tissues and fluids, they account for only a small percentage of body weight (Groff, Gropper and Hunt, 1995).

By definition, vitamins are organic (carbon-containing) substances that are needed in small amounts in the diet for use in important metabolic reaction in the body (Wardlaw and Insel, 1993). Vitamin occurs in minute quantities in foods. Each vitamin has a specific chemical structure; some are simplistic (e.g. vitamin C), where others are more complex (e.g. vitamin B₁₂). Vitamins are classified as either fat-soluble or water-soluble. Vitamin A (retinol, carotenes), D

(cholecalciferol), E (tocopherols), and K (phylloquinone, menaquinone, and menadione) are fat-soluble. Vitamin C and the B-complex: thiamin, riboflavin, niacin, pantothenic acid, pyridoxine (B₆), cobalamin (B₁₂), folate, and biotin are water-soluble (Groff et al., 1995).

Water-soluble vitamins are easily excreted in urine; excess levels of fat-soluble vitamins are readily stored in adipose tissue. Acute and chronic toxicities have been reported with both classes of vitamins, particularly vitamin A and D, niacin, pyridoxine, vitamin C, and folate (Mueller and Burke, 1996).

Vitamin Recommendations for Elderly

Low-to-inadequate intake may account for much of the poor vitamin nutrition observed in the elderly. In addition, physiologic changes associated with the aging gut may increase or decrease vitamin absorption, thereby influencing total dietary vitamin requirements (Ausman and Russell, 1999). Individual vitamins are discussed below.

Thiamin

Thiamin plays a part in the metabolism of carbohydrate, alcohol, and branched chain amino acids (Truswell, 1992). The more carbohydrate consumed and the greater one's energy output, the more thiamin one needs for metabolic

needs (Wardlaw and Insel, 1993). The RDA for the elderly for thiamin is 1.2 mg/day for males and 1.0 mg/day for females. Thiamin deficiency in the elderly is largely due to alcoholism accompanied by low thiamin intake (Groff et al., 1995). However, the RDA for thiamin appears to cover the needs of most well elderly persons.

Riboflavin

Riboflavin has a vital role in cellular oxidation (Truswell, 1992). The coenzymes of riboflavin participate in many metabolic pathways, including the citric acid cycle and the pathway for breaking down fatty acids (Wardlaw and Insel, 1993). Despite lower energy expenditures in elderly people, riboflavin needs appear to be constant across the life span (Russell and Rasmussen, 1999). The 1989 RDA for riboflavin for the elderly is 1.4 and 1.2 mg/day for males and female, respectively.

Niacin

The vitamin niacin exists in two forms-nicotinic acid and nicotinamide. The two coenzyme forms of niacin are nicotinamide adenine dinucleotide (NAD) and nicotinamide adenine dinucleotide phosphate (NADP). Since almost every cellular metabolic pathways use either NAD or NADP, a niacin deficiency causes

widespread damage in the body (Wardlaw and Insel, 1993). The 1989 RDA for niacin is the same as for young adults, 15 mg/day for males and 13 mg/day for females. Little if any evidence indicates that niacin requirements change with age.

Vitamin B₆

Vitamin B₆ is needed for the activity of more than 50 enzymes involved in carbohydrate, protein, and fat metabolism (Wardlaw and Insel, 1993). Surveys among the elderly have found that vitamin B₆, which is involved in homocysteine metabolism, is frequently deficient in the age group span (Russell and Rasmussen, 1999). The current RDA for vitamin B₆ in the elderly is 2.0 mg/day for men and 1.6 mg/day for women. While dietary intake of vitamin B₆ are reported to be below RDA levels in 50 to 90% of older adults, studies indicate that the physiologic requirement exceeds this standard (Blumberg, 1997).

Folate

The most important role of folate is to the formation of the purine and pyrimidine bases used in RNA and DNA (Groff et al., 1995). Folate is very susceptible to destruction by heat. Food processing and preparation destroy 50% to 90% of the folate in food (Wardlaw and Insel, 1993). Folate is rare in foods or

in the body (Truswell, 1992). The current RDA in the elderly is 200 µg/day for men and 180 µg/day for women.

Vitamin B₁₂

Vitamin B₁₂ is present only in animal foods. While plants do not contain vitamin B₁₂, bacteria and soil contamination of vegetables and the process of fermentation contribute to very little to a diet. This is an important consideration for the vegan's diet (Wardlaw and Insel, 1993). Serum or plasma vitamin B₁₂ levels in the elderly are often found to be low because of decreased body reserve. Low intake, especially among the poor, and impaired absorption of vitamin B₁₂, may be important factors (Ausman and Russell, 1999). The current RDA of vitamin B₁₂ is 2.0 µg/day for both sexes.

Biotin

Biotin acts as a coenzyme in fat synthesis, amino acid catabolism and carbohydrate metabolism (Wardlaw and Insel, 1993). It is widely distributed in foods, the requirement is small, and deficiency is rare. Deficiency has occurred in people who eat large amount of raw eggs (Truswell, 1992). The lack of definitive studies of biotin requirements makes it difficult to estimate an allowance. The

estimated safe and adequate daily intake of biotin (ESADDI) for biotin is 30 to 100 µg/day for adults.

Pantothenic Acid

Pantothenic acid is a constituent of coenzyme A, which allows many important metabolic actions of the citric acid cycle to take place (Wardlaw and Insel, 1993). It is especially abundant in animal tissues, whole grain cereal and legumes. The name means “available everywhere.” Spontaneous deficiency in man has never been proved (Truswell, 1992). There is insufficient evidence to set an RDA for pantothenic acid; however, an intake of 4 to 7 mg/day should be safe and adequate for adults.

Ascorbic Acid

Ascorbic acid is the major antioxidant in the aqueous phase of the body (Truswell, 1992). Adequate vitamin C is thought to be effective in helping prevent certain cancer, as well as cataracts in the eye. It is also vital for the function of the immune system and iron absorption (Wardlaw and Insel, 1993). The current RDA for vitamin C is 60 mg/day for both sexes. Although the vitamin is widely abundant in many foods, intakes in the elderly vary widely. Factors such as

smoking, medication, and emotional and environmental stress all adversely affect vitamin C nutrition (Groff et al., 1995).

Vitamin A

Best understood of the actions of vitamin A is its role in night vision. Although vitamin A is not distributed widely in foods, excess daily amounts can be stored in the body (Groff et al., 1995). Greater than 90% of vitamin A is stored in the liver (Wardlaw and Insel, 1993). The 1989 RDA for vitamin A is based on the possible role of vitamin A precursors in chronic disease prevention. The current RDA in the elderly is 800-1000 µg/day.

Vitamin D

Because vitamin D is found in only a few foods, including seafood and fortified milk products, it is not surprising that over three-quarters of elderly persons have vitamin D intake of less than two-thirds of the RDA (Ausman and Russell, 1999). The contribution of sunlight to the vitamin D status of the elderly is also reduced, because they receive less sun exposure and have a decreased efficiency of vitamin D synthesis in the skin (Blumberg, 1997). Poor vitamin D nutrition profoundly affects bone and mineral metabolism leading to osteomalacia

and fracture. The 1989 RDA for vitamin D of 5 µg/day has been modified in the 1997 adequate intake reference values to 10 µg/day for age 51 through 70 and to 15 µg/day for older individuals.

Vitamin E

Vitamin E is present in all cell membrane, where it is thought to reduce peroxidation of unsaturated fatty acids by free radicals (Truswell, 1992). Plenty of evidence has shown that large doses of vitamin E can lower the risk of heart disease, especially in people who have already had a heart attack or stroke (Forman, 1999). High circulating vitamin E levels and/or vitamin E supplementation use (60-800 IU/day) have been linked to improvements in immune status, protection and stabilization of membranes, lower prevalence of cataract and cancer, and slowed progression of Alzheimer's disease span (Russell and Rasmussen, 1999). The 1989 RDA for the elderly is 10 mg/day for males and 8 mg/day for females.

Vitamin K

Vitamin K comes in three chemical forms. Vitamin K₁ (phytomendadione) is found mainly in vegetables. The series of K₂ vitamins (menaquinones) are

produced by bacteria. Vitamin K₃ (menadione) is synthetic, water-soluble, can cause jaundice (Truswell, 1992). Although vitamin K is known primarily for its significance in blood coagulation, vitamin K may play an important role in bone metabolism span (Russell and Rasmussen, 1999). The 1989 RDA for the vitamin K for the elderly is 80 µg/day for men and 65 µg/day for women.

Minerals and Mineral Recommendations of Elderly

Mineral elements are inorganic substances that occur in simple forms such as NaCl or in combination with organic compounds such as the iron in hemoglobin and the sulfur in almost all proteins. Based on their percentage of the body's total content, minerals are classified as (Groff et al., 1995):

1. **Macronutrients:** constituting more than 0.0005% of the body's weight, or 50 parts of per million (ppm), such as calcium, chloride, phosphorus, potassium, magnesium, sodium, sulfur.
2. **Micronutrients,** which fall into two categories:
 - a. **Minerals with identified roles in health maintenance,** including chromium, cobalt, copper, fluoride, iodide, iron, manganese, molybdenum, selenium, and zinc.

- b. Minerals with unestablished roles in health maintenance, such as arsenic, boron, cadmium, lithium, nickel, silicon, tin, and vanadium.

In food, minerals occur as salts, such as sodium chloride. Because minerals are water soluble, some loss occurs during cooking, especially when foods soak in water or marinate and when cooking liquids are discarded (Mueller and Burke, 1996).

Mineral Recommendations for Elderly

In the United States, mineral deficiencies receiving the most attention are iron (iron-deficiency anemia), calcium (osteoporosis), iodine (goiter) and fluoride (dental carries). Among the numerous factors that reduce mineral status, most relate to primary deficiency due to inadequate intake, decreased release from food, malabsorption, or increased losses (Mueller and Burke, 1996). Individual minerals are discussed below.

Calcium

Lifetime calcium intake appears to be a factor in the incidence of osteoporosis in the elderly, and laying down sufficient bone in early life is one of the most critical factors protecting against fracture in old age (Blumberg, 1997). In the presence of adequate vitamin D nutrition, it appears that calcium intake in the range of 800-1200 mg/day will have beneficial effects on bone mineral density.

Other potential benefits of high calcium intakes, such as reduced blood pressure and decreased risk of colon cancer, may also be important span (Russell and Rasmussen, 1999). The adequate intake reference value for calcium of the Food and Nutrition Board is 1200 mg/day for those 51 years and above (Ausman and Russell, 1999). This is an increase of 400 mg/day above the 1989 RDA.

Iron

Iron forms part of hemoglobin in red blood cells and myoglobin in muscle cells. Iron is also used to synthesize some enzymes and is needed for immune function (Wardlao and Insel, 1993). Absorption of iron—both heme and non-heme—does not appear to be affected by aging (Russell and Rasmussen, 1999). The iron deficiency seen in the elderly is due to inadequate iron intake and blood loss due to chronic disease (Mueller and Burke, 1996). The current RDA for iron is 10 mg/day for elderly.

Zinc

Over 200 coenzymes require zinc as a cofactor for optimum activity. Adequate zinc intake is necessary to support many bodily functions, such as wound healing, growth, proper immune function, storage and release of insulin and proper development of sexual organs and bone (Wardlao and Insel, 1993).

Some studies indicate that supplementation with RDA levels of zinc in older people is associated with improvements in immune responsiveness (Bogden, Bendich, Kemp, Bruening, Churnick, Denbny, Baker and Louria, 1994; Boukaiba, Flament, Acher, Chappuis, Piau, Fusselier, Dardenne and Lemonnier, 1993). Various studies have shown dietary intakes of zinc among healthy elderly people ranging from 5.8 to 12.8 mg/day, which are well below the 1989 RDA of 15 mg/day for men and 12 mg/day for women (Ausman and Russell, 1999; Russell and Rasmussen, 1999).

Copper

Copper is part of certain enzymes, contributes to the activity of other enzymes, and aids in iron metabolism (Wardlaw and Insel, 1993). Aging has not been associated with significant changes in copper metabolism, and copper balance has been shown to be maintained in elderly people consuming 1.3mg/day (Russell and Rasmussen, 1999). Thus, the current RDA for copper in the elderly, 1.5-3.0 mg/day, is appropriate for this population.

Selenium

Selenium is important for protecting heart cells against oxidative damage (Wardlaw and Insel, 1993). Several studies have shown low serum selenium or plasma selenium concentrations in adults greater than 60 years old as compared

to younger adults (Russell and Rasmussen, 1999). The RDA for selenium for adults 51 years or older is 70 µg/day for men and 55 µg/day for women. Because age-related changes in absorption or metabolism of selenium have not been described, poor selenium intake is probably responsible for the prevalence of poor indices reported among most elderly people (Ausman and Russell, 1999).

Magnesium

Proper nerve function and cardiac function require magnesium (Wardlaw and Insel, 1993). There is no compelling evidence that magnesium deficiency is prevalent in Western society, where dietary intakes of magnesium have been estimated to be between 225-280 mg for those over the age of 65 (Russell and Rasmussen, 1999). In 1989, the magnesium RDA for adults of both sexes was set at 4.5 mg/day, which translate into an intake of 350 mg for a reference 76-kg male and 280 mg/day for a reference 62-kg female.

Chromium

The most studied function of chromium is the maintenance of normal glucose uptake into cells (Wardlaw and Insel, 1993). Chromium acts as a cofactor for insulin and is required for normal metabolism of glucose and lipids.

Chromium supplementation of 200-250 µg/day has resulted in some improvement in glucose tolerance, insulin response, and blood lipids in elderly population (Russell and Rasmussen, 1999). The estimated safe and adequate daily dietary intake for chromium is set between 50 to 250 µg/day.

Other trace minerals

The nutritional status and requirements of manganese, molybdenum, phosphorus, iodine, and fluoride in relation to aging have not been adequately studied (Russell and Rasmussen, 1999).

Elderly and Supplementation

Dietary supplements are used by more than 50 percent of the US population according to most recent national survey (Nesheim, 1998). Currently, public interest in and curiosity about vitamin and minerals has heightened. Media headlines and widespread advertising by manufacturers of nutrient supplements emphasizing the role of vitamin and minerals in preventing or treating medical conditions by natural methods have led to Americans to spend about three billion dollars annually on over-the counter supplements.

Dietary supplements are defined in the Dietary Supplement and Health Education Act (DSHEA) as a product (other than tobacco) intended to

supplement the diet that bears or contains one or more the following dietary ingredients: (a) a vitamin; (b) a mineral; (c) an herb or other botanical; (d) an amino acid; (e) a dietary supplementing use by man to supplement the diet by increasing the total dietary intake; or (f) a concentrate, metabolite, constituent, extract or combination of any ingredient described in clause (a), (b), (c), (d), or (e). These products can be ingested as a capsule, powder, gelcap, tablet, liquid, or other form (Nesheim, 1998).

According to 1996 American Dietetic Association position paper of vitamin and mineral supplementation, when dietary selection is limited, nutrient supplementation can be useful for meeting the RDAs. Examples include supplemental vitamin B₁₂ for strict vegans who eliminate all animal products from the diet; folic acid for women of child-bearing age who consume limited amount of fruits, leafy vegetables, and legumes; vitamin D for those with limited milk intake and sunlight exposure; calcium for those with lactose intolerance or allergies to dairy products; and a multivitamin and mineral supplement for those following severely restricted weigh-loss die (American Dietetic Association, 1996). Up to 85 percent of elderly people have disease that could be alleviated with nutritional interventions such as changes in dietary patterns or supplement use (Posner, Fanelli, Krackenfels and Saffiel-Shrier, 1987).

The elderly may be more susceptible to using food supplements since individual at this age often become more concerned about their health (Stanek and Sempek, 1990). This may occur because in today's society becoming older is equated with being ill and useless. Mass media proliferate this image with countless advertisement either on how to stay younger, or if already old, how to combat stereotypical problems which are assumed to be a part of every elderly person's life. As medical advances reduce illness and disability, there will be more elderly persons who will live longer and be more active.

Various studies have been conducted on supplement use by the elderly. Supplement use examined as part of the nutritional status survey of free-living elderly in Boston (Ausman and Russell, 1999). Daily vitamin and mineral use was reported by about half of the elderly; use of vitamin C and E supplements was most common. Supplement use markedly decreased the number of individuals whose total daily intake of vitamin B₆, B₁₂, and D, of folate, and of calcium would be considered low. Of concern, both elderly males and females consumed excessive levels (at least 10 times the RDA) of vitamin A.

The amount of supplements that can be digested safely varies greatly among the different nutrients and may also vary with age and the health status of an individual. Some elderly may ingest unnecessary supplements that contain nutrients adequately supplied by their diets (Houston, Daniel, Johnson and Poon,

1998). Suttie and Rivlin (1993) demonstrated that high intakes of some dietary supplements interfere with the normal metabolism of other nutrients, with clinical lab tests, and with the therapeutic effects of some drugs. Such reaction could cause serious problems for elderly individuals, especially those with deteriorating health and inadequate nutrient intakes.

Nutritional Knowledge and Supplement Use

Much concern is placed on the dietary practices of the elderly. Because elderly are faced with deterioration of their physical health, they may be vulnerable to health claims by the supplement industry in which dietary supplementation is portrayed as necessary for optimal health. Low levels of education, leading to low levels of nutrition knowledge, have been implicated as a factor influencing the older adults' vulnerability to questionable dietary practices.

A study (Fanelli and Abernethy, 1986) revealed that participants in congregate meal program appeared to have a more limited understanding of foods and nutrition than non-participants, emphasizing the need for nutrition education program at senior citizen meal sites. Subjects in this study recognized the importance of calcium for bone health, but intake of dairy products was quite

low. The belief that cheese is constipated may affect consumption of dairy products.

A study of 227 elderly participants attending Title III-C nutrition program was conducted to determine food supplement use and its relationship to nutrition knowledge and quality of diets (Stanek and Sempek, 1990). Although nutrition knowledge was found to be positively related to the quality of the diet for all subjects, it appeared that supplement and non-supplement users had comparable nutrition knowledge and dietary intake. The mean knowledge score was low; however, positive relationship was found between nutrition knowledge and both education and income for all subjects.

Health Beliefs in Supplement Use

There was a belief that diet alone was inadequate to supply all the nutrients needed and, in addition, many believed that supplements help improve immunity, boost energy levels and delay the effects of aging (Read, Bock, Carpenter, Medeiros, Ortiz, Rabb, Schutz, Sheehan and William, 1989; Freeman, Sargent, Sharpe, Waller, Powell and Drane, 1998). Other perceived health-related benefits from supplements include reduced severity of serious illness, stress, colds, skin problems, heart attacks, and cancer (Read et al., 1989). Many

of these beliefs seem to be commonly held among food supplement users. As concern with nutrition spread, so has the desire for some quick fix or easy answer to less-than-perfect health. Hence, health beliefs are often based on unfounded facts.

Health Beliefs Model

Belief in a connection between diet and disease may be a notable predictor of the adoption of healthful diet, including use of supplements. The Health Beliefs Model provides one theoretical framework for studying compliance in regard to using preventive health-related behavior measure. The model was developed to explain why some people who are healthy take specific actions to avoid illness, where as others do not do so. Based on established psychological and behavioral theories, the model involves two major variables: motivation to avoid illness (or to get well) and the belief that a behavior will reduce the threat of illness or enhance the likelihood of good health (Janz and Becker, 1984).

Generally, a behavior with a perceived beneficial outcome is more likely to be carried out than one that has a perceived negative outcome.

Health Beliefs in Supplement Use

Despite numerous recommendations that healthy individuals should be able to meet their entire nutrient needs with diet rather than with supplemental vitamin and minerals, the use of food supplements is a very common practice in the United States (Pelletier and Kendall, 1997). In a study of the elderly, Sheehan and associates found that 60 percent of those over the age of 60 reported using one or more food supplements (Sheehan et al., 1989). Stanek and Sempek found that 37 percent of the elderly participating congregate meal program took some type of supplements (Stanek and Sempek, 1991).

The Surgeon General's Report on Diet and Health attributes some of the use of food supplements to the pervasive myth that they are necessary for good nutrition and that megadoses of nutrients provide additional health benefits (U.S. Department of Health and Human Services, 1998). Health reasons for supplement use varied. Some of the more common reasons cited for taking supplements are to increase energy; to prevent colds and chronic disease, as a precaution; to make up for what is not in food, to feel better, and to reduce stress (Eldridge and Sheehan, 1994; Neuhouser et al., 1999). Neuhouser and associates also reported that supplement users felt that it is hard to eat a balanced diet and that optimal intake of the micronutrient could not be obtained from food alone (Neuhouser, Patterson and Levy, 1999).

Eldridge and Sheehan (1994) conducted a study to assess the food supplement use and related beliefs among community college students. The findings revealed that supplement users perceived more health benefits of food supplements than nonusers. Most students believed that eating a variety of foods provide all the vitamins and minerals necessary, but that extra vitamins are needed when people feel tired and run down and that vitamin C can prevent colds. Students who used supplements believed that supplemental vitamins and minerals are needed for proper nutrition and that they provide extra pep and energy and help reduce stress.

In a study of 332 middle-aged adults (age 45-60) and 496 older adults (60 years and older), William and his associates conducted a study to compare the health beliefs and supplement use of these two groups. The findings suggested that there was no difference of health beliefs between the two age groups; however, older adults more frequently believed their state of health was outside their control (William, Bock, Medeiros, Ortiz, Raab, Read, Schutz and Sheehan, 1993).

Another recent study examined possible interactions among food beliefs, supplementation, and food intake. That study, based on a sample of 8,865 adults (20 years or older), suggested that persons with positive (or healthful) attributes are a highly motivated and health-conscious group in which supplement use is

part of a healthy overall lifestyle. Or, users with unhealthful nutrition attitudes and beliefs may be using supplements to compensate for a diet and lifestyle they perceive to be unhealthful (Pelletier and Kendall, 1997).

Conclusion Based on the Literature Review

The elderly are a more diverse population than any other age group; individuals have widely varying capabilities and levels of functioning. On the whole, elderly persons are more likely than younger adults to be in marginal nutritional health and thus to be at higher risk for frank nutritional deficiency in times of stress or health care problems (Blumberg, 1997).

Physiologic and functional changes during aging result in changes in nutrient needs. Altered ability to taste and smell, poor oral health, dysphasia, and/or failure-to-thrive syndrome (i.e., nonspecific symptoms associated with deteriorating mental status and functional ability, social isolation, and decreased food intake) can contribute to decreased nutrient intake, involuntary weight loss, and malnutrition (Weddle et al., 1996). Physical, social, and emotional problems may interfere with appetite or affect the ability to purchase, prepare, and consume an adequate diet (Ausman and Russell, 1999). An evaluation of the Elderly Nutrition Program of the Older Americans Act indicates that 67 to 88 percent of participants are at moderate to high nutritional risk (Coulston, Craig and Voss, 1996). A detailed review of dietary intake studies in elderly people suggested that the nutrients likely to be least adequately supplied in the diets of

elderly people are: calcium, zinc, potassium, vitamin B₆, magnesium, and folate (Horwath and Worsley, 1989).

Optimal health in older adults involves preventing both nutritional deficiency and nutrient toxicities. Although there are some potential health benefits of supplement use, the high cost, unsubstantiated health claims, toxicity, and nutrient/drug interactions warrant discretionary use. The potential risks and benefits to older adults of nutrient supplementation beyond current recommendations must be carefully considered.

CHAPTER THREE

METHODOLOGY

This chapter includes a description of the survey subjects, means of distribution and collection of the survey instrument, the contents of the three sections of the instrument, data analysis, and a statement of the limitations of the study.

The fundamental hypothesis of this study was that the use of vitamin and mineral supplements among older adults would be mediated by their nutrition knowledge and health beliefs. The research questions investigated by the procedures detailed in this chapter were:

3. Does nutrition knowledge have an effect on the use of vitamin and mineral supplements in older adults?
4. Do health beliefs affect the usage of vitamin and mineral supplements of the seniors?

Subjects

Prior to subject recruitment, the study design and protocol were approved by the Institutional Review Board for the protection of Human Subjects at the

University of Wisconsin-Stout. Subjects were elderly persons 50 years of age and over who attended Title III-C nutrition programs in northwestern Wisconsin. Participation was completely voluntary and subjects were assured of anonymity.

Instrumentation

The instrument employed in the study was developed by the researcher in Spring 2000 (Appendix A). Survey questions were taken from other similar studies and used as a resource in constructing nutrition knowledge questions and health belief statements (Eldridge and Sheehan 1994; Freeman et al., 1998; Houston et al., 1998; Neuhouser et al., 1999; Oakland and Thomsen, 1990). Items were designed to establish participants' nutrition knowledge and health beliefs regarding vitamins and minerals. The questionnaire consisted of three separate sections. In the first section, subjects were asked to provide pertinent demographic information and the usage of vitamin and mineral supplements. They were asked to identify their age, education and whether they take vitamin and mineral supplements.

A nutrition knowledge quiz made up section two. Thirteen true/false questions assessed general knowledge of vitamins and minerals. Questions 1, 2, 8, 10, 11, 12, and 13 were taken and adopted from instruments developed by

Freeman et al. (1998), Eldridge and Sheehan (1994), and Oakland and Thomsen (1990). Other items were developed by researcher. The second part of the knowledge questions was multiple choice. Seven of the multiple choice items measure knowledge about individual vitamins and minerals. These seven questions were all taken and modified from the instruments developed by Freeman et al. (1992). To minimize the number of correct responses due to chance, subjects were asked to indicate if they did not know the answer to an item. Knowledge scores were based on the number of questions answered correctly.

The third section of the instrument was a health belief scale. Nine health belief statements about supplement use were constructed to assess overall attitude toward supplement use in the form of a five-point Likert-type scale. Statements 1, 3 and 5 were taken and adopted from the instrument developed by William et al. (1993). Statements 2, 6, 7 and 8 were taken and adopted from the instrument developed by Eldridge and Sheehan (1994). Statement 4 is taken and adopted from the instrument used by Oakland and Thomsen (1990). Statement 9 is taken and adopted from the instruments used by Freeman et al. (1998).

The respondents were given the options of strongly agree, agree, neutral, disagree, and strongly disagree with regard to each item. Responses for this section were scored from 1 (strongly disagree) to 5 (strongly agree). However,

two statements were scored in reverse: "I should take vitamin/mineral supplements only after consulting a physician" and "Eating a variety of foods provides all the vitamins and minerals necessary for health". Total scores on the items were continuous with a higher score denoting a more positive attitude toward supplement use.

The questionnaire was designed to be short enough to allow senior citizens to complete the form without impeding their activity at meal sites. Content validity was established by having two registered dietitians and two aging units nutrition directors of these Title III-C centers review the survey for accuracy and efficiency of administration.

Procedure

Permission to conduct the study at senior centers in northwestern Wisconsin was obtained from the nutrition program coordinator of Northern Area Agency of Aging in Wisconsin. Aging Unit directors in Eau Claire County and Trempealeau County agreed to participate in the survey.

The actual study was conducted during the month of April 2000. An informational letter was given to subjects (Appendix B). This letter explained the nature of the study. Each subject was then asked to complete a questionnaire by placing a check mark in the appropriate spaces for the demographic information

and responding to nutrition knowledge and health beliefs statements. This activity was completed quickly.

An educational tool was then given to the participants after completion of the questionnaires (Appendix C). The educational tool was designed to give correct answers and explanations of each item in the nutrition quiz section. Subjects were free to go about their usual activities immediately after the questionnaires had been completed.

Statistical Analysis

The information for the study was computed by Christine Ness, Research and Statistical Consultant at University of Wisconsin-Stout. All questionnaire information was coded and responses statistically analyzed using SPSS. Grossly incomplete surveys lacking significant portions of needed information were discarded.

The main independent variable was defined as current use versus nonuse of any type of vitamin/mineral supplements. Explanatory dependent variables having continuous scores were nutrition knowledge and health beliefs. Nominal independent variables included gender, age, and education.

Frequencies, means, and standard deviation were calculated for gender, age, education and nutritional supplement use. Rank, means, standard deviation

and frequencies were calculated for each of the twenty nutrition knowledge items and nine health belief statements. Chi-Square tests were used to determine significant levels between supplement users and non-users for each of nutrition knowledge item correct responses. Independent t-tests were used to compare differences between supplement users and non-users for total nutrition knowledge scores, total health beliefs statements scores, and each of the nine health beliefs statement.

Limitation of the Study

The study was limited to participants in the Title III Nutrition Program for the Elderly in two counties in northwestern Wisconsin. The study was also limited to meal participants in attendance at each meal site on specific days. The responses received may or may not reflect the interests of the total group at any one site or for the county.

The main limitation of this investigation was that those who volunteered and completed the questionnaire may have been those who were most interested in nutrition. Persons with an interest in nutrition may also have more knowledge of nutrition than those who refused to participate.

CHAPTER FOUR

RESULTS AND DISCUSSION

Chapter four presents and discusses the findings of a survey administered to elderly persons 50 years of age and over who attended Title III-C nutrition programs in northwestern Wisconsin. The present study was designed to investigate the following two research questions:

1. Does nutrition knowledge have an effect on the use of vitamin and mineral supplements in older adults?
2. Do health beliefs affect the usage of vitamin and mineral supplement of the seniors?

The survey instrument was completed by 82 older adults from the congregate meal sites in Eau Claire County and Trempealeau County in Wisconsin. The survey consisted of three sections: Section I involved demographic information and the use of nutritional supplements (Table 1-2), section II scored the elderly persons' nutrition knowledge (Table 3-5), and section III scored the elderly persons' attitude toward nutritional supplement use (Table 6-8).

The fundamental hypothesis of this study was that the use of vitamin and mineral supplements among older adults would be mediated by their nutrition knowledge and health beliefs. The main independent variable was current use versus nonuse of any type of vitamin and mineral supplements. Explanatory dependent variables were nutrition knowledge and health beliefs.

Results

Demographics

The characteristics of the subjects are summarized in Table 1. Eighty-two individuals responded to the questionnaire. Of the total respondents, 30.5% (n=25) were male and 69.5% (n=57) were female.

Respondents were from 50 years old up to 90 years old and above. About 3.7 % (n= 3) were between 50-59 years old, 14.6% (n=12) between 60-69 years old, 46.3 % (n=38) between 70-79 years old, 32.9 % (n=27) between 80-89 years old and, and 2.4% (n=2) were 90 years old and above.

The percentage of respondents whose terminal education was 8 years or less, some high school, high school graduates, some college or vocational training, college, or post college were 18.3%, 13.4%, 41.5% 18.3%, 3.7% and 2.4%, respectively. While the total sample showed 18.3% with an 8th grade

education or less as the highest level of education, an appreciable number (41.5%) were high school graduates and another 18.5% of the respondents indicated that they had had some college or vocational training.

TABLE 1. Demographic Information of Respondents (n=82)

Categories	Number (N)	Percentage (%)
<u>Gender:</u>		
Male	25	30.5
Female	57	69.5
<u>Age Range:</u>		
50-59	3	3.7
60-69	12	14.6
70-79	38	46.3
80-89	27	32.9
90 or older	2	2.4
<u>Education:</u>		
8 years or less	15	18.3
Some high school	11	13.4
High school graduate	34	41.5
Some college or vocational training	15	18.3
Collage graduate	3	3.7
Post college	2	2.4

TABLE 2. Self-Reported Nutritional Supplement Use (n=82)

Category	Number (N)	Percentage (%)
<u>Consumption of nutritional supplements:</u>		
Yes	53	64.6
No	29	35.4
<u>Frequency of nutritional supplement use:</u>		
Daily	44	53.7
Weekly	2	2.4
Less than once per week	3	3.7
<u>Types of nutritional supplement use:</u>		
Calcium	26	31.7
Multivitamin/minerals	25	30.5
Vitamin E	24	29.3
Vitamin C	23	28.0
Vitamin B-12	10	12.2
Vitamin D	10	12.2
Magnesium	8	9.8
Vitamin A	7	8.5
Iron	7	8.5
Potassium	7	8.5
Zinc	6	7.3
Vitamin B-complex	5	6.1
Vitamin B-6	4	4.9
Folate	3	3.7
Niacin	1	1.2
Pantothenic acid	1	1.2

Vitamin K	1	1.2
Don't know	0	0
Others	4	4.9

Supplement Use

Table 2 illustrates supplement use by the respondents. Fifty-three subjects (64.6%) reported they consumed some type of vitamin or mineral supplements: 44 of them consume supplements daily, 2 persons weekly, and 3 persons take supplements less than once per week.

The respondents revealed the use of a large variety of nutritional supplements. Among all supplement users, calcium was the most commonly used supplement (31.7%), followed by multivitamins and minerals (30.5%), vitamin E (29.3%) and vitamin C (28.0%).

Nutrition Knowledge

In part two of the questionnaire, the elderly participants were to respond to a nutrition knowledge quiz. Items 1 to 13 were true/false questions, which were concerned with the general knowledge of vitamins and minerals. Items 14 to 20 were multiple choice items, which were designed to identify the functions or benefits of selected vitamins and minerals.

The results of true/false items were summarized in Table 3. Over 90% of the respondents correctly agreed that fruits and vegetables are good sources of

vitamins and minerals, that potassium can be found in bananas and potatoes, and that overcooking of vegetables in large amount of water removes some of the vitamins and minerals. Above 80% of the respondents correctly indicated that large doses of vitamins and minerals can be harmful to the body and that medications can interfere with the body's supply of vitamins and minerals. About three-fourths of the respondents (74.4%) correctly believed that medication can interfere with the body's supply of vitamins and minerals. About two-thirds of the respondents (65.9%) correctly agreed that skim milk contains the same amount of vitamins and minerals as whole milk and that vitamins and minerals work best when taken with foods.

However, only 52.4% of respondents correctly identified that zinc deficiency cause loss of ability to taste. Only 30% of respondents correctly indicated that the statement of vitamin C can prevent common cold was false. About one-fourths (24.4%) of the respondents falsely believed that natural vitamins and minerals are more effective than synthetic ones. Less than 20% of the respondent correctly disagreed with the statements that the beets are high in iron and that vitamins and minerals provide energy.

The multiple-choice section of the knowledge text revealed information about the respondent's level of knowledge about specific vitamins and minerals. The results of multiple choice items were summarized in Table 4.

About 80% of the respondents identified that vitamin D and calcium are required for healthy bones. Almost 60% of the respondents identified that vitamin E can help the body protect against heart disease. About 40% of the respondents identified that vitamin B-complex is important for healthy nerves. However, only 14.6% of the respondents identified that vitamin B is lost in the body due to drinking alcohol. Only 37.8% of the respondents identified that vitamin A is essential to maintain healthy eyes and vision. Less than 30% of the respondents identified that vitamin C can help protect the body against cancer (26.8%) and that vitamin C is destroyed in the body by smoking cigarettes (9.8%).

TABLE 3. True/False Nutrition Knowledge Item Results (n= 82)

Questionnaire Item	Correct Answer	% Correct	% Incorrect
Fruits and vegetables are good sources of vitamins and minerals.	(T)	96.3	1.2
Potassium can be found largely in bananas and potatoes.	(T)	95.1	2.4
Overcooking of vegetables in large amount of water removes some of the vitamin/mineral values.	(T)	92.7	3.7
Large doses of vitamins and minerals can be harmful to the body.	(T)	86.6	7.3
Vitamin D can be produced by the body from sunshine.	(T)	80.5	9.8
Medications can interfere with the body's supply of vitamins and minerals.	(T)	74.4	18.3

Skim milk contains the same amount of vitamins, minerals and protein as whole milk.	(T)	65.9	26.8
Vitamin and mineral supplements work best when taken with food.	(T)	65.9	23.2
Zinc deficiency causes loss of ability to taste.	(T)	52.4	24.4
Vitamin C can prevent the common cold.	(F)	30.5	64.6
Natural vitamins and minerals are more effective than synthetic vitamins and minerals.	(F)	24.4	62.2
Beets are high in iron.	(F)	17.1	74.4
Vitamins and minerals provide energy.	(F)	11.0	81.7

TABLE 4. Multiple Choice Nutrition Knowledge Item Results (n= 82)

Questionnaire Item	Correct Answer	% Correct	% Incorrect
What is required for strong bones? (a) Vitamin D and calcium (b) Vitamin C and Vitamin E (c) Vitamin B-complex (d) Don't know	(a)	81.7	14.7
What can help protect the body against heart disease? (a) Vitamin D (b) Vitamin E (c) Iron (d) Don't know	(b)	59.8	36.6
What is important for healthy nerves? (a) Vitamin A (b) Vitamin B-complex (c) Vitamin D (d) Don't know	(b)	41.5	55.7
What is essential to maintain healthy eyes and visions?	(a)	37.8	58.7

(a)	Vitamin A			
(b)	Vitamin K			
(c)	Vitamin B-complex			
(d)	Don't know			
What can help protect the body against cancer?				
(a)	Vitamin C			
(b)	Vitamin D	(a)	26.8	63.5
(c)	Iron			
(d)	Don't know			
What is lost from the body due to drinking alcohol?				
(a)	Iron			
(b)	Vitamin A	(c)	14.6	71.9
(c)	B-Vitamins			
(d)	Don't know			
What vitamin is destroyed in the body by smoking cigarettes?				
(a)	Vitamin A			
(b)	Vitamin C	(b)	9.8	78.1
(c)	Vitamin D			
(d)	Don't know			

The mean score on the nutrition knowledge test was 10.87 ± 3.20 for supplement users and 10.24 ± 3.05 for non-users. A total of 20 points were possible. When a Student t-test was applied to the mean nutrition knowledge scores and supplement users and non-users, no significant differences were found (Table 5). From this information it appears that supplement users and non-users had comparable nutrition knowledge.

TABLE 5. T Value on Nutrition Knowledge: Supplement Users vs. Non-users.

Categories	Mean Scores Mean \pm SD	t	Sig.
Supplement Users	10.87 \pm 3.20	.861	.392
Non-users	10.24 \pm 3.05		

Health Beliefs Statements

Nine health beliefs statements were used to examine the degree to which elderly held common beliefs about nutritional supplements. The statement used 5-point Likert type scales The elderly persons were to indicate their responses of strongly disagree, disagree, neutral, agree, or strongly agree. Responses for this section were scored from 1 (strongly disagree) to 5 (strongly agree). A higher score denoted more positive agreement with each statement and a higher tendency to use supplements. Mean, standard deviation, and rank orders were summarized for each attitude statements in Table 6.

TABLE 6. Mean Scores of Health Beliefs Scales Results

Health Belief Statements	Mean	SD	Rank Order
Taking vitamin and mineral supplements will contribute to my overall health.	3.83	0.99	1
Most elderly persons need vitamin and minerals supplements to ensure proper nutrition.	3.75	0.97	2
If I take vitamin and mineral supplements, I will feel better.	3.44	1.00	3
Supplements can help reduce stress.	3.37	0.94	4
I can NOT fill all nutrient needs with food alone.	3.27	1.24	5
If I feel tired and run down, I should take extra vitamins.	3.22	1.11	6
Taking supplements can delay the effects of aging.	2.99	1.09	7
Eating a variety of foods provides all the vitamins and minerals necessary for health.*	2.70	0.99	8
I should take vitamin/mineral supplements only after consulting a physician.*	2.61	1.16	9

* This statement was scored in reverse, so the lower the number the stronger the agreement.

These elderly persons had strong beliefs that taking vitamin and mineral supplements will contribute to their overall health (mean = 3.83, SD = .99) and that most elderly persons need nutritional supplements to ensure proper nutrition

(mean = 3.75, SD = .97). They also believed that they will feel better if they take supplements (mean = 3.44, SD = 1.00) and that supplements can help reduce stress (mean = 3.37, SD = .94). They were in agreement with the statement, “ I can not fill all the nutrient needs with food alone” (Mean =3.27, SD = 1.24) and with the statement, “ If I feel tired and run down, I should take extra vitamins” (Mean= 3.22, SD= 1.09). However, their opinion of “taking supplements can delay the effects of aging” seemed neutral (Mean = 2.99, SD = 1.09).

The statements of “eating a variety of foods provides all the vitamins and minerals” and of “ I should take vitamin/mineral supplements only after consulting a physician” were scored in reverse. So the lower the scores were, the stronger the agreement and the higher the tendency to use supplements. The findings suggested that the elderly persons also believed that eating variety of foods provides all the vitamins and minerals necessary for health (Mean = 2.70, SD = .99) and that they should take vitamin/mineral supplements only after consulting a physician (Mean = 2.61, SD = 1.16).

Table 7 summarizes the t scores of each health belief statement among supplement users and non-users. Findings indicated that elderly subjects who used supplements had more positive attitudes about vitamin and mineral supplementation than elderly subjects who did not use supplements. Supplement users believed that taking vitamin and mineral supplements contribute to their

overall health ($t = 2.32, p < 0.05$) and that they feel better when taking supplements ($t = 2.14, P < 0.05$). Supplement users also had a strong belief that they can not fill all the nutrients needs by food alone ($t = 2.84, p < 0.01$).

The mean score of the health belief statements was $3.37 \pm .62$ for supplement users and $2.93 \pm .42$ for non-users (Table 8). When a Student t-test was applied to the mean health statements scores between supplement users and non-users, there was significant difference in on the usage of vitamin and mineral supplements based on health beliefs of seniors ($t = 3.08, p < 0.03$).

TABLE 7. T Scores on Health Beliefs about Vitamins and Minerals: Supplement Users vs. Non-users.

Health Belief Statements	Users Mean \pm SD*	Non-Users Mean \pm SD*	t	Sig.
1. Taking vitamin and mineral supplements will contribute to my overall health.	3.96 \pm 1.08	3.36 \pm .99	2.32	.023 ^a
2. If I feel tired and run down, I should take extra vitamins.	3.26 \pm 1.24	3.04 \pm 1.02	.76	.448
3. I can NOT fill all nutrient needs with food alone.	3.59 \pm 1.18	2.74 \pm 1.14	2.84	.006 ^b
4. If I take vitamin and mineral supplements, I will feel better.	3.54 \pm 1.00	3.00 \pm 1.02	2.14	.036 ^a
5. I should take vitamin/mineral supplements only after consulting a physician. [‡]	2.85 \pm 1.25	2.44 \pm 1.16	1.36	.178
6. Eating a variety of foods provides all the vitamins and minerals necessary for health. [‡]	2.96 \pm 1.10	2.48 \pm 1.00	1.80	.076
7. Most elderly persons need vitamin and minerals supplements to ensure proper nutrition.	3.76 \pm 1.09	3.58 \pm .97	.65	.515
8. Supplements can help reduce stress.	3.45 \pm .98	3.13 \pm 1.03	1.30	.197
9. Taking supplements can delay the effects of aging.	3.02 \pm 1.11	2.67 \pm 1.20	1.24	.221

* Questions were scored on a 5-point Likert-type scale ranging from strongly disagree (1) to strongly agree (5).

¥ This statement was scored in reverse, so the lower the number the higher the tendency to use supplements.

a Significant at $p < 0.05$ level.

b Significant at $p < 0.01$ level

TABLE 8. T Score Mean Differences of Health Beliefs Statements: Supplement Users vs. Non-users.

Categories	Mean Scores Mean \pm SD	t	Sig.
Supplement Users	3.37 \pm .62	3.08	.003 ^a
Non-users	2.93 \pm .42		

a Significant at $p < 0.01$ level.

Discussion

This study was designed to correlate nutrition knowledge and health beliefs with nutritional supplement use among elderly. The sample were composed of 82 elderly who participated in Title III Nutrition Program of the Elderly in northwestern Wisconsin. Twenty-five of them were males and 57 of them were females. Fifty-three subjects (64.6%) reported they consumed some type of vitamin or mineral supplements: 44 of them consume supplements daily, 2 persons weekly, and 3 persons take supplements less than once per week.

Among all supplement users, calcium was the most commonly used supplement (31.7%), followed by multivitamins and minerals (30.5%), vitamin E (29.3%) and vitamin C (28.0%). This study supports the finding of Stanek and Sempek (1990) who also discovered calcium, multivitamins and minerals as the most frequently consumed supplements by the elderly. Houston et al. (1998) also reported that elderly people used multivitamins/minerals (28%) with the greatest frequency. Of the single supplements, vitamin C (13%), calcium (8%) and vitamin E (7%) were consumed most frequently. In a study by Yu and Smith (1999), vitamin C was the most commonly used supplement (19.1%), followed by mineral and other supplements (16.8%), multivitamins (13.5%) and vitamin E (10.5%).

The nutrition knowledge test reveals interesting information about the respondent's level of knowledge about specific vitamins and minerals. Only 30% of respondents correctly indicated that the statement that vitamin C can prevent common cold was false. This belief was a common misconception held by adolescents and young adults (Eldridge and Sheehan, 1994). About one-fourth (24.4%) of the respondents falsely believed that natural vitamins and minerals are more effective than synthetic ones. This belief was also held by the majority of the elderly participants of congregate meal programs in a previous study (Oakland & Thomsen, 1990).

When asked the question of what is essential to maintain healthy eyes and vision, only 37% of the respondents selected the correct response (vitamin A). Equally interesting is the finding that 63% of the sample did not know the answer to the question of what can help protect the body against cancer, when the correct response (vitamin C) seemed evident among the other choices. An even greater majority of the sample (81%) incorrectly selected "true" as the response to the item stating that vitamins and minerals provide energy.

The mean score on the nutrition knowledge test was 10.87 ± 3.20 for supplement users and 10.24 ± 3.05 for non-users. There was no significance difference on nutrition knowledge scores between supplement users and non-users. Nutrition knowledge scores were quite low with a mean of 10 out of 20

questions for the total group. This finding suggested that the nutrition knowledge of the elderly was very low in both supplement users and non-users. This result is the same as the study by Stanek and Sempek (1991). However, in the study of Pelletier and Kendall (1997), supplement use was positively associated with greater knowledge about diet-heart relationship.

The mean score of the health belief statements was $3.37 \pm .62$ for supplement users and $2.93 \pm .42$ for non-users ($t = 3.08, p < .003$). The overall health belief score was significantly lower ($p < 0.01$) for those who did not take vitamin and mineral supplements than for those who used supplements.

Therefore, it was concluded that older adults were more likely to be supplement users if they revealed a more favorable attitude and stronger beliefs toward supplement use.

This study indicated that supplement users had more positive attitudes toward vitamin and mineral supplements. This is similar to those of Eldridge and Edward (1994) and Neuhouser et al. (1999) who found that college students taking supplements believed that supplements was necessary to ensure proper nutrition and increase pep and energy, and that it was not possible to obtain enough micronutrients from food alone.

An individual's attitude toward a behavior denotes positive or negative feelings toward performing the behavior. Generally, a behavior with a perceived

beneficial outcome is more likely to be carried out than one that has a perceived negative outcome (Janz and Becker, 1984). It could be hypothesized that persons with positive attitudes are highly motivated and health-conscious group in which supplement use is part of a healthy overall lifestyle.

In addition, there were significant differences of the following health belief statements between supplement users and non-users: (1) taking vitamin and mineral supplements contribute to their overall health ($t = 2.32, p < 0.05$); (2) they feel better when taking supplements ($t = 2.14, p < 0.05$); and (3) they can not fill all the nutrients needs by food alone ($t = 2.84, p < 0.01$). Supplement users had a significantly stronger belief than non-users that it was not possible to obtain enough nutrients from food alone. This finding suggests that supplement users will continue to use supplements despite recommendations from health professionals to obtain nutrients from food instead of supplements.

Increased risk of malnutrition in the expanding population of older adults, their prevalent use of nutritional supplements, and their increased susceptibility to nutrition misinformation are current public health issues which compel the investigation of vitamin and mineral supplementation behavior in older adults. Professionals in the field of nutrition have the responsibility to expose older age groups to accurate nutrition information and to encourage safe and appropriate use of vitamin and mineral supplementation. Recognizing patterns of supplement

usage and related factors can help health professionals develop nutrition education programs, which encourage seniors to arrive at a safe regimen of supplement use appropriate for their needs.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, EDUCATIONAL IMPLICATIONS AND RESEARCH RECOMMENDATIONS

Chapter five present an overview of the procedures and finding of this study. Conclusions, recommendations for future study and education implication are also given.

Summary

The purpose of this study was to correlate nutrition knowledge and health beliefs with nutritional supplement use among elderly. The research objectives of this study were:

1. Describe demographic information of the elderly who attend Title III nutrition program.
2. Identify and describe the vitamin and mineral supplement use of the elderly.
3. Identify, describe and analyze nutrition knowledge of the elderly.
4. Identify, describe and analyze health beliefs of the elderly.

5. Determine if nutrition knowledge of the elderly have an effect on the use of vitamin and mineral supplements.
6. Determine if health beliefs affect the usage of vitamin and mineral supplements of the elderly.

The sample for this study comprised 82 elderly persons who participated in Title III Nutrition Program of the Elderly in Eau Claire County and Trempealeau County, Wisconsin. Data was obtained from a survey administered at congregate meal sites in April 2000.

The survey was developed by researcher and was divided into three sections. Section I asked elderly persons to record demographic information and nutritional supplement use. Section II included 13 true/false questions and 7 multiple choice items to identify elderly persons' nutrition knowledge. Section III included 9 attitude statements regarding nutrition supplements. A Likert scale was used to determine the extent to which the elderly persons agreed with each statement. Each answer was rated according to the following scale: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree and 5 = strongly agree.

The responses to the survey were analyzed by a University of Wisconsin-Stout Research and Statistical Consultant. Frequency counts and percentages were used to analyze the demographic information and nutrition supplements use. Frequency counts, percentages, means, and standard deviations were used

to analyze the data in Section II and Section III. Independent t-test was used to determine if there were significant differences between supplement users and non-users on nutrition knowledge and health beliefs.

There were 82 elderly persons who participated in the study and completed the survey. Twenty-five of them were males and 57 were females. Fifty-three subjects (64.6%) reported they consumed some type of vitamin or mineral supplements: 44 of them consumed supplements daily, 2 persons weekly, and 3 persons took supplements less than once per week. Among all supplement users, calcium was the most commonly used supplement (31.7%), followed by multivitamins and minerals (30.5%), vitamin E (29.3%) and vitamin C (28.0%).

The mean score on the nutrition knowledge test was 10.87 ± 3.20 for supplement users and 10.24 ± 3.05 for non-users. There was no significance difference on nutrition knowledge scores between supplement users and non-users.

The mean score of the health belief statements was $3.37 \pm .62$ for supplement users and $2.93 \pm .42$ for non-users. There was significant difference in on the usage of vitamin and mineral supplements based on health beliefs of seniors ($t = 3.08, p < 0.01$). In addition, there were significant differences of the following health belief statements between supplement users and non-user: (1)

taking vitamin and mineral supplements contribute to their overall health ($t = 2.32, p < 0.05$); (2) they feel better when taking supplements ($t = 2.14, p < 0.05$); and (3) they can not fill all the nutrients needs by food alone ($t = 2.84, p < 0.01$).

Conclusions

The research instrument was designed to answer the following questions:

3. Does nutrition knowledge have an effect on the use of vitamin and mineral supplements in older adults?
4. Do health beliefs affect the usage of vitamin and mineral supplement of the seniors?

After reviewing the demographic information and information regarding supplement use, nutrition knowledge, and health beliefs, some general conclusions can be made.

Responses to the nutrition knowledge quiz indicated that nutrition knowledge did not account for the use of vitamin and mineral supplements in elderly subjects. However, there was a statistically significant difference on health belief scores between supplement users and non-users. The overall health belief score was significantly lower ($p < 0.01$) for those who did not take vitamin and mineral supplements than for those who used supplements. Therefore, it was

concluded that older adults were more likely to be supplement users if they revealed a more favorable attitude and stronger beliefs toward supplements usage.

Educational Implications

The finding that nutrition knowledge scores were quite low with a mean of 10 out of 20 questions for the total group identifies the need for the enhancing nutrition education. With the restraints of time and money that senior center managers and program directors have to work within, utilization of community resources seems advisable. Perhaps area high school and university students could be utilized to plan and conduct a nutrition program at senior nutrition sites as part of a course requirement. The present study helped to identify weak areas of nutrition knowledge among elderly.

Health promotion activities are becoming increasingly recognized as a means to increase the quality of life. Having recognized the significance of health belief factor of supplement use, the health professionals in education, government, and marketing environments should update their knowledge of supplements and be aware of the beliefs that foster their use. Furthermore, health belief educational strategies should be developed to combat nutrition

misinformation to the elderly and to combat the nutrition misinformation that often surrounds the use of nutritional supplements.

Research Recommendations

Based on this study, recommendations for future research include the following:

1. For further investigation, it is recommended that the questionnaire be administered to meal participants in a Nutrition Program for the Elderly at larger, more urban locations.
2. It is recommended to investigate the motivations of nutritional supplement use among older adults to identify health reasons for taking supplements.
3. It is also recommended to investigate the relationship of nutritional supplement use and dietary intake to identify whether the public are using supplements as a substitute for healthful diets or as a complement to such diets.

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APPENDIX A
Questionnaire

This survey is part of my research for a Master's Degree in Food and Nutritional Science at the University of Wisconsin-Stout. DO NOT PUT YOUR NAME ON THE SURVEY. The questionnaire is completely anonymous. Your participation is appreciated.

I. General Information: Place a check in the blank next to the one response best describes you.

1. Gender:

Male Female

2. Age range:

60-69 70-79 80-89 90 or older

3. Education (check the highest level of achievement):

<input type="checkbox"/> 8 years or less	<input type="checkbox"/> Some college/vocational training
<input type="checkbox"/> Some high school	<input type="checkbox"/> College graduate
<input type="checkbox"/> High school graduate	<input type="checkbox"/> Post college

4. Do you take any vitamin or mineral supplements?

Yes No

If No, continue on page 2.

5. How often do you take vitamin or minerals supplements?

Daily Weekly Less than once / week

6. What type of supplements you are taking? (Check all that apply)

<input type="checkbox"/> Multivitamin/minerals	<input type="checkbox"/> Vitamin C	<input type="checkbox"/> Magnesium
<input type="checkbox"/> Vitamin B-complex	<input type="checkbox"/> Vitamin A	<input type="checkbox"/> Potassium
<input type="checkbox"/> Vitamin B-6	<input type="checkbox"/> Vitamin D	<input type="checkbox"/> Zinc
<input type="checkbox"/> Vitamin B-12	<input type="checkbox"/> Vitamin E	<input type="checkbox"/> Don't know
<input type="checkbox"/> Niacin	<input type="checkbox"/> Vitamin K	<input type="checkbox"/> Others:
<input type="checkbox"/> Folate	<input type="checkbox"/> Calcium	<input type="checkbox"/>
<input type="checkbox"/> Pantothenic acid	<input type="checkbox"/> Iron	<input type="checkbox"/>

II. Nutrition Knowledge: The following questions have been developed to help the researcher get a better indication of older adults understanding of nutrition.

A. True/False

Directions: For each of the following questions, circle the letter **T** if the information is **TRUE** or circle the letter **F** if the information is **FALSE**. Circle the correct answer.

- T F 1. Fruits and vegetables are good sources of vitamins and minerals.
- T F 2. Large doses of vitamins and minerals can be harmful to the body.
- T F 3. Overcooking of vegetables in large amounts of water removes some of the vitamin/mineral values.
- T F 4. Skim milk contains the same amount of vitamins, minerals, and protein as whole milk.
- T F 5. Potassium can be found largely in bananas and potatoes.
- T F 6. Zinc deficiency causes loss of ability to taste.
- T F 7. Vitamin D can be produced by the body from sunshine.
- T F 8. Vitamin C can prevent the common cold.
- T F 9. Beets are high in iron.
- T F 10. Medications can interfere with the body's supply of vitamins and minerals.
- T F 11. Vitamin and mineral supplements work best when taken with food.
- T F 12. Vitamins and minerals provide energy.

T F 13. Natural vitamins and minerals are more effective than synthetic vitamins and minerals.

B. Multiple Choices

Directions: For each of the following questions, select the best answer from the four listed. Write the letter of choice in the blank to the left of the question.

_____ 14. What is required for strong bones?

- (a) Vitamin D and calcium
- (b) Vitamin C and Vitamin E
- (c) Vitamin B-complex
- (d) Don't know

_____ 15. What can help protect the body against heart disease?

- (a) Vitamin D
- (b) Vitamin E
- (c) Iron
- (d) Don't know

_____ 16. What vitamin is destroyed in the body by smoking cigarettes?

- (a) Vitamin A
- (b) Vitamin C
- (c) Vitamin D
- (d) Don't know

_____ 17. What is essential to maintain healthy eyes and vision?

- (a) Vitamin A
- (b) Vitamin K
- (c) Vitamin B-complex
- (d) Don't know

_____ 18. What is important for healthy nerves?

- (a) Vitamin A
- (b) Vitamin B-complex
- (c) Vitamin D
- (d) Don't know

_____ 19. What is lost from the body due to drinking alcohol?

- (a) Iron

- (b) Vitamin A
- (c) B-Vitamins
- (d) Don't know

_____ 20. What can help protect the body against cancer?

- (a) Vitamin C
- (b) Vitamin D
- (c) Iron
- (d) Don't know

III. Health Beliefs: Below are statements concerning your beliefs about vitamin and mineral supplements. Please circle your response to each statement using the following scale of 1 (strongly disagree) through 5 (strongly agree).

1	2	3	4	5	
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
1. Taking vitamin and mineral supplements will contribute to my overall health.	1	2	3	4	5
2. If I feel tired and run down, I should take extra vitamins	1	2	3	4	5
3. I can NOT fill all nutrient needs with food alone.	1	2	3	4	5
4. If I take vitamin and mineral supplements, I will feel better.	1	2	3	4	5
5. I should take vitamin/mineral supplements only after consulting a physician.	1	2	3	4	5
6. Eating a variety of foods provides all the vitamins and minerals necessary for health.	1	2	3	4	5
7. Most elderly persons need vitamin and mineral	1	2	3	4	5

supplements to ensure proper nutrition.

8. Supplements can help reduce stress. **1 2 3 4 5**

9. Taking supplements can delay the effects of aging. **1 2 3 4 5**

APPENDIX B

Informational Letter

Mei-Chun Patty Yeh
Graduate Student in Food and Nutritional Science
2624 Fryklund Dr. Apt.3
Menomonie, WI 54751
Telephone: 715-235-4155

Dear Participant,

I am a graduate student at the University of Wisconsin-Stout in Menomonie, WI. As part of my graduate work in the Department of Food and Nutritional Science, I am conducting a survey on the use of vitamin and mineral supplements.

If you choose to participate, a survey will be given to you. The survey will include demographic information, use of vitamins and minerals, nutrition knowledge, and health beliefs. This questionnaire will take 10 minutes of your time to complete. The results of this study will be used to develop a nutrition education program to encourage safe and appropriate use of vitamin/mineral supplementation.

Your participation in this study is strictly voluntary. The information provided will be kept strictly confidential. The results of this study will be available to you to read. By returning this questionnaire, you are giving informed consent as a participating volunteer in this study. If you have any concerns with this project, you may contact Mei-Chin Patty Yeh, 715-235-4155, Karen Zimmerman, PhD, Department of Home Economics, Menomonie, WI, 715-232-2530 or Ted Knous, PhD, Chair of the Committee for the Protection of Human Subjects, UW-Stout, Menomonie, WI, 54751, 715-232-1126.

Thank you for your time and effort with this study.

Respectfully,

Mei-Chun P. Yeh
Graduate Student
Food and Nutritional Science
University of Wisconsin-Stout

APPENDIX C
Educational Tool

A. True/False

Q1. Fruits and vegetables are good sources of vitamins and minerals.

Correct answer: **True**

Colorful fruits and vegetables provide large amounts of vitamins, minerals, and dietary fibers. The 1995 Dietary Guidelines for Americans recommends eating 5 to 9 servings of fruits and vegetables daily.

Q2. Large doses of vitamins and minerals can be harmful to the body.

Correct answer: **True**

Many people believe that eating large amount of vitamins and minerals provide them with extra energy, protection from disease, and prolonged youth. In contrast, our total vitamin/mineral needs to prevent deficiency symptoms are really quite low.

Regular use of a “one-a-day” type of multivitamin and mineral supplement usually yields less than two times of RDA. Therefore, it is unlikely to cause toxicity problems. However, taking too much vitamin A and D can cause health problem.

Q3. Overcooking of vegetables in large amounts of water removes some of the vitamin/mineral values.

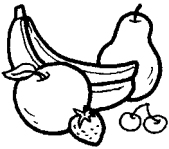
Correct Answer: **True**

Water-soluble vitamins can be lost in cooking due to heat and leaching into the cooking water. Steaming, stir-frying, microwaving, or simmering vegetables in little water retains most of the B vitamins and vitamin C

Q4. Skim milk contains the same amount of vitamins, minerals, and protein as whole milk.

Correct Answer: **True**

Skin milk and whole milk have the same amount of vitamins, minerals and protein. The only difference between them is that skim milk contains less than 1% of fat per serving compared with whole milk.



Q5. Potassium can be found largely in bananas and potatoes.

Correct Answer: **True**

The minimum potassium requirement for health for adults is 2000 mg/day. Our diets supply enough potassium if a variety of foods are eaten. Leafy melons, banana, potatoes, and tomatoes are rich sources of potassium.

Q6. Zinc deficiency causes loss of ability to taste.

Correct Answer: **True**

Zinc deficiencies are most found in hospital patients with sever malabsorption, In addition, people with alcoholism, older people, and strict vegetarians can be low in zinc. Common symptoms of zinc deficiency in the elderly include reduced sense of taste and smell, lack of appetite, and hair loss.

In general, protein-rich diets are also rich in zinc. The best sources of zinc are oyster, shrimp, crab, beef, turkey, greens, and mushrooms. The adult RDA for zinc is 15 mg/day for men and 12 mg/day for women.

Q7. Vitamin D can be produced by the body from sunshine.

Correct Answer: **True**

Skin cells are capable of producing vitamin D for the body. The amount of sun exposure needed to produce vitamin D depends on the darkness of the skin. Young light-skinned people need approximately 15 minutes a day in the sun. Dark-skinned people need more sun exposure.



Young people need less time In the sun than the elderly.

Q8. Vitamin C can prevent the common cold.

Correct Answer: **False**

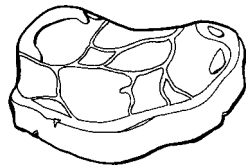
The common cold is actually a group of minor infections caused by viruses. Sometimes a viral infection is followed by a more serious bacterial infection of the throat, lungs or ear.

Vitamin C **cannot** prevent the common cold. Consuming vitamin C may decrease a cold's severity somewhat. However, there is no striking evidence that vitamin C greatly decreases the severity or duration of a cold.

Q9. Beets are high in iron.

Correct Answer: **False**

Beets are **not** high in iron. The best iron rich foods are spinach, oyster, liver, peas, and legumes. Other sources of iron in the diet include: animal products, such as beef steak and roast; bakery products made with iron-fortified flour; and iron-fortified formula and cereals.



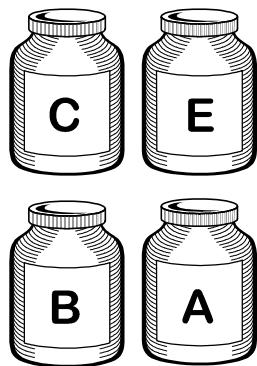
Q10. Medications can interfere with the body's supply of vitamins and minerals.

Correct Answer: **True**

Long-term use of certain medications may pose serious concerns for older adults' nutritional status. Prescriptions and over-the-counter medications can affect nutritional status by increasing or decreasing appetite, altering the absorption of nutrients, affecting how the body uses nutrients, and increasing the excretion of certain vitamins and minerals.

The most common ones are

- (1) an increased need for potassium when taking some types of diuretics, and
- (2) a decreased production of vitamin K in the intestine when taking antibiotics.



Q11. Vitamin and mineral supplements work best when taken with food.

Correct Answer: **True**

Most vitamin and mineral supplements should be taken with food for better absorption.

Q12. Vitamins and minerals provide energy.

Correct Answer: **False**

Vitamins and minerals provide **no** energy. The main role of vitamins and minerals is to enable many chemical reactions in the body to occur.

Q13. Natural vitamins and minerals are more effective than synthetic vitamins and minerals.

Correct Answer: **False**

Whether isolated from foods or synthesized in the laboratory, vitamins are the same chemical compounds and **work equally well** in the body. Claims in health-food literature that “natural” vitamins isolated from foods are more healthful than those synthesized in a laboratory are unfounded.

B. Multiple Choices

 a 14. What is required for strong bones?

- (e) **Vitamin D and calcium**
- (f) Vitamin C and Vitamin E
- (g) Vitamin B-complex
- (h) Don't know

Vitamin D and calcium are both essential for maintaining healthy bones. Calcium is a major part of bone structure. Calcium requires vitamin D for effective absorption. Adequate intake of calcium and vitamin D and regular exercise are necessary to prevent bone loss in older adults.

b 15. What can help protect the body against heart disease?

- (e) Vitamin D
- (f) Vitamin E**
- (g) Iron
- (h) Don't know

Vitamin E functions primarily as an antioxidant, which can help protect the body against heart disease. The best food sources of vitamin E are plant oils, margarine, some fruits and vegetables, such as peaches and asparagus. A diet rich in fruits and vegetables, along with a teaspoon of plant oil in foods eaten each day, supplies plenty of vitamin E.

b 16. What vitamin is destroyed in the body by smoking cigarettes?

- (e) Vitamin A
- (f) Vitamin C**
- (g) Vitamin D
- (h) Don't know

Smokers generally have lower vitamin C stores. The 1989 RDA for vitamin C for adults is 60 mg/day. Cigarettes smokers should consume at least 100 mg/day of vitamin C.

a 17. What is essential to maintain healthy eyes and vision?

- (e) Vitamin A**
- (f) Vitamin K
- (g) Vitamin B-complex
- (h) Don't know

The best-defined function of vitamin A is vision. A deficiency of vitamin A results in inflammation of the eye and night blindness.

The best sources of vitamin A are liver, carrots, eggs, tomatoes, vegetable soups, whole milk, and greens. A varied diet rich in green vegetables and carrots ensures meeting vitamin A needs.

b 18. What is important for healthy nerves?

- (e) Vitamin A
- (f) Vitamin B-complex**
- (g) Vitamin D
- (h) Don't know

Most of the B vitamins function in the development or maintenance of the nervous system. Deficiencies of thiamin, niacin, vitamin B-1, and vitamin B-6, as well as excessive alcohol use, causes central nerve system problem in the elderly.

c 19. What is lost from the body due to drinking alcohol?

- (e) Iron
- (f) Vitamin A
- (g) B-Vitamins**
- (h) Don't know

Consuming large amounts of alcohol may reduced appetite and impair vitamin B metabolism in older adults. Alcohol increases a person's requirements of B vitamins, including B1, B6, biotin, and niacin. Deficiencies of thiamin, niacin, and riboflavin also occur with alcohol abuse.

a 20. What can help protect the body against cancer?

- (e) Vitamin C**
- (f) Vitamin D

- (g) Iron
- (h) Don't know

Many nutrients promoted as keys to prevent cancer. They are called anticarcinogens. The most important ones are beta-carotene (a plant form of vitamin A), vitamin E, vitamin C, and selenium. All four of these nutrients functions as antioxidants in the body.

Vegetables and fruits may reduce the risk of cancers. These foods are normally rich in beta-carotene and vitamin C, dietary fiber and vitamin E.

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