BIRKHOLZ, C. L. Nutritional knowledge and eating behaviors of phase III cardiac rehabilitation program participants. MS in Adult Fitness/Cardiac Rehabilitation, December 1999, 46pp. (R. Mikat)

Nutritional knowledge and eating behaviors were compared in Phase III cardiac rehabilitation (CR) participants (N = 47, 38 males, 9 females) and adult fitness (AF) participants (N = 38,17 males, 11 females) of the La Crosse Exercise and Health Program. Subjects completed a personal background questionnaire, the Hawkes-Nowak (1998) nutrition questionnaire, and a 3-day food diary. A 2x2 ANOVA indicated no significant differences ($p > .05$) existed with nutrition knowledge in AF vs. CR participants and males vs. females. However, there were significant differences in eating behaviors between AF and CR participants ($p < .01$) and between males and females ($p < .01$). No significant interactions were found. CR females and AF males exhibited a significant correlation ($r = .83$ and $r = .71$, respectively) between nutritional knowledge and behaviors. In conclusion, CR participants' eating behaviors were healthier than AF participants' and women's eating behaviors were healthier than men's. These findings suggest that CR nutrition education programs should include better follow-up, assessment plans, and tactics directed towards improving nutritional behaviors in men.

NUTRITIONAL KNOWLEDGE AND EATING BEHAVIORS OF PHASE III CARDIAC REHABILITATION PROGRAM PARTICIPANTS

A MANUSCRIPT STYLE THESIS PRESENTED

TO

THE GRADUATE FACULTY

UNIVERSITY OF WISCONSIN-LA CROSSE

IN PARTIAL FULFILLMENT

OF THE REQUIREMENTS FOR THE

MASTER OF SCIENCE DEGREE

BY

CORIE L. BIRKHOLZ

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COLLEGE OF HEALTH, PHYSICAL EDUCATION, AND RECREATION

UNIVERSITY OF WISCONSIN-LA CROSSE

THESIS FINAL ORAL DEFENSE FORM

Candidate: Corie L. Birkholz

We recommend acceptance of this thesis in partial fulfillment of this candidate's requirements for the degree:

Master of Science in Adult Fitness/Cardiac Rehabilitation

The candidate has successfully completed the thesis final oral defense.

Thesis Committee Chairperson Signature — Date: 7-9-99

Thesis Committee Member Signature — Date: 7/9/99

Thesis Committee Member Signature — Date: 7-9-99

This thesis is approved by the College of Health, Physical Education, and Recreation.

Associate Dean, College of Health, Physical Education, and Recreation — Date: 7-27-99

Director of University Graduate Studies — Date: 7-27-99

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A great appreciation to all the LEHP cardiac rehabilitation and adult fitness members who took interest and participated in my study. I could not have done this without all of you. I hope my study has helped you reflect and directs you in your path to optimal health.

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INTRODUCTION

According to the American Heart Association (AHA),[1] heart disease is the number one cause of death for both adult men and women in the United States. An individual's risk of developing heart disease is based on his or her number of non-modifiable and modifiable risk factors.[2] Non-modifiable risk factors include age, gender, and heredity and cannot be changed by the individual. Modifiable risk factors involve lifestyle and can be changed by the individual. Among the modifiable risk factors are nutritional behaviors.[3]

Many nutritional behaviors can influence the risk of developing heart disease. Excessive sodium intake has been found to increase blood pressure in some people.[4, 5] Chronically high blood pressure is directly associated with increased risk of cardiovascular disease.[6,7] Overeating and eating high-fat foods can lead to obesity, which also increases the risk of heart disease.[8,9] Saturated fat and dietary cholesterol increase serum cholesterol levels, which leads to increased risk of atherosclerosis.[8-12]

Just as some nutritional behaviors will raise an individual's risk of developing heart disease, others will lower the risk. Among the behaviors that lower heart disease risk is the ingestion of antioxidants. Antioxidants are found naturally in many fruits and vegetables and include the vitamins E, C, and beta carotene. Antioxidants help to eliminate free-radicals in the body -- greatly reducing the risk of heart disease and

cancer.[13-18] Finally, a diet that is high in soluble fiber (such as oat bran) will reduce serum cholesterol by binding to it in the digestive tract.[19]

Avis, McKinlay, and Smith[20] identified education as one of the factors that influences nutritional behaviors. Cardiac patients receive educational information as a part of their Phase I and II rehabilitation programs, however, the assessment of nutritional knowledge among cardiac rehabilitation patients has not been adequately examined.[21] Moreover, the relationship between nutritional knowledge and eating behaviors among cardiac rehabilitation program participants is not apparent in the current literature. Therefore, the purpose of this study was to examine the relationship between nutritional knowledge (specifically regarding fat, cholesterol, and fiber intake) and personal eating behaviors in cardiac patients of a Phase III rehabilitation program. An ancillary purpose was to examine the intake of antioxidants and sodium, which are also important for a heart healthy diet.

METHODS

Subjects

Seventy-five members of the La Crosse Exercise and Health Program (LEHP) participated in this study. Forty-seven cardiac rehabilitation (CR) participants (38 males, 9 females) volunteered to be in the study. This treatment group had received various types of nutrition education through the use of videos, pamphlets, lectures, and individual or group sessions while in Phase I or II of their rehabilitation. The control group contained 28 adult fitness (AF) participants (17 males, 11 females) who also volunteered to be in this study. This group had no known heart disease, therefore they did not receive

the nutrition education as the treatment group. Ages ranged from 26 - 84 (67 ± 9). After the investigator received approval from the University of Wisconsin-La Crosse Institutional Review Board, the volunteers received instructions both verbally and in a letter regarding their informed consent and participation in this study.

Procedures

All CR and AF participants were sent a letter describing the study and instructions for becoming a subject (see Appendix A). Additionally, study announcements were posted during the LEHP hours. Participants were sent a confirmation/thank you letter (see Appendix B) which included instructions for their personal background and nutritional knowledge questionnaires. Subjects were informed they had 2 weeks to complete and return the questionnaires. After returning the questionnaires, subjects were given a 3-day food diary with instructions for completion and to return the completed diary within 2 weeks. Subjects included in this study were those who had completed their personal background questionnaire, nutritional knowledge questionnaire, and 3-day food diary by the designated deadlines.

Questionnaires

The personal background questionnaire (see Appendix C) was modified from the medical/health history questionnaire administered by the LEHP. The questionnaire contained 10 questions, which assessed participant heart health, education, and dietary practices.

The Hawkes-Nowak questionnaire (see Appendix D) was used to assess subject nutritional knowledge. This tool contains 38 questions, which examine the intake of fats,

cholesterol, and fiber in the diet. It was examined by Hawkes and Nowak in 1998 and found to be both reliable (r = .71 using Cronbach's alpha) and valid.[22]

Food Diary

Subjects were asked to record the type and quantity of every food and beverage that was consumed for 3 days (see Appendix E). Each subject's 3-day food diary was composed of 2 weekdays and 1 weekend day. Subjects were instructed to eat normally during the 3 days so that their diaries would represent usual eating patterns.

Statistical Treatment

NutriQuest (The McGraw-Hill Companies, Inc.), a computerized dietary analysis program, was used to evaluate the 3-day food diaries. Dietary categories evaluated were vitamins A, C, and E, (antioxidants), fiber, total fat, saturated fat, cholesterol, and sodium. Category scores represented the percentage of each participant's RDA that was consumed for each category of nutrient. The total nutritional score was the sum of all six category scores.

All statistical operations were performed with SPSS 9.0. A 2x2 ANOVA was used to determine if significant knowledge or behavior differences existed among groups. Alpha was set at .05.

RESULTS

Seventy-five LEHP members volunteered to be in this study. Fisher's tests for skewness and kurtosis revealed the data were normal. No significant differences ($p > .05$) existed in nutritional scores between males and females or between AF and CR groups. There were, however, significant differences in eating behavior scores between

males and females ($p < .01$) and between AF and CR groups ($p < .01$). Mean nutrition and eating behavioral scores are presented in Figures 1 and 2. No significant interactions were found between groups. Descriptive data of the subjects are summarized in Table 1. Summarized nutrient intakes are presented in Table 2. Subjects' nutrition and behavioral scores are found in Table 3.

Two groups had significant ($p < .05$) correlations between nutritional knowledge and eating behavior. These groups were the CR females ($r = .83$) and AF males ($r = .71$). Interestingly, CR male participants exhibited an extremely low correlation between nutritional knowledge and eating behavior ($r = .06$). Correlations found between groups are presented in Table 4.

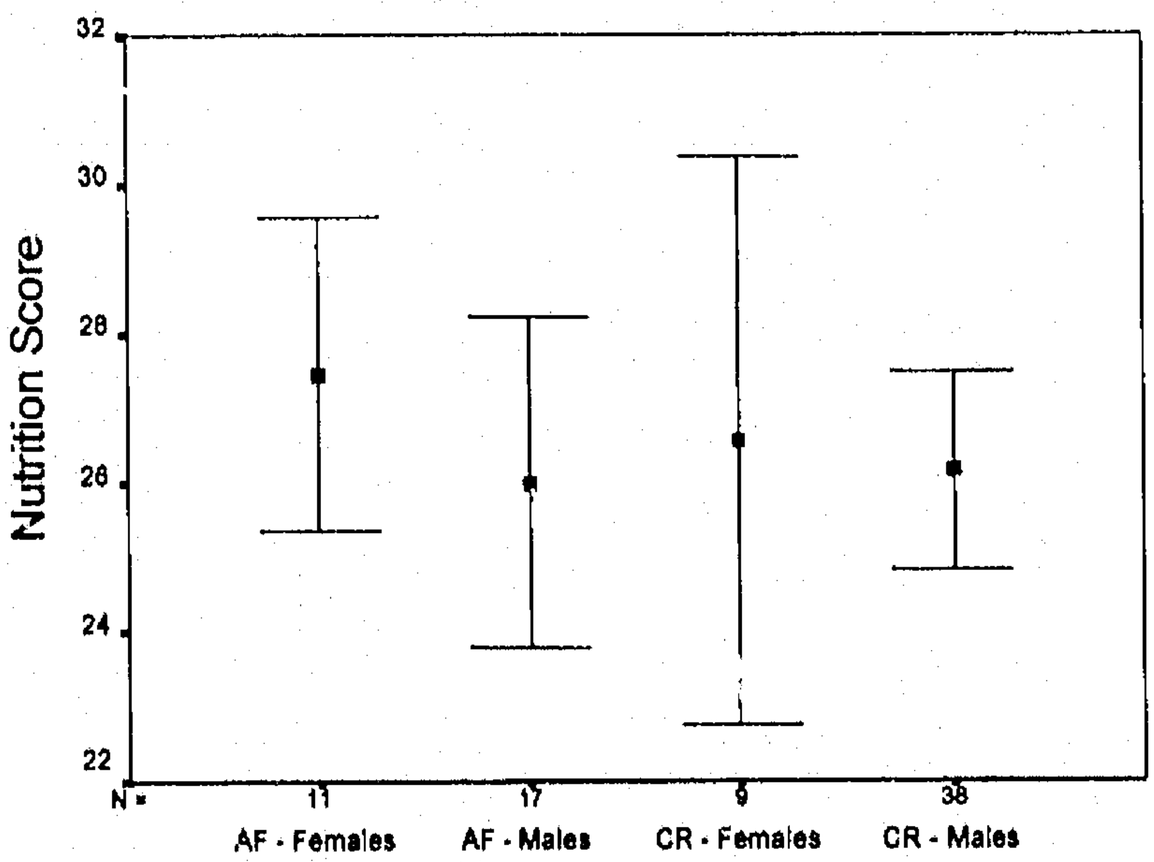

Figure 1. Mean Nutrition Scores $\pm$ 2 Standard Errors

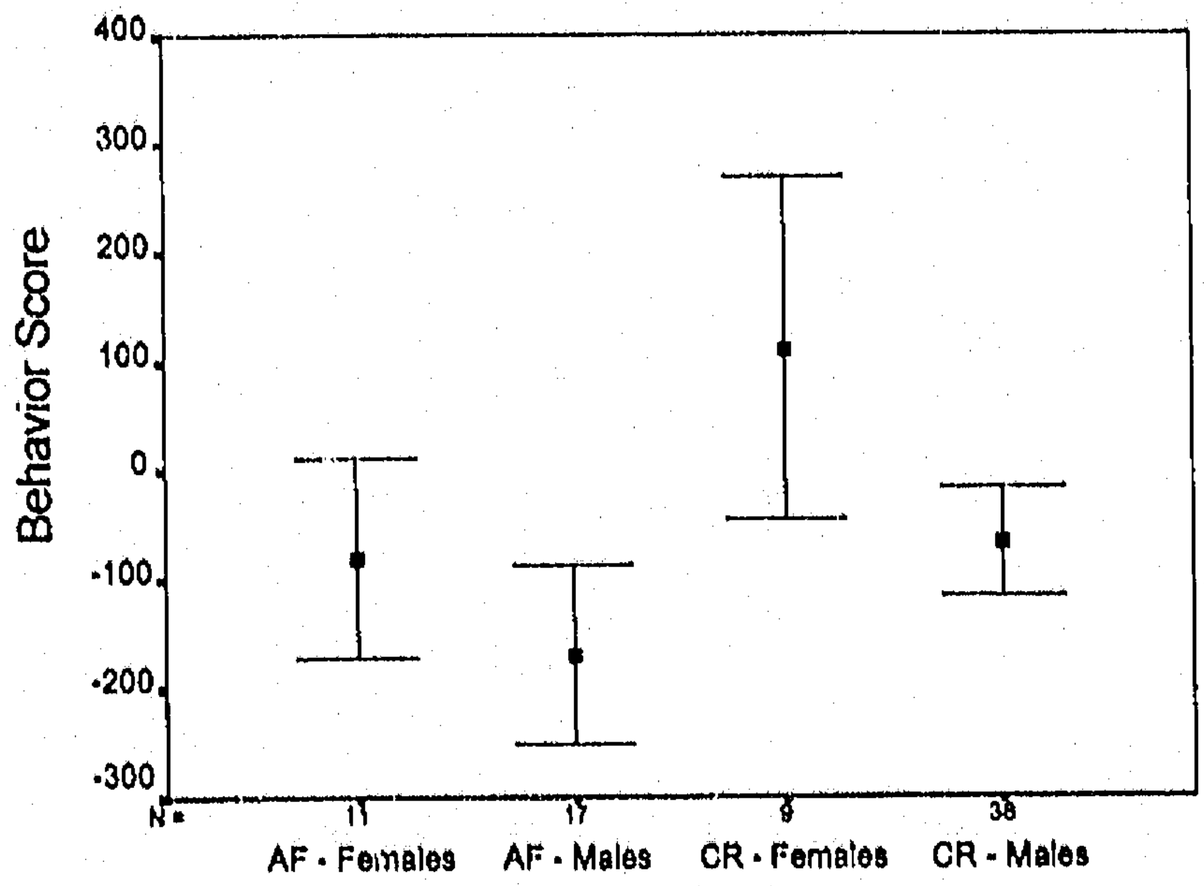

Figure 2. Mean Behavioral Scores ± 2 Standard Errors

Table 1. Group Characteristics (Mean ± SD)

Group	n	Age Range	Age	Height (cm)	Body Mass (kg)	Number of Heart Incidences
AF	28	49-82	66 ± 5	172 ± 10	80 ± 12	0
Males	17	60-77	67 ± 5	178 ± 7	87 ± 7	0
Females	11	59-71	64 ± 4	161 ± 4	70 ± 10	0
CR	47	26-84	67 ± 11	174 ± 10	82 ± 16	2 ± 1
Males	38	26-84	66 ± 11	178 ± 7	86 ± 14	2 ± 1
Females	9	64-79	72 ± 5	159 ± 9	65 ± 8	1 ± 1

Table 2. Nutrient Intake -- Percentage of RDA (Mean ± SD)

Group	Antioxidant	Fiber	Total Fat	Saturated Fat	Cholesterol	Sodium
AF	132 ± 61	57 ± 24	147 ± 29	136 ± 41	127 ± 100	115 ± 46
Males	140 ± 68	61 ± 24	154 ± 27	146 ± 39	145 ± 119	126 ± 54
Females	120 ± 48	51 ± 23	135 ± 29	119 ± 41	99 ± 54	98 ± 23
CR	154 ± 95	68 ± 27	130 ± 37	108 ± 39	95 ± 56	122 ± 39
Males	139 ± 68	69 ± 27	132 ± 37	110 ± 38	103 ± 58	130 ± 38
Females	217 ± 157	67 ± 27	120 ± 36	102 ± 47	62 ± 31	89 ± 19

Table 3. Nutrition and Behavioral Scores (Mean ± SD)

Group	Nutrition Score	Behavioral Score*
AF	27 ± 4	-135 ± 167
Males	26 ± 5	-170 ± 171
Females	27 ± 3	- 82 ± 153
CR	26 ± 4	- 32 ± 185
Males	26 ± 4	- 67 ± 156
Females	27 ± 6	111 ± 235

* Significant differences ($p < .05$) shown in AF vs. CR and males vs. females

Table 4. Correlations Between Nutritional Knowledge and Eating Behaviors

Group	n	R	r^2	Adjusted r^2	SEE
AF	28	.55	.30	.28	141.96
Males	17	.71	.50*	.47	124.77
Females	11	.13	.02	-.10	159.92
CR	47	.30	.07	.05	198.68
Males	38	.06	.003	-.03	187.34
Females	9	.83	.69*	.64	141.00

* Significant at .05

DISCUSSION

Researchers regularly evaluate eating behaviors through the use of food frequency questionnaires, diaries, and dietary recalls. Assumptions have been made by researchers that nutritional behaviors are affected by the knowledge, attitudes, and beliefs of an individual.[21, 23-27] Plous, Chesne, and McDowell[21] reported their subjects viewed their diet as important in primary and secondary prevention of heart disease, however, they were confused about the nutrition information given to them. Their mean score of 35% on a nutrition quiz reflected this confusion. Another study showed that subjects' eating behaviors were independent, while attitudes toward eating were dependent on their social backgrounds.[23] A study done by Mann et al demonstrated positive eating behavior changes were associated with an increase in positive health beliefs.[25] The purpose of this

study was to test these assumptions by assessing the correlations between nutritional knowledge and eating behaviors.

The results reported here indicate that CR participants eat healthier than AF participants. The correlation between nutritional knowledge and eating behaviors was .29 for CR participants and .55 for AF participants. Therefore, despite the additional nutrition education the cardiac participants received during their Phase I or Phase II programs it seemed that factors other than nutritional knowledge contributed to their healthier eating behaviors. Conversely, Bedell and Shackleton[24] reported no significant differences in eating behaviors between their control and treatment groups, although the latter group had received nutrition education sessions. However, McIntosh et al [23] reported that the more misinformed their subjects were, the more likely they were to change their eating behaviors with instructions.

An examination of gender differences revealed that female participants had healthier diets than male participants. No significant differences in nutritional knowledge scores between genders were found. This study agrees with the Mann et al[25] findings in which males and females exhibited no difference in mean nutritional quiz scores. Additionally, reported women being more confused on how to stay healthy. Non-significant correlation coefficients were found between nutritional knowledge and eating behaviors in females ($r = .48$) and in males ($r = .28$). This suggests that better eating behaviors were not associated with improved nutritional knowledge.

The correlation between nutritional knowledge and eating behaviors for CR males and females was .06 and .83, respectively. This indicates that the females applied what they knew to their diet and the males clearly did not.

In summary, CR participants ate healthier than AF participants and females ate healthier than males. Healthier behaviors appeared to correlate well with nutritional knowledge in CR women and AF men. Data suggests that the current CR nutrition education programs do not significantly improve eating behaviors in both men and women. It is therefore recommended that future programs include assessment plans, follow-up evaluations, hands-on nutrition applications, and improved tactics directed towards improving nutritional behaviors in males. It is further recommended that additional research be conducted to evaluate nutritional knowledge and behaviors in other populations.

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APPENDIX A

COVER LETTER

February 3, 1999

Dear Participant,

As a cardiac rehabilitation or adult fitness participant in the La Crosse Exercise and Health Program your participation in this nutritional study would be of great benefit to you personally and to the advancement of knowledge in nutrition and cardiac rehabilitation. This study will examine the relationship between nutritional knowledge and personal eating patterns in cardiac rehabilitation participants like you. I am asking for volunteers to be in my study.

I have studied eating habits, attitudes, and nutritional knowledge in K-12 students. I would now like to expand my studies to include LEHP participants. Participants in this study will be asked to complete questionnaires on health background and nutrition and to complete a 3-day food diary.

The questionnaires have been enclosed with this letter. Please understand that the completion and return of the questionnaires will indicate your consent to participate in my study. Should you choose to participate, the 3-day food diary will be sent to you after the return of your questionnaires.

Following the completion of the study, you will receive a printout of the 3-day food diary. This will include calorie breakdown and nutritional values through the use of tables or charts for easy interpretation. This will show you how healthy your diet was. In addition, the results of the completed study will be available upon your request.

Strict confidentiality will be adhered to for all individual data. Understand that group data may be used for professional publication and/or presentation. Please note that your data will be used only in the study outlined above and will not be included in other research or projects.

Signs will be posted and I will be available during program hours to answer any questions you may have in regards to this study. You may also reach me at home at 796-1996 or you may call Dr. Mikat at 785-8182. Hopefully you will find some time to be a subject in my study. Thank you in advance for your time and cooperation. Please note, in order to be a subject in this study your completed questionnaires must be returned to me by February 19.

Sincerely,

Corie Birkholz, B.S.

Dr. Richard Mikat, Ph.D.
Chair of research project

APPENDIX B

CONFIRMATION/THANK YOU LETTER

1141 Main St. #5
La Crosse, WI 54601
796-1996

February 3, 1999

Dear Participant,

Thank you for your interest and participation. I believe you will find this study both interesting and informative.

Attached you will find a personal health questionnaire and the nutritional knowledge questionnaire which you need to complete and return to me within two weeks. Please do not refer to any reference materials or confer with other people when completing the questionnaires. Answer all questions to the best of your abilities. Note that the term "ticking" the box in the instructions for the nutritional knowledge questionnaire is an Australian term which means "checking" the box. The completion and return of these questionnaires will indicate your consent to participate in my study. **Please note that the deadline for the questionnaires to be completed and returned to me is February 19.**

After completing and returning the questionnaires, you will receive your 3-day food diary and its instructions. You will have two weeks to complete the diary and return it to me.

Remember, your identity will be kept confidential. If you have concerns or questions do not hesitate to call me at 796-1996 or Dr. Mikat at 785-8182. Once again, thank you very much for your participation.

Sincerely,

Corie L. Birkholz

Dr. Richard Mikat
Chair of Thesis

APPPENDIX C

PERSONAL BACKGROUND QUESTIONNAIRE

PERSONAL BACKGROUND QUESTIONNAIRE

Please answer the following questions 1-10 which pertain to your personal health background. Your answers will be categorized and used in the study. Your name and answers will remain confidential.

Name: _____

Gender: Male Female Date of Birth:_____ Height:_____
(This is needed for the diet analysis program) Weight:_____

1. Please check conditions you may have:

___ Heart Attack

___ Angioplasty

___ Angina/chest pain, pressure, discomfort

___ Abnormal heart beats/arrhythmias

___ Stroke

___ Open heart surgery (CABG, valve, etc.)

___ Congenital heart problems

___ Congenital heart failure (fluid in lungs)

___ Heart murmurs

2. Name all the types of heart procedures you have had (i.e., angioplasty, by-pass, open-heart, transplant, catheterization, etc.)

_____

3. How long ago was your most recent heart incident?

One month Within the past year Within the past 2-5 years Over 5 years

4. Did you receive any nutritional information in connection with your most recent heart procedure?

Yes No

5. Please list any medical conditions you have that may alter your diet (i.e., diabetes, hypoglycemia, food allergies)

_____

6. How many times a week do you eat at a restaurant or order food in? _____

7. Of the number you answered in #6, how many of these are fast food? (McDonald's, pizza, etc.) _____

8. Would you attend nutrition and cooking classes on a regular basis if they were made available to you?

   Yes No

9. How would you rate your diet:

   1 Always Unhealthy
   2 Usually Unhealthy
   3 Equally Unhealthy/Healthy
   4 Usually Healthy
   5 Always Healthy

10. What is the level of education you have completed?

    Primary Secondary/GED Technical 4 year Masters Doctoral

APPENDIX D

HAWKES-NOWAK QUESTIONNAIRE

HAWKES & NOWAK NUTRITION KNOWLEDGE QUESTIONNAIRE

INSTRUCTIONS: Please answer ALL of the TEN questions by ticking the box that you feel is most correct.

1) To reduce your cholesterol level do you think you should eat less: (tick ONE box for each food)

FOODS	YES	NO	NOT SURE
Cakes and Biscuits			
Skim Milk			
Ice Cream			
The Fat on Meat			
Sugar			
Bread			
Peanuts			
Coconut			
Avocados			

Score ...../9

2) Cholesterol is only found in animal products:

❑ True ❑ False ❑ Not Sure Score ...../1

3) To reduce your cholesterol level is it more important to eat less saturated fat or less cholesterol?

(please tick ONE box)

❑ Saturated Fat ❑ Cholesterol ❑ Not Sure Score ...../1

4) Which has LESS fat? (please tick ONE box)

❑ Butter ❑ Margarine ❑ They Are Equal ❑ Not Sure Score ...../1

5) Which has LESS fat? (please tick ONE box)

❑ Olive Oil ❑ Vegetable Oil ❑ They Are Equal ❑ Not Sure Score ...../1

6) The correct way to lose weight is to eat LESS: (please tick ONE box for each food)

FOODS	YES	NO	NOT SURE
Bananas			
Cakes			
Bread			
Potatoes			
Grapes			
Butter			
Margarine			
Cheese			
Rice			

Score ...../9

7) Are these foods LOW in fat? (please tick ONE box for each food)

FOODS	YES	NO	NOT SURE
Toasted Muesli			
Spaghetti			
Rice			
Bread			
Nuts			
Margarine			
Olive Oil			
Carob Bar			

Score ...../8

8) The main ingredient in a food is listed LAST on a food label: (please tick ONE box)

❑ True ❑ False ❑ Not Sure

Score ...../1

9) Does one teaspoon of fat weigh: (please tick ONE box)

❑ 0.1 gram
❑ 1 gram
❑ 4 grams
❑ 10 grams
❑ Not Sure

Score ...../1

10) Do these foods contain fibre? (please tick ONE box for each food)

FOODS	YES	NO	NOT SURE
Steak			
Bakes Beans			
Apple Juice			
Bread			
Fish			
Oranges			

Score ...../6

Total Score ...../38

James Cook University, Townsville QLD 4811 AUSTRALIA
Ph: 0011 617 4722 5700
Email: Anna.Hawkes@jcu.edu.au

APPENDIX E

FOOD DIARY

3-DAY FOOD DIARY

Day One

Name_____

Please keep a 3-day record of everything that you drink and eat. One day constitutes from midnight to midnight. The three days must include two weekdays and one weekend day (a Friday, Saturday, or Sunday). Record WHEN you ate or drank an item (breakfast, lunch, dinner or for a snack), WHAT you ate (ONE item per line), the AMOUNT you ate or drank (ounces, slices, items, cups, etc.), the BRAND of food or drink when at all possible, and HOW the item was prepared.

Breakfast, Lunch, Dinner, Or a Snack	Foods that you consumed	Amount Consumed (ounces, cups, slices, etc.)	Brand Name	How it was Prepared

3-DAY FOOD DIARY

Day Two

Breakfast, Lunch, Dinner, Or a Snack	Foods that you consumed	Amount Consumed (ounces, cups, slices, etc.)	Brand Name	How it was Prepared

3-DAY FOOD DIARY

Day Three

Breakfast, Lunch, Dinner, Or a Snack	Foods that you consumed	Amount Consumed (ounces, cups, slices, etc.)	Brand Name	How it was Prepared

APPENDIX F

NUTRITION COMPARISON GUIDELINE

Nutrient Comparison Guidelines

My study evaluated the following nutrients, vitamins, and minerals that you consumed in your diet reported on your 3-day food diary:

Good Guys	Bad Guys
Vitamin A – antioxidant	Total fat
Vitamin C – antioxidant	Saturated fat
Vitamin E – antioxidant	Cholesterol
Dietary Fiber	Sodium

Each amount consumed was compared to the recommended dietary guidelines suggested for cardiac rehabilitation patients. Below is listed the caloric breakdowns per day suggested for a cardiac patient and the average American.

Bad Guys	Cardiac Patient	Average American
Total Fat	< 20%	< 30%
Total Saturated Fat	< 7% of total calories	< 10% of total calories
Cholesterol	< 200 mg	< 300 mg
Sodium	< 2400 mg *	< 2400 mg *

***Realize that many cardiac patients and the general population have high blood pressure and may be "salt sensitive" requiring a lower intake of sodium/salt.

Good Guys	Cardiac Patient	Average American
Vitamin A*	1000 RE for males 800 RE for females	1000 RE for males 800 RE for females
Vitamin C*	60 mg	60 mg
Vitamin E*	10 mg for males 8 mg for females	10 mg for males 8 mg for females
Dietary Fiber	25-30 g	25-30 g

***There are currently studies that show antioxidant supplements may have an effect on the progression or occurrence of cardiovascular disease. The AHA has not made recommendations for supplements for the general or cardiac populations until further studies are done.

Please note your percent intake of fats, carbohydrates, and proteins and your percent intake of saturated, polyunsaturated, and monounsaturated fats. This is handwritten on the bottom right hand side of the first page. Compare your average intake with the recommended intake on this page. Any questions please just ask! Thank you all very much. I really have appreciated your participation in my study!!!! ☺

APPENDIX G

REVIEW OF RELATED LITERATURE

REVIEW OF RELATED LITERATURE

Introduction

Patients in Phase I or II of a cardiac rehabilitation program are presented with dietary information instructions for eating healthy. This education is thought to improve the dietary patterns of these patients.

Dietary patterns are influenced by many factors including the knowledge, attitudes, and beliefs of an individual. This review will focus on these contributing factors and will include nutrients connected with a heart healthy diet.

Education

Most elderly individuals do not know or have accurate information on how to eat healthy.[1] This problem is addressed for patients in Phase I or Phase II of cardiac rehabilitation through nutrition education programs. This education is designed to increase the nutritional knowledge of patients, answer questions that they may have had prior to their heart incident, and to promote healthier eating patterns.

Society is presented with nutritional quackery on a daily basis. Data obtained by Krinke,[2] a Gallop Survey,[3] and the National Trends Survey[4] reveal that our society relies on newspapers and TV newscasts for nutritional information. In fact, between 44 to 67% of the people studied rely on these sources over nurses, doctors, and registered dietitians.[4] Although the major sources of nutritional information came from newspapers and TV newscasts, doctors, nurses, and registered dietitians were deemed to be the most reliable.

Seventy-nine percent of Americans believed nutrition alters their life, however, only 39% claimed to be doing everything possible to improve their nutrition.[4] Therefore, nutrition education must be an on-going process involving highly knowledgeable, certified sources. Hand, Antrim, and Crabtree[5] found that the technical nutritional knowledge of older adults did not necessarily represent their applied nutritional knowledge. In other words, dietary behavior did not correlate with nutritional knowledge. It was suggested that facts and the application of those facts needed to be taught and encouraged together in order for eating behaviors to change.

Motivation also must be addressed. Educators should apply material through various methods to reach all learners in order to motivate. In turn, learners of all types will retain the information, perhaps have less confusion and fewer questions over time, and apply the learned knowledge to their lifestyles.[2,6,7]

Beliefs

McIntosh et al[8] introduced two types of belief systems in their study of nutrition and diet practices of the elderly. The first was the scientific belief system. People who held scientific beliefs sought medical advice and participated in prevention. The second belief system was the popular belief system. People who affiliate with the popular belief system tend to deny their symptoms and do nothing about them. The popular belief system was more common among the less educated and older adults.

Confusion about nutrition in older adults and cardiac patients is apparent in literature. Ferrini, Edelstein, and Barret-Connor[9] reported an increase in the public's education about cardiovascular risk factors and the importance of health within the last

20 years. Despite this increase, almost half of the elderly respondents in this study reported confusion about health foods. Similarly, a General Mills survey (as cited in Krinke[2]) stated that older Americans lack adequate knowledge of a healthy diet.

In another study, 25% of the subjects reported being confused about what to do to stay healthy. Ninety-one percent of the subjects were willing to spend extra money on improving their health, however, 47% were confused about health foods and 25% were confused on what to do to stay healthy.[9] This study also found that older adults were less likely to make healthy behavioral changes than younger adults.

In another study of 486 subjects (predominantly Caucasian, mean age 59 years) who received dietary information, only 30% completely understood the information, 20% highly understood it, 39% somewhat understood it, and 9.7% stated the information was not very understandable.[10] This study concluded that two-thirds of the subjects had significant questions or confusion about the material.

Not all studies find that older adults are at risk for poor eating behaviors. The National Trends survey[4] showed the majority of Americans, 55 and older, strive to eat healthy. This survey also demonstrated that only 28% of adults between the ages of 25-34 years strive to eat healthy diets.

Attitudes

Attitudes can influence a person's learning and behaviors, and therefore, need to be addressed and examined in groups receiving an education program. Plous, Chesne, and McDowell[10] stated that cardiac patients view their diet as a means to treat and prevent heart disease. In spite of that attitude, Montgomery and Amos[11] found Phase I

patients to be too consumed with surviving their heart incident to be willing or able to learn heart healthy information. Phase II patients, those who have made it through a heart procedure and are recovering, are more open to this type of information. Karvetti[7] looked at the attitudes of myocardial infarct patients. In this study, the myocardial infarct patients used their incident as incentive to make effective and permanent changes in relation to their health attitudes and behaviors. Karvetti found that these changes were largely due to the nutritional education they received.

Knowledge

Many factors influence behaviors including; environment, beliefs, attitudes, and knowledge. Each of these factors, (particularly knowledge) is addressed through education. A limited number of studies have been done which assess the knowledge of cardiac patients and older adults in relation to their eating patterns.

The first study done on the knowledge and attitudes of cardiac patients was by done by Plous, Chesne, and McDowell.[10] This study showed that cardiac patients viewed diet as important but that their nutritional knowledge was very minimal. They further stated that for 543 subjects who took a 10-question nutritional knowledge quiz the mean score was 36% and fewer than 1 in 20 scored over 60%. Those who had previous heart conditions scored higher than those who had just experienced their first heart event. This suggests that multiple exposures to a healthy eating education program are effective in improving nutritional knowledge.

Montgomery and Amos[11] found that nutritional education was important beenuse cardiac diet guidelines are "complex and detailed." Repeated exposure was

necessary to produce changes in knowledge to alter behavior. Further, they found that older adults wish to learn about nutrition to clear up their confusion.

A recent publication from the American Dietetic Association reported that 67% of their National Trends Survey sample recognized the food guide pyramid and 43% found it useful in making food choices.[4] These findings reflect a low level of basic nutritional knowledge among American adults.

Antioxidants

Much research has been conducted on antioxidants and their role in preventing cardiovascular disease. Normal bodily functions produce substances called superoxides or free radicals. Free radicals are harmful for the body because they attack healthy cells and tissues.[12] These attacks weaken healthy cells, destroy tissues, and increase the risk of diseases such as cancer and coronary artery disease. Antioxidants reduce the cardiovascular damage caused by free radicals by reducing and preventing the oxidation of low-density lipoproteins (LDL).

Antioxidants reduce the oxidation of LDL in the blood. This in turn limits the progression of atherosclerosis. Low antioxidant vitamin intake has been associated with increased occurrence of angina.[13] In one study, the intake of beta-carotene caused a 44% reduction in all major coronary events in patients with chronic stable angina.[14] Further, an inverse relationship exists between antioxidant intake and acute myocardial infarctions.[15] Ingestion of antioxidants has also been associated with a decrease in the total number of cardiac events, less necrosis, less lipid perioxides, and a lower electrocardiogram QRS score.[16]

Antioxidants, primarily vitamins A, C, and E, are found naturally in fruits and vegetables. Despite their potential benefits 80% of Americans do not consume the recommended 3-5 servings of vegetables and 2-4 servings of fruit per day.[17] Thirty percent of Americans supplement their diet with antioxidant vitamins.[18]

Vitamin A

Vitamin A, a form of beta-carotene helps prevent damage caused by free radicals. The current recommended dose of vitamin A is 1000 retinal equivalents (RE) for males and 800 RE for females.[19]

The Nurses Health Study followed 87,000 women with no known heart disease for 8 years. These women took supplemental beta-carotene, vitamin C, and vitamin E. The ingestion of beta carotene produced a 22% decrease in the risk for experiencing a cardiovascular event.[20]

Likewise, the Health Professional's Follow-up Study followed 39,000 men for 4 years. These men decreased their chance of having a cardiovascular event by 25% when they consumed supplemental vitamin A.[20]

Vitamin C

Another name for vitamin C is ascorbic acid. Some studies have shown that vitamin C can reduce the risk of heart disease and stroke. The RDA[19] for vitamin C is 60 mg daily for both men and women.

Levine et al[21] showed an improvement in endothelial dysfunction with vitamin C ingestion among people with heart disease. They also showed that vitamin C supplementation reduced the oxidation of LDLs in the brachial ateries. According to

Hornig et al,[22] the antioxidant vitamin C increases the availability of nitric oxide, which allows vessels to dilate. This is especially important to people with heart disease who demonstrate endothelial dysfunction due to reduced levels of nitric oxide. Other studies have shown that vitamin C supplementation does not significantly increase cardiovascular health by decreasing cholesterol, blood pressure, or LDL.[23]

Vitamin E

Vitamin E is a powerful antioxidant. It's benefits have been related to protection of cells from free radical damage. Supplemental ingestion of vitamin E has been shown to decrease the development of various diseases.[24] It is thought that vitamin E is most effective when taken with Vitamin C.[25]

Stephens et al[26] showed that individuals who consumed 400 and 800 international units daily of vitamin E had decreased cardiovascular risks and less non-fatal myocardial infarctions. Supplemental vitamin E in women was shown to decrease the chance of developing heart disease according to the Nurses' Health Study.[27] This study included 87,000 nurses who took 100 mg of supplemental vitamin E. This resulted in a 36% reduction in the chance of developing heart disease. Prolonging the supplementation for periods of time greater than 2 years decreased the risk of developing heart disease by 40%.[27] Current recommended daily doses of vitamin E are 10 mg for males and 8 mg for females.[19]

Dietary Fiber

Two types of fiber (soluble and insoluble) are found in foods. Insoluble fiber aids in the body's normal bowel functions and has not been shown to reduce blood

cholesterol. Soluble fiber, however, has been shown to lower blood cholesterol. This type of fiber binds to cholesterol in the digestive tract and is then eliminated from the body.[28] One study demonstrated a 20% reduction in LDLs in subjects who consumed 10-20 grams of soluble fiber per day.[29] This type of fiber can also benefit diabetics because it contributes to the regulation of blood glucose following meals.[30]

Whole grain does not contain cholesterol. It is low in total and saturated fat, and contains complex carbohydrates. This makes whole grain foods a desirable low-calorie energy source for the body. Whole grains also contain vitamins A, C, and E, which as discussed previously are protective agents against heart disease.[31]

The recommended dietary intake for dietary fiber is or 20-35g.[32,33] Unfortunately, the average American only consumes about 11 grams of fiber per day.[32]

Dietary Cholesterol

The body produces the amount of cholesterol that it needs to support it's normal functions. Therefore measurable dietary cholesterol consumption is unnecessary and can increase the risk of CAD.

Dietary cholesterol generally comes from animal products such as meat, seafood, poultry, dairy foods, and egg yolks. Plant foods including fruits, vegetables, and products made from these sources do not contain cholesterol.

The ingestion of dietary cholesterol will increase serum cholesterol levels to some degree. Brown[34] documented slight increases in serum cholesterol levels when dietary cholesterol was above 200 mg/1000 kilocalories. Due to its influence on serum cholesterol, the AHA recommends that dietary cholesterol consumption be less than

300 mg and preferably less than 200 mg per day for both men and women.[35] The average American man consumes about 60 mg above this recommended level and the average American woman consumes about 40 mg less than this recommendation.[36]

It is estimated that 51% of Americans have serum cholesterol levels greater than 200 mg/dL. Twenty percent have levels greater than 240 mg/dL.[37] The desirable level is to be less than 200 mg/dL. Levels greater than 240 mg/dL is considered to be high and detrimental to health.[35]

Sodium

Sodium itself is an essential mineral needed in the body for functions such as muscle contractions and water balance.[38] This mineral is naturally found in milk, meat, and some vegetables. Both sodium and salt are added to a number of foods. The AHA[38] and ADA[39] recommend no more than 2,400 mg of sodium per day for both men and women. This is equivalent to of 1¼ teaspoons of table salt. Most Americans consume about 4,000 mg of sodium in a day.[39]

Researchers have declared that the effects of salt consumption on blood pressure are unclear. A double-blind study examined individuals between ages 60-78 and the affect of sodium on their blood pressures. Eighteen subjects had normal and 24 subjects had high blood pressures. All subjects were on a low sodium diet throughout the study and took sodium pills for one month and placebos for one month. Average blood pressures were the lowest during the low sodium intake period. This suggests that avoiding salty foods may be beneficial for everybody and not just for those who are hypertensive or "salt sensitive."[40,41]

Hypertension was responsible for nearly 40,000 deaths and influenced 200,000 other deaths in 1995.[42] Simply reducing the amount of salt or sodium in the diet may provide significant benefit to those with borderline or high blood pressure.

Saturated Fat

Saturated fat is solid at room temperature and has been shown to increase serum cholesterol and LDL levels. This positive relationship promotes the development of heart disease and atherosclerosis. How saturated fat affects blood cholesterol is still unclear. It may slow the elimination of LDL from the blood or influence the concentration and structure of lipoproteins.[43,44] To prevent negative health conditions, saturated fat intake should not exceed 7-10% of total caloric intake.[45,46]

Total Fat

People need a certain amount of the essential fatty acids found in their diet in order to maintain normal body functions. The AHA suggests that fat intake should be less than 30% of total caloric intake and between 10-20% of total caloric intake in those with heart disease.[35] A few cardiovascular risk factors, including high serum cholesterol and blood pressure, are linked to high levels of saturated fat in the diet. Conversely, low fat diets generally contain high volumes of fruits and vegetables, which supply beneficial amounts of fiber and vitamins. This extra consumption of beneficial nutrients can produce favorable health. Ornish, Brown, and Scherwitz[47] showed that low-level consumption of fat along with other lifestyle changes indeed reduced coronary lesion stenosis.

Summary

Eating behavior is one component that affects the heart's health. Promotion of a heart healthy diet includes the consumption of antioxidants (vitamins A, C, and E) and dietary fiber along with limiting the consumption of total fat, saturated fat, dietary cholesterol, and sodium. The AHA's Step I and Step II diets promote cardiovascular health and provide guidelines specifically for people with heart disease.

The decision to eat healthy is affected by a person's knowledge, beliefs, and attitudes. Continual education encourages an increase in knowledge, a healthy belief system, and positive attitudes to promote heart healthy diets.

Conclusion

A lack of education, false beliefs, and poor attitudes can contribute to an unhealthy diet. Health professionals must address these issues and assess them in their clients. This study supports the use of on-going nutrition education programs in CR participants. Technical and applied learning can not take place if people are confused. The longer education is prolonged the less (more poorly) educated they become and the more they adhere to the popular belief system (denying their problems and doing nothing about them). If nutrition education is included beyond Phase II programs and into Phase III programs, the application of nutritional knowledge may be more favorable.

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