Evaluation of a nutrition education activity for medical students in China

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In China, where cancers and cardiovascular disease are the major causes of morbidity and mortality, an important role for preventive medicine has emerged. Therefore, preparing China's medical students to tackle contemporary health problems requires attention to nutrition and health promotion in the medical curruculum. To evaluate the effectiveness of a nutrition education activity for medical students, a two-group pre-test/post-test nutrition education program was conducted in a medical university in south-western China (n=300 per group). Students in another south-western Chinese medical university served as controls (n=150 per group). Special features of the intervention were: (1) nutrition education materials developed from (a) the results of a pre-test survey of medical students and (b) discussions with medical students, faculty, and physicians; and (2) a multi-channel delivery, which included a classroom lecture-discussion; a nutrition knowledge competition; a handout providing a day's dietary allotment; campus radio and movie theatre announcements, and posters. Analysis of variance, chi-square, and t-tests showed a significant increase ($P<0.05$) in nutrition knowledge, but not in nutrition attitude score. The final nutrition knowledge and attitude scores were also found to be related to the students' increased exposure to the various channels ($P<0.001$). Also observed was an increase in the consumption of soybean and dairy products ($P<0.05$). It is concluded that the method is a useful and practical model for designing and developing student nutrition education activities in China, as well as demonstrating nutrition and health education methods among the medical university community.

Introduction

In China, the chronic diseases of cancer and cardiovascular disease are the major causes of morbidity and mortality[1], giving rise to the re-emergence of an important emphasis in the health care system for preventive medicine[2–4]. Since nutrition is an important component of preventive medicine, an understanding of the field has now become central to medical practice in almost any medical speciality in China. Therefore, preparing China's medical students to tackle contemporary health problems requires attention to health promotion, including nutrition, in the medical curriculum.

However, in China, there are 128 medical schools, none of which offers required courses in nutrition for their medical students. Three of the schools offer nutrition as a speciality. However, 36 of these medical schools do offer required nutrition and food hygiene courses for their public health majors[5]. The result is that the average medical student gets very few hours of nutrition in his or her 4–6 year curriculum.

A previous nutrition education assessment survey conducted among adults in both urban and rural Sichuan showed that an awareness of the diet/disease relationship among the Sichuan public is almost lacking[6]. However, the potential contribution of doctors providing patients with nutrition and health education is great. In 1988 this was affirmed by the Edinburgh Declaration, which was the action plan emerging from the World Conference on Medical Education. This action plan called for increased emphasis on Health Promotion in the curriculum[7].

This report describes a nutrition education activity conducted during the 1991 spring term at West China University of Medical Sciences (WCUMS), in Chengdu, Sichuan. The three goals of the nutrition education activity were (1) to improve the nutrition knowledge, attitudes, and practices of the medical students partici-

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pating in the activity; (2) to introduce some nutrition/health education methodology to the students and staff of the medical university; and (3) to provide information which could serve as a basis for establishing a nutrition elective for medical students.

WCUMS, established in 1910, is one of China's five key medical schools, and it is located in China's most populous province. WCUMS has six schools (Basic Medical Science, Medicine, Stomatology, Public Health, Pharmacy, and Forensic Medicine), a Foreign Language Department, and about 3000 students, about one-sixth of whom are graduate students. The only nutrition course offered to any of the students of these departments is the required Nutrition and Food Hygiene course taught to the final year undergraduate public health students.

Methods

Study design. A two-group pre-test/post-test design was chosen for this nutrition education activity (Table 1). The education group (n=1382) consisted of all 1st through 4th year public health students and all 2nd and 3rd year medical, pharmacy, dental, forensic medicine, and foreign language students. The control group consisted of all 2nd and 3rd year students at Chongqing Medical University in eastern Sichuan (N=1086).

Table 1. Study design

Group	March	April	May	June
Education	Pre-test		Intervention	Post-test
Control	Pre-test			Post-test

The pre- and post-test self-administered questionnaires used in the study were identical except for some intervention evaluation questions added to the post-test questionnaires used in the education group. Questions were adapted from instruments used previously in nutrition and health surveys in and outside China, as well as questions designed specifically for this medical student population. Draft questionnaires were pre-tested among students not participating in the activity and revised accordingly.

The questionnaire contained items intended to measure the students' nutrition knowledge, attitudes, and practices, as well as to elicit some sociodemographic information. The nutrition practices were elicited by a food frequency listing. Systematic sampling from class rosters, using student ID numbers, was used to select the students participating in the pre- and post-test surveys. Students who participated in the pre-test survey were not eligible to participate in the post-test survey. Students had no idea that there would be a post-test evaluation. Questionnaires were completed in classrooms in small groups and checked by students administering the instrument in the presence of the subject. If necessary the subject was asked to clarify ambiguous or missing responses.

Description of intervention: content and channels. The month-long intervention was begun two weeks after the pre-test survey, and the post-test survey was conducted beginning a week after the intervention activities were completed. The channels selected for the intervention were those preferred by the students in the pre-test survey.

The major intervention activity was a 90-minute classroom lecture/discussion given by two graduate students and two final year undergraduates. The content of this lecture was determined in part by the results of the pre-test survey and also by the needs of future health professionals as judged by the team of students and advisors conducting this activity. Four main areas were discussed: (1) nutrition's definition and importance, (2) some basic nutrition concepts (including the Chinese Dietary Guidelines), (3) diet and health relationships, and (4) nutrition problems of vulnerable groups. All of these areas were discussed as they referred to the students' and the Chinese population's lifestyles, illustrated with many examples taken from the pre-test results, and various Chinese health survey data. References were also made to relevant examples from the international literature. Transparencies were prepared as visual aids to the lecture. A one-page handout containing the Chinese Dietary Guidelines and a day's dietary allotment was also distributed and discussed during the presentation.

Simultaneous to the classroom presentations, other channels were also used in an attempt to reinforce the content of the classes. These channels consisted of blackboard displays, posters, student radio station 5-minute broadcasts, slides shown at the campus cinema, and a nutrition quiz for the public health students. This quiz pitted the four public health grades against each other. Prizes awarded during the competition were healthy foods (fresh fruits and powdered milk) and books on nutrition and health.

All intervention activities, which lasted about a month, emphasized the two campaign slogans: 'Nutrition is the doctor's responsibility', and 'Good health means good nutrition'. These slogans were pre-tested and preferred by the students.

Data analysis. All data from both pre- and post-survey questionnaires were double-punched and verified using a micro-computer. Frequencies were examined and composite variables were constructed representing nutrition knowledge and attitudes. Each nutrition knowledge or attitude question response received from 1 to 2 points depending on its degree of correctness or strength of positive attitude. In the education post-test group, a composite variable representing participation in the intervention was also calculated from the respondents' reported participation. SPSS/PC+ Version 3.0 was used in all statistical analyses. Analyses compared the education and control groups' pre- and post-test nutrition knowledge, attitudes and practices, and also the association between the education group members' degree of participation in the various activities and their nutrition knowledge and attitude scores.

Results

Subject profile. Questionnaires were completed by a total of 893 students from all four groups. However, because 50 students in the control group post-test had just received an intensive nutrition course, their questionnaires were eliminated from the analysis. This resulted in

Table 2. Education and control group summary characteristics.

Characteristic	Education group pre-test	Education group post-test	Control group pre-test	Control group post-test
Department/specialty composition, *n*(%):				
Medical	100(33)	97(33)	69(47)	38(37)
Public health	95(32)	94(32)	30(21)	30(29)
Pediatrics			30(21)	15(15)
Pharmacy	52(17)	51(17)		
Health testing			16(11)	19(19)
Stomatological	23 (8)	23 (8)		
Forensic medicine	15 (5)	15 (5)		
Foreign Language	15 (5)	16 (5)		
Total students	300	296	145	102
Year of study ($\bar{X}\pm$sd)	2.5(±.8)	2.3(±.7)	2.2(±.5)	2.5(±.8)
% female	46	48	47	51

a total of 843 questionnaires analysed and distributed among the four groups as shown in Table 2.

Nutrition knowledge. For each student in each group, a nutrition knowledge score was calculated by adding together points for each answer to 31 of the questionnaire questions designed to assess nutrition knowledge. There were 54 possible points in the score; the scores ranged from 14 to 51. The group means and ranges are shown in Table 3. Analysis of variance tests showed that the education group post-test mean score was significantly higher than that of the education group pre-test ($P<0.05$), and also higher than those of both control group tests. The control group pre- and post-test scores did not differ significantly. T-tests conducted in each of the four groups showed that nutrition knowledge was not related to sex. It was, however, related to the students' speciality: analysis of variance tests showed that the Public Health students' nutrition knowledge score (36.8±6.3) was significnatly higher ($P<0.05$) than that of the Pharmacy students (31.7±7.3), with no other significant differences found. Some examples of the knowledge questions and the percentage of students' responses in each group are shown in Table 4.

Table 3. Pre- and post-test nutrition knowledge and attitude.

Characteristic	Education group Pre-test	Education group Post-test	Control group Pre-test	Control group Post-test
Nutrition knowledge score ($\bar{x}\pm$sd)	27.4(±6.1)	34.2(±7.0)*	26.5(±5.6)	28.1(±6.1)
Knowledge score range (min-max)	14–42	16–51	14–39	14–41
Nutrition attitude score ($\bar{x}\pm$sd)	14.6(±3.2)	14.2(±3.3)	14.6(±3.4)	14.9(±3.1)
Attitude score range (min-max)	5–21	2–22	6–22	7–22
Knowledge/attitude score correlation	0.37***	0.43***	0.40***	0.25**

(*$P<0.05$; **$P<0.01$; ***$P<0.001$)

Nutrition attitude. For each student, a nutrition attitude score was calculated from the responses by adding together points representing the positive magnitude of the nutrition attitude of each response to the questionnaire questions designed to assess attitude toward nutrition. There were 22 possible points in the score; the scores ranged from 2 to 22. The group means and ranges are shown in Table 3. Analysis of variance tests showed that the mean attitude scores of the four groups did not significantly differ. T-tests showed nutrition attitude to be associated with sex in three of the four groups: small (1-point) but significant differences were found between the men and women. In all four groups the nutrition knowledge and attitude scores were significantly and positively correlated (Table 3). Relatively few negative attitudes were reported. However, it should be noted that approximately one-fifth of the students in all groups felt that it was not important to eat nutritious foods. Some examples of the attitude questions and the percentage of students' responses in the four groups are shown in Table 5.

Table 4. Percent of responses to some of the nutrition knowledge questions.

Knowledge question	Education group pre-test	Education group post-test	Control group pre-test	Control group post-test
China's two main causes of mortality are __ & __.				
–could not name either	68	24	66	55
–could name one of these	12	13	15	19
–could name both of these	20	63	19	26
Chinese people's two major mortality causes are associated with dietary habits.				
–don't know or disagree	74	44	66	78
–somewhat agree	23	46	31	21
–completely agree	3	10	3	1
Last year the Chinese Nutrition Society released eight Dietary Guidelines. Name two of these.				
–could not name any	99	62	98	100
–could name one of these	0	13	2	0
–could name two of these	1	25	0	0
If a patient had iron deficiency anemia, what foods should he eat?				
–could not name any foods	34	16	37	24
–could name only poor sources	32	20	35	28
–could name good sources	34	64	28	48
Salt consumption is associated with high blood pressure.				
–don't know or disagree	40	18	42	28
–somewhat agree	45	63	48	56
–completely agree	15	19	10	16

Nutrition practices. Chi-square examinations of the results of the food frequency inquiry into the dietary practices of the students showed an increase in the consumption of soybean and milk products in the education group, but not in the control gorup, a decrease in the consumption of whiskey in both groups, and a decrease of soybean product and fruit consumption in the control group only (Table 6). Chi-square tests showed that for the education group, the consumption of soybean products and yogurt increased significantly on a daily basis ($P<0.05$). and the numbers reporting that the consumed these items and milk once a month or less

Table 5. Percent of responses to some of the nutrition attitude questions.

Attitude question	Education group pre-test	Education group post-test	Control group pre-test	Control group post-test
I think nutrition is __ to my life.				
–not important	1	2	1	1
–important	29	29	26	28
–very important	70	69	73	71
I think nutrition is __ to my future work.				
–not important	7	7	1	6
–important	41	43	41	37
–very important	52	50	58	57
I think nutrition is __ to the health of the Chinese people.				
–not important	1	2	2	1
–important	19	16	14	12
–very important	80	82	84	87
Eating nutritious foods is very important.				
–disagree or no opinion	22	19	26	15
–agree	54	62	52	63
–strongly agree	24	19	22	22
I believe that as a health professional, I am responsible for the nutritional status of the public.				
–disagree or no opinion	14	11	18	16
–agree	54	62	52	64
–strongly agree	32	27	29	20
During consultation, a doctor should give a patient health education.				
–disagree or no opinion	6	7	6	10
–agree	49	57	54	54
–strongly agree	45	36	40	36
If my university were to offer a nutrition elective for medical students, I would choose it.				
not willing	9	13	7	7
willing	91	87	93	93

Table 6. Pre/post comparisons in dietary practices in education (e) and control (c) groups.

Food item		Percent of students consuming: daily/ almost daily	at least weekly	more than once monthly	monthly or less
		pre/post	pre/post	pre/post	pre/post
Soybean	(e)	9/16*	52/60	27/19	12/5**
products	(c)	12/6	62/54	22/23	4/17**
Yogurt	(e)	2/8**	20/36	30/28	48/28**
	(c)	1/1	21/18	24/36	54/45
Milk	(e)	14/9	9/17	11/16	66/58*
	(c)	7/7	15/13	11/12	67/68
Fruit	(e)	13/13	32/29	34/31	21/27
	(c)	6/6	22/14	38/32	34/48*
Whiskey	(e)	–	1/1	6/1	92/98**
	(c)	1/–	1/2	15/1	84/97**

(Note: *$P<0.05$ **$P<0.01$)

decreased very significantly ($P<0.01$). Whiskey consumption once a month or less in both groups increased very significantly as well ($P<0.01$). The only other significant changes seen were that the number of students in the control group consuming soybean products and fruit once a month or less increased significantly ($P<0.05$).

However, only for soybean products and whiskey were these changes associated with nutrition knowledge or attitude score. The students in each group were divided into two groups by frequency of consumption of these five food and beverage items: those consuming these items at least once a week and those consuming these items less than once a week. When these two consumption groups' nutrition knowledge and attitude scores were compared, significant results were found as are shown in Table 7. Where associations existed, more frequent consumption of soybeans was associated both higher nutrition knowledge and attitude scores, while more frequent consumption of whiskey in the pre-test education group only was associated with lower nutrition attitude score.

Table 7. Relationship of knowledge or attitude score and frequency of soybean product and whiskey consumption in education (e) and control (c) groups.

Soybean products		Consumption frequency		
group	score	<once a week(*n*)	≥once a week(*n*)	significance
e/pre/test	knowledge	26.3±6.2(116)	28.1±6.0(176)	$P=0.015$
e/post-test	knowledge	32.0±6.6(71)	35.0±6.9(212)	$P=0.002$
e/post-test	attitude	13.2±3.9(71)	14.5±3.0(219)	$P=0.011$
c/pre-test	attitude	13.4±3.5(37)	15.0±3.2(103)	$P=0.010$
Whiskey		Consumption frequency		
group	score	<once a week(n)	≥once a week(*n*)	significance
e/pre-test	attitude	14.6±3.2(295)	11.3±3.3(4)	$P=0.035$

Intervention participation. A participation variable was calculated for each student in the education group post-test from the reported participation in or exposure to the six channels (class, handout, radio, blackboard & poster, quiz, movie spot) of the intervention. This variable was found to be very significantly associated ($P<0.001$, 1-tailed) with both the nutrition knowledge ($r=0.37$) and attitude scores ($r=0.19$). Participation was also associated with speciality: analysis of variance tests showed that the Public Health students' participation score was significantly higher ($P<0.05$) than that of the Pharmacy students, with no other significant differences found.

Intervention evaluation. A total of 1050 (76% of the target group) students attended the classroom presentations. Of the 235 students in the education group post-test who reported hearing our presentation, approximately 80% reported it as being good or very good, clear, interesting, useful, and persuasive, while an additional 15% had no opinion. The remaining 5% of students found it bad, unclear, uninteresting, useless or not persuasive. Fifty-six percent of students said the campaign made them change their behavior.

As for the other channels, the nutrition knowledge quiz received the highest rating, with 85% of the students who attended reporting it to be good to very good. The blackboard and poster displays and movie theatre spots

received the next highest rating with 75% of the students who saw them reporting them as good to very good. However, only about 20% of the students reported seeing the movie spots. Least highly rated were the radio spots heard only by about half of the students and rated as good to very good by only slightly more than half of those.

However, despite all these efforts to reach them, only a quarter of students could remember one or both of our campaign slogans. When we asked if our activity resulted in them changing their behaviors, 22% reported that they had already changed some behavior and 46% reported that they were in the process of changing their nutrition behaviors. When asked specifically what behaviors they had changed or were changing, the most commonly reported ones were to eat more fruit (8%), eat a balanced diet (7%), and eat breakfast regularly (5%).

Discussion

Although our nutrition education activity had three goals, this discussion will focus on the first, which was to improve the nutrition knowledge, attitudes, and practices of the participating medical students. The results show that although the students' nutrition knowledge increased after the activity, and some food selection patterns changed, the nutrition attitude did not improve. The final nutrition knowledge and attitude scores in the education group were also associated with increased participation in the intervention.

The knowledge and behavior changes of the students were due to the combined success of the various channels used, as the activities reached most of the students, and they were evaluated favorably by the students. These changes were probably enhnaced by the initial positive attitude of the students toward nutrition: as medical students, they were aware of the importance of nutrition in their own lives as well as in their future careers as health professionals. This initial positive attitude was probably the reason we could not improve it further.

However, only in the case of soybean products were the changes in nutrition practices directly associated with nutrition knowledge and attitude in the education group. We promoted soybean products as economical and nutritious sources of calcium and protein, the economic aspect being very important for students on tight budgets. We also mentioned soybean products being complementary to rice (the main staple for this group) to form complete protein.

As to the other behavior changes observed, weather may have played a role. The increased consumption of yogurt, which on campus in Chengdu is sold as a cool liquid drink more popular in warmer weather, may have been influenced by the warmer weather prevalent during the time of the post-test. However, since its consumption did not increase in the control group, we conclude that the increase in consumption was also influenced by our campaign activities.

The warmer weather was probably also responsible for the decrease in whiskey consumption which occurred in both groups. However, as one of China's Dietary Guidelines is 'Drink low-alcohol content alcoholic beverages,' a discussion of this in our presentation may have had some influence in the decline observed in the education group.

The decrease in fruit consumption in the control group and not in the education group should also be seen as a positive result of the nutrition education. Two earlier surveys conducted among Chengdu residents during the same seasonal time frame a year previoously in 1990 also showed that fruit consumption declined from early to late spring[8]. Therefore, the significant increase in consumption in he group of students consuming fruit once a month or less in the control group may have been due to a seasonal decrease in fruit availability from early to late spring. The lack of a decrease in fruit consumption in the education group may therefore have been due to the students' efforts to increase or maintain their fruit consumption levels after participating in the program. This explanation would be consistent with their reported behavior changes after the intervention.

We have two suggestions for groups conducting similar activities in the future. We encountered a problem when we distributed our daily food allotment handout during the classroom presentation. Unfortunately, we had not pre-tested this material with students, and the suggested foods met with incredulity and resentment by the first students who received the handout. This is because the suggestions were the result of a computer program designed to produce such an allotment for elite athletes whose food budgets are higher than those of university students. As a result, we had to give the students appropriate substitution techniques for some of the foods, mainly showing them how to substitute less expensive plant protein for some of the more expensive animal protein items. We therefore emphasize that all materials, including lessons, slogans, and questionnaires must be pre-tested to ensure their appropriateness and enhance their effectiveness.

Our second suggestion concerns the adding of another channel to the activity if conducted in situations similar to this one. Because of time limitation and the small number of staff available to work on this activity, the student meal services were not included as a venue for this education. However, since it was found that students ate almost all meals in the school canteens, we suggest that these services be used as an eminently suitable channel in future student nutrition education campaigns.

Conclusion

The study shows that a nutrition education campaign, designed with the students' situation and requests in mind, was an effective method for conveying nutrition information to medical students, and effective as well in encouraging some degree of food selection change. It also showed that medical students' attitudes toward the study of nutrition is good; the students are aware of the importance of nutrition and would welcome the introduction of an elective nutrition course. The authors hope that this research will serve as guidance to others involved in the design of student health education activities and as well as to those involved in the preparation of nutrition courses for medical education in China and elsewhere.

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中國醫學生營養教育活動的評估
摘要

在中國，癌症和心血管疾病這兩種慢性病是致死的主要原因，因此預防醫學非常重要。所以爲訓練中國醫科大學生來處理當代健康問題，需要在大學課程中注意營養學。爲了評估對大學生營養教育活動的有效性，設計了一個兩組的試前及試后營養教育計劃，在中國西南的一所醫科大學爲實驗組（n=300人/組），西南另一所醫科大學爲對照組（n=150人/組），這一干預的特點爲：營養教育資料來源于（a）對醫科大學生的預測結果；（b）與醫科大學生職工及內科醫生的討論，營養知識競賽；提供每日飲食分配資料、廣播及校園電影院宣教和教學樓及宿舍區的廣告。經方差、卡方和T檢驗顯示，營養知識有顯著性提高（$p<0.05$），但營養態度記分却沒有顯著性提高。最后的營養知識和態度記分與學生接觸各種渠道的教育的增加相關（$p<0.001$）。還觀察到對大豆及奶制品的消耗有提高（$p<0.001$）。可以說，這種方式是一種切實有效的模式來設計并發展中國學生營養教育活動，以及示範在醫科大學社區的營養及健康教育方式。