Impact of health education on lifestyles in central Saudi Arabia

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ABSTRACT

الأهداف: تقييم تأثير التوعية الصحية على عادات التدخين، والنظام الغذائي والنشاط البدني لدى مرضى مراكز الرعاية الصحية الأولية بمنطقة القصيم في المملكة العربية السعودية.

الطريقة: أُجريت هذه الدراسة التجريبية الغير مقارنة في المراكز الصحية المختارة بمنطقة القصيم، المملكة العربية السعودية وذلك خلال القترة من يناير إلى أكتوبر 2009م. لقد تم عقد دورات تدريبية لمنسوبي الرعاية الصحية الأولية لتحسين مهاراتهم في التوعية الصحية وقد شارك بالتوعية طلبة الطب من خلال إعطاء ندوات التوعية للمرضى. لقد كان عدد المشاركين أثناء المسح الأساسي الذي أُجري قبل التوعية 1254 شخصاً، ومن ثم أصبح عددهم بعد التوعية وأثناء مسح المتابعة 1011 شخصاً حيث تم تحديد عوامل الخطر في العينة المشاركة قبل وبعد التدخل التوعوي. وبعد ذلك تم تقييم تأثير التوعية من خلال تحليل الانحدار اللوجستي وذلك من أجل التحكم بالمتغيرات الدخيلة.

النتائج: أشارت نتائج الدراسة بأن كميات استهلاك الكبسة والمخبوزات والتمور قد قلت بعد التدخل التوعوي، فيما زادت بالمقابل كميات تناول الأسماك والخضروات الطازجة ($p<0.001$)، وتبين عند مقارنة نتائج المسح الأساسي بمسح المتابعة بأن التوعية قد أدت إلى تقليل نسبة التدخين بين المشاركين الذكور وزيادة نسبة ممارسة الرياضة. ولقد استمر التحسن في مستوى المعرفة والنظام الغذائي الصحي وقلة التدخين وممارسة التمارين الرياضية حتى بعد التحكم بعوامل الجنس، والعمر، والتعليم، والحالة الاجتماعية، وذوي التاريخ الأسري لمرضي ارتفاع ضغط الدم والسكري، ومن لديهم تاريخ سابق لهذين المرضين.

خاتمة: أظهرت الدراسة بأن تطوير التوعية الصحية لمراجعي المراكز الصحية يعمل على زيادة وعيهم الصحي وممارستهم للسلوكيات الصحية.

Objectives: To assess the impact of health education on diet, smoking, and physical activity among patients visiting the primary health care centers (PHCCs) in Al-Qassim province, Kingdom of Saudi Arabia (KSA).

Methods: We conducted an uncontrolled experimental study from January to October 2009 to evaluate the impact of health education on smoking, diet, and physical activity among attendees of PHCCs in Al-Qassim province, KSA. We trained the PHCC staff in health education skills and introduced health education seminars organized by the medical students. Baseline (n=1,254) and follow-up (n=1,011) sample surveys were conducted to measure the prevalence of risk factors in target population before and after intervention. We used logistic regression analysis to control for the effects of possible confounding variables.

Results: After the intervention, consumption of kabsa, bakery items, and dates decreased, and that of fish and fresh vegetables increased ($p<0.001$). Compared to the baseline, male respondents in the follow-up survey were less likely to smoke and more likely to do regular exercise. These improvements persisted after controlling for gender, age, marital status, education, and presence, or family history of hypertension and/or diabetes.

Conclusion: We conclude that enhancing the quality and scope of health education to patients visiting the PHCCs would improve the awareness and practice of healthy behaviors.

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The prevalence of obesity, hypertension, diabetes and coronary artery disease is increasing in the Middle East, where nearly 70% of deaths among adults >15 years of age are attributed to non-communicable diseases.[1] Physical activity in the Middle East is lower than the other parts of the world.[2-4] Obesity, physical inactivity, smoking, and "westernized" dietary patterns are the main risk factors of cardiovascular diseases (CVD).[5] In the Kingdom of Saudi Arabia (KSA), hypertension, diabetes, and CVD are the leading causes of adult mortality, and prevalence of obesity is high, not only among adult men and women but also among adolescents.[6] Physical inactivity and unhealthy dietary patterns, which are the most important risk factors associated with non-communicable diseases are highly prevalent in KSA.[3] In particular, women, the elderly, and less educated people are more likely to have unhealthy dietary habits and low physical activity.[7] There is a cumulative evidence over the past 30 years, both from developing and developed countries that health education programs are effective in promoting healthy behaviors and preventing non-communicable diseases.[8] A recent study in Al-Qassim province, KSA established that healthy diet and active lifestyle were associated with a lower risk of type 2 diabetes mellitus, even in the presence of a family history of diabetes.[9] Adopting a healthy lifestyle helps not only in the prevention of disease, but also in reducing the risk of complications. Studies in KSA and United Arab Emirates have found that the population's level of awareness on the risk factors associated with non-communicable diseases, such as diabetes is low.[10,11] Health education aims to improve knowledge and change behaviors. It is the most authoritative way to disseminate information on practical, effective, and low-cost strategies to protect health and improve quality of life.[12] The KSA has a vast network of primary health care (PHC) centers, which are the ideal places to provide health education to patients and general population. The basic concept of PHC is that people must be empowered and motivated to take informed decisions on the activities to ensure attainment of health.[13,14] This role of PHC in health promotion is well-recognized in KSA, although there is a need to further improve the quality and scope of health education that is routinely provided at the PHC centers. In this experimental study, we trained the PHC staff in health education techniques and introduced health education seminars organized by the medical students in selected PHC centers in Al-Qassim province, KSA, thus improving the quality and scope of health education. The primary objective of the study was to evaluate the impact of health education on the prevalence of smoking, unhealthy dietary practices, and physical inactivity among attendees of PHC centers.

Methods. We conducted an uncontrolled experimental study with a pretest-posttest design (2 independent samples) to evaluate the impact of facility-based health education on the awareness and practice of healthy lifestyles (regular exercise and healthy dietary practices). Our intervention comprised of training the PHC staff in health education techniques, and introducing health education sessions organized by the medical students in the PHC centers. We tested the hypothesis that improving the quality and scope of health education in PHC centers will significantly decrease the prevalence of smoking and unhealthy dietary practices, and increase physical activity in the target population. Our target population included community members visiting the PHC centers for any reason. The PHC centers are the first-level healthcare facilities in KSA, and anyone in need of any kind of health care must visit the PHC center. Most patients visiting the PHC centers, particularly women and children are accompanied by other family members. The average number of visits to the PHC centers in our target population is 2.5 per person per year, and approximately one fifth of the patient's visits are for follow-up of diabetes.

This study was conducted between January and October 2009 in 18 PHC centers in Al-Qassim province, KSA (**Appendix 1**). Approval for conduction of this study was obtained from the Qassim College of Medicine Ethics Committee and the Ministry of Health Research Center. Our intervention was 2-pronged, firstly, we trained the PHC staff (doctors and health educators) to improve their skills in health education and inter-personal communication, and to motivate them to invest more time and effort in health education. The doctors were trained to provide health education to patients and their family members during routine consultation. The health educators were trained to conduct health education sessions on selected topics. Anyone present in the PHC center could attend these sessions. We ensured that the PHC staff followed the Ministry of Health guidelines for health education. Secondly, we trained medical students to organize health education seminars, in which community members were also invited. During the study period, the medical students conducted at least one such seminar in each participating PHC center. The materials used

*The full text including Appendix is available in PDF format on Saudi Medical Journal website (www.smj.org.sa)

in health education were brochures, booklets, and charts provided by the Ministry of Health, which were already available at the PHC centers. The primary focus of health education was on the risks associated with unhealthy diet, smoking, and physical inactivity. Baseline survey was conducted in January 2009. During February 2009, refresher training of the PHC staff and medical students was conducted. The interventions were launched during March to August 2009, while the follow-up survey was conducted during October 2009. Baseline and follow-up surveys were cross-sectional, and were conducted in randomly selected samples of the patients visiting the PHC centers. Sampling space for the 2 surveys was the same as the target population defined earlier. The 2 samples were independent, and the probability of having the same respondents in both surveys was low. This eliminated the testing effect, and provided a conservative estimate of the impact of health education. Both surveys used the same questionnaire to assess the respondents' knowledge and practice of healthy lifestyle, and to estimate the prevalence of lifestyle-related risk factors. To calculate the sample size for each survey, we assumed that in our target population the proportion of individuals having adequate health knowledge was 50% at baseline. Sample size was computed to detect an increase of 10% or greater after the health education intervention. The confidence level was set at 95% (α=0.05, and power was set at 90% (β=0.10). The required sample size was 538 in each survey, which was increased to 1,076 to account for the design effect.[15] Each participating PHC center was thus asked to complete a minimum of 60 interviews in each survey. All individuals 20 years and above who visited the PHC center and gave consent during the survey period were interviewed and included in the study. We excluded patients below 20 years old. The interviews were started on a pre-decided date that varied slightly between the PHC centers. Starting on that date, the PHC staff enlisted all individuals visiting the center, and requested them for an interview. Interviews were stopped when the sample size allocated to the PHC center was reached. The questionnaire was in Arabic. All questions were pre-coded, most of them requiring a simple yes/no answer. Medical students and the PHC staff not involved in health education conducted interviews, and interviewers were trained on the use of questionnaire and interviewing techniques.

Data were entered into a Statistical Package for Social Sciences database (SPSS Inc. Chicago, IL, USA). Data analysis was also carried out using SPSS version 11.5. After clean-up and correction of mistakes, data from the 2 surveys were combined, keeping a variable to identify each survey (Survey phase). Cross-tabulation and chi-squared test were applied to detect statistically significant differences between the 2 surveys. We calculated a "knowledge-score" by adding up the correct responses to questions related with knowledge (possible values: 0-41). Analysis of variance (ANOVA) was carried out to evaluate the difference in mean knowledge score between and within groups. Knowledge-score of ≥26 (corresponding to the median of entire sample) was arbitrarily regarded as the "adequate knowledge level". Since our study did not have a comparison group, we conducted logistic regression analysis to control for the effects of possible confounding variables on the participants' knowledge and behavior (gender, age, marital status, education, and presence or family history of hypertension or diabetes). We measured the impact of health education through adjusted odds ratios for the Survey phase, where baseline survey was the reference category (0=baseline; 1=follow-up). The adjusted odds ratios reflect the likelihood of adequate knowledge level, unhealthy dietary habits, regular exercise, and smoking in the follow-up survey compared to the baseline survey.

Table 1 - Percentage distribution of respondents by selected demographic characteristics, history of chronic diseases and family history of hypertension or diabetes.

Respondent characteristics	Baseline survey N=1,254	Follow-up survey N=1,011	*P*-value*
Age group, years			0.935
20-29	25.0	23.4	
30-39	28.0	27.5	
40-49	22.3	22.9	
50-59	14.8	14.9	
60-69	6.7	6.9	
70+	3.1	3.1	
Gender			0.008
Male	70.7	65.3	
Female	29.4	34.7	
Marital status			0.706
Never married	16.4	15.8	
Married	81.1	80.9	
Divorced	0.8	1.0	
Widowed	1.7	2.3	
Education, highest level achieved			0.027
Primary/preparatory school	33.8	40.1	
Secondary school	25.3	22.6	
University degree	36.5	32.3	
Other, professional diploma, so forth	4.4	5.1	
Disease			
Type 2 diabetes mellitus	59.4	56.7	0.441
Hypertension	37.5	35.1	0.472
Family history, parents only			
Type 2 diabetes mellitus	48.0	42.8	0.086
Hypertension	44.3	45.7	0.370

**p*-values indicate the statistical significance of differences between baseline and follow-up surveys calculated through chi-squared test

Results. The actual number of interviews completed was 1,254 in the baseline survey, and 1,011 in the follow-up survey. Most respondents had received some form of health education in recent past (70.2% in the baseline survey, and 72.0% in the follow-up survey [p=0.374]). Respondents in the 2 surveys were similar with regard to age, marital status, and presence and family history of diabetes and hypertension. However, the proportion of females and of those having primary/preparatory education was higher in the follow-up survey (**Table 1**). **Table 2** presents a comparison of dietary habits of respondents in the baseline and follow-up surveys. A history of the food items consumed during the preceding 24 hours indicates that the proportion of respondents having kabsa, juices and soft drinks, dates, and bakery items was significantly lower in the follow-up survey. Post-education significantly more respondents reported consuming fish, eggs, and fresh vegetables during the prior 24 hours. Prevalence of smoking (among males) was significantly lower in the follow-up survey. Finally, significantly more males in the follow-up survey reported doing brisk walk and playing football. **Table 3** presents the mean knowledge scores computed from the questions on the awareness of risk factors of non-communicable diseases. The overall mean knowledge score was 22.1 at baseline, and 23.4 in the follow-up survey. The difference in the mean knowledge score at baseline and follow-up was significant among males but not among females. Knowledge scores among university graduates were significantly higher in the follow-up survey, compared to the baseline. **Table 4** presents the results of the logistic regression analyses estimating the

Table 2 - Percentage of respondents according to diet in last 24 hours, smoking and exercise, before and after the health education intervention.

Respondent characteristic	Baseline survey N=1,254	Follow-up survey N=1,011	*P*-value*
Foods consumed during past 24 hours†			
Meat kabsa	79.5	72.4	<0.001
Barbecued meats	20.1	23.6	0.045
Potato chips or French fries	22.8	24.1	0.485
Fish	14.4	19.8	0.001
Eggs	34.0	40.4	0.002
Fresh vegetables	54.8	62.6	<0.001
Snacks and appetizers	35.5	35.1	0.860
Juices and other beverages	26.6	22.9	0.045
Diet juices and beverages	15.2	11.0	0.003
Dates	50.3	42.0	<0.001
Bakery items and desserts	32.9	24.7	<0.001
Fresh fruit	59.7	63.5	0.068
Smoking males	17.4	11.6	0.001
Doing regular exercise			
Males	55.6	57.3	0.500
Females	38.0	43.0	0.193
Type of exercise, males	(N=490)	(N=377)	0.005
Walking	67.2	58.3	
Brisk walking	6.6	13.4	
Football	20.8	24.6	
Other forms of exercise	5.9	3.7	
Type of exercise, females	(N=139)	(N=147)	0.734
Walking	84.6	85.0	
Brisk walking	2.9	2.9	
Other forms of exercise	12.5	11.5	

*p-values indicate the statistical significance of differences between baseline and follow-up surveys calculated by chi-squared test, †excludes respondents who said that food consumed in the last 24 hours was not a reflection of their routine diet

Table 3 - Mean knowledge scores by respondents' characteristics and survey phase.

Respondent characteristic	Baseline survey N=1,254	Follow-up survey N=1,011	*P*-value*
All respondents	22.1	23.4	0.001
Gender			<0.001
Male	22.5	24.5	
Female	21.2	21.2	
Education, highest level achieved			<0.001
Primary/preparatory school	23.2	22.3	
Secondary school	22.4	23.8	
University degree	21.3	23.6	
Other (professional diploma, so forth)	21.0	23.7	

*p-values indicate the statistical significance of differences between baseline and follow-up surveys calculated by one-way analysis of variance

Table 4 - Adjusted odds ratios and 95% confidence limits denoting the impact of the intervention on the knowledge level, dietary patterns, smoking, and exercise.

Dependent variables	Adjusted odds ratio*	95% confidence limits
Achievement of above median knowledge score, ≥26‡	1.58	1.34 - 1.86
Food items consumed during the last 24 hours†‡		
Kabsa	0.72	0.62 - 0.86
Potato chips or French fries	1.14	0.86 - 1.53
Fish	1.32	1.01 - 1.73
Vegetables	1.15	0.97 - 1.37
Dates	0.74	0.61 - 0.89
Bakery items	0.59	0.47 - 0.73
Fresh fruits	1.00	0.81 - 1.22
Smoking, males only‡	0.67	0.42 - 0.76
Exercise, brisk walk‡	1.91	1.26 - 2.90

*computed from logistic regression models, odds ratio for each variable is adjusted for age, gender, marital status, education, presence of hypertension, diabetes or coronary artery disease, and family history of diabetes or hypertension, †excludes respondents who said that food consumed in the last 24 hours was not a reflection of their routine diet, ‡reference: baseline (pre-intervention)

impact of intervention on the knowledge level, dietary patterns, smoking, and exercise. The likelihood of achieving adequate knowledge level (knowledge score ≥ 26) was 60% higher in the follow-up survey compared to baseline. Compared to baseline, respondents in the follow-up survey were 28% less likely to eat kabsa, 26% less likely to eat dates, and 41% less likely to eat bakery items, while the likelihood of consumption of fish was 32% higher at follow-up than at baseline (all of these differences were statistically significant). There was no change in the likelihood of eating potato chips/French fries, vegetables, and fresh fruit. The likelihood of smoking (among males) in the follow-up survey was 33% less than the baseline survey. Finally, the likelihood of men reporting regular brisk walking was nearly twice that in the baseline survey.

Discussion. Our study suggests that improving the educational and communication skills of healthcare providers and motivating them to inform their patients on the risks of unhealthy diet, smoking, and physical inactivity helps in improving healthy behaviors. In spite of the short exposure time, health education had a significant impact on the knowledge and behavior of the target population, wherein modest improvements were recorded in smoking habits, exercise, dietary habits, and the level of awareness on lifestyle-related risk factors. These improvements persisted after controlling for age, gender, education, respondent's disease status, and family history of diabetes and hypertension. These findings are quite encouraging. If a short and focused program to improve the quality of health education at PHC centers can increase awareness and change practices, a large-scale community-based health education program is likely to have an enormous impact on the burden of non-communicable diseases. That regular exercise and prudent dietary practices are significantly associated with the risk of disease and death due to hypertension and coronary artery disease was first demonstrated by the world-famous Framingham Study in the USA in the early 1950's. Well-organized health education programs have been successful in promoting healthy lifestyles under diverse circumstances. An evaluation of Singapore's National Healthy Lifestyle Program showed significant decreases in smoking prevalence, and increases in regular exercise over a 6-year period.[16] The prevalence rates of obesity and type 2 diabetes also stabilized over this period, although prevalence of high total blood cholesterol and hypertension somewhat increased.[16] A global review of variations in cardiovascular diseases by ethnicity, geographical region, and prevention strategies also documented that prevention programs in Northern Europe and elsewhere in the world have resulted in significant improvements in diet and exercise routines in the population.[17]

A disconcerting finding of our study is that there was no significant impact of health education on the female population with regard to exercise. From anecdotal evidence, it appears that since women engage in daily household chores they do not have the time, or the desire to engage in regular exercise. However, exercise, such as brisk walking is equally important for males and females. Recent studies have shown that household chores do not provide women good protection against the risk of non-communicable diseases, and more vigorous exercise such as brisk walking is necessary.[18] Our study did not consider community-level variables, such as prevalence of smoking in the community, and presence of a "healthy culture," whereby healthy lifestyle practices are accepted and cherished. It was shown that the socio-cultural environment has an impact on lifestyles, not only with regard to smoking and exercise, but also in terms of availability of recreational facilities in the neighborhood.[19] Lifestyle practices tend to "cluster" among individuals. For example, those having a prudent lifestyle tend to be non-smokers, do regular exercise, and also have good dietary practices, whereas, individuals leading a sedentary life tend to be smokers and have unhealthy dietary habits. Both sets of behavior are determined by inherent beliefs and level of awareness, the latter group, for example, having their own definition of a "healthy lifestyle". Although our sample was restricted, we believe that our study results can be extended beyond PHC centers in Al-Qassim. In KSA, an upsurge in the prevalence of non-communicable diseases is related to a host of behavioral factors, which can be modified through health education.[20-22] Promoting healthy lifestyles and informing the public on the hazards of leading a sedentary life, and engaging in unhealthy practices is the only way to control, and contain the unprecedented increase in the lifestyle-related diseases in KSA. This study suggests that an intensive health education program would go a long way in achieving this goal.

Our study used the uncontrolled pretest-posttest design. Although a randomized controlled trial is far superior to uncontrolled experiments, the pretest-posttest design is quite commonly used to evaluate health education interventions, due to its flexibility and low costs. This design is particularly suitable to evaluate ongoing health education programs.[23,24] In our view, the pretest-posttest design is a good option when time and resources to conduct a randomized clinical trial are not available, or for exploratory research to be used as a pilot project before designing a full-scale prevention research trial.

We did not have a sampling frame of our target population, although we believe that samples selected represent the users of PHC centers. The samples for the 2 surveys were largely similar, except that in the follow-

up survey, the proportion of women was slightly higher, and of those having secondary school and university education was lower. These differences pulled the results toward the null, and possibly diluted the impact of the intervention program.

In conclusion, improving the quality of health education at PHC centers had a significant impact on the knowledge and practices of healthy lifestyles. We recommend that PHC centers' staff should be re-trained in conducting health education and in interpersonal communication to convey health messages to their patients. We also recommend that medical students should be involved actively in health education activities, so as to expose them to preventive measure at an early stage in their professional lives, and to ingrain into them the importance of health education.

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