Community Screening for Hypercholesterolemia

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This study focused on a cholesterol screening and education program conducted in Scottsdale, Arizona, to determine the prevalence of hypercholesterolemia among the volunteer participants, and whether such a program motivates lifestyle changes and physician follow-up. The study also examined whether participants used the program to monitor known hypercholesterolemia. During the 6-month program, 1228 individuals were screened. Of these, 29% had a previous history of elevated cholesterol and 5% were on cholesterol-lowering medication. Of the group with no previous history of hypercholesterolemia, 41% had cholesterol levels higher than 5.17 mmol/L (200 mg/dL) and 10% had levels higher than 6.21 mmol/L (240 mg/dL). A subgroup of 120 persons with levels higher than 6.21 mmol/L (240 mg/dL) were contacted 4 to 6 months after the screening. Most of this group reported improvement in diet and exercise patterns, and 58% had consulted a physician. These results suggest that people with known hypercholesterolemia are using community screening programs to monitor their own cholesterol levels, and that such programs identify new high-risk individuals. Program participants appear to change diet and exercise patterns and to seek physician follow-up. **J Fam Pract 1990; 31:365-368.**

Elevated levels of cholesterol are a major risk factor for the development of atherosclerotic heart disease, and recent studies have verified that reducing cholesterol lowers the risk of developing coronary-artery disease.[1-4] The National Cholesterol Education Program (NCEP) targets both physicians and the public regarding the risks of hypercholesterolemia. NCEP's expert panel on detection, evaluation, and treatment of high blood cholesterol in adults has recommended screening total cholesterol measurements in all adults over the age of 20 years.[5]

With increasing public education, many individuals are having cholesterol levels measured in public screening programs. Studies have suggested that voluntary screening programs may attract a more health-conscious population with fewer cardiac risk factors than the general public.[6,7] Information is limited on whether screening programs are effective in changing the lifestyles of high-risk individuals.

The present study describes a cholesterol screening and education program carried out in Scottsdale, Arizona. The study addressed the following questions: What is the prevalence of hypercholesterolemia among individuals participating in a voluntary community screening program? To what extent do individuals identified as having hypercholesterolemia report changes in lifestyle 4 to 6 months following screening? What proportion of individuals with elevated cholesterol levels at screening subsequently seek physician care for this problem? And finally, are individuals using screening programs to monitor their cholesterol levels?

METHODS

This study was conducted through Health Steps, the health-promotion program at Scottsdale Memorial Hospital. Scottsdale Memorial is a 360-bed community hospital that serves Scottsdale, Arizona, a suburb in the Phoenix metropolitan area.

Cholesterol screening was offered to community members for a 6-month period from November 1987 to April 1988. The initial screening event occurred during an "open house" for a new Health Steps facility. This event was advertised through community flyers, press releases, and the hospital's employee publication. It resulted in 345 people being screened. Six additional screening events were held in the community during the study period.

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These events were advertised by flyers and held at various locations: a benefits fair for city employees, the police department, a local church, the community college, a local business, and the city corporate yard. In addition, the Health Steps office offered screening 2 days each week from 9 AM to 3 PM for the remainder of the study period. These times were announced through notices in the local newspapers.

Before screening, each participant signed a consent form and completed a questionnaire regarding age, sex, race, prior history of high cholesterol, and use of cholesterol-lowering medications. Nonfasting capillary blood samples were collected from the middle or ring finger using a spring-driven lancet. Cholesterol measurements were performed by dry chemistry method using a Boehringer Mannheim Reflotron (Indianapolis, Ind). A protocol regarding machine calibration, sample collection, sample preparation, and cholesterol determination was carefully followed by all screening personnel.

To assess the accuracy of the screening protocol, venous and capillary blood samples were obtained simultaneously from 22 volunteers. Cholesterol levels were determined on the venous samples by a Paramax instrument (Baxter Scientific, Chicago, Ill) and on the capillary samples using the study protocol. The results were then correlated (r = 0.92, 95% confidence intervals 0.81 to 0.96).

All participants were given the National Heart, Lung and Blood Institute's "Facts about Blood Cholesterol" handout, supplementary diet information, and counseling regarding diet and exercise. They were informed that the test was a screening procedure, not a definitive diagnostic study. Persons with cholesterol levels between 5.17 mmol/L (200 mg/dL) and 6.21 mmol/L (240 mg/dL) were advised to have the test repeated within 6 months, but were not advised whether to have the test repeated in a physician's office or at a screening program. Individuals with cholesterol levels higher than 6.21 mmol/L (240 mg/dL) were asked to follow up with their personal physicians. Each participant was charged $5.

To help evaluate the effectiveness of population screening in fostering change, a follow-up telephone survey of high-risk individuals was performed. An attempt was made to contact all individuals with cholesterol levels higher than 6.21 mmol/L (240 mg/dL) from 4 to 6 months after their initial screening. All interviews were conducted by a registered nurse using a standard questionnaire. A total of three telephone calls were made in an attempt to contact each participant.

Participants were asked to characterize diet and exercise changes as none, mild, moderate, or major. They also were asked whether they had seen a physician, whether their cholesterol level had been rechecked, and whether cholesterol-lowering medications had been started.

RESULTS

A total of 1228 individuals were screened during the study period. Population characteristics are summarized in Table 1. Fifty-three percent of the participants were female, 95% were white, and a broad range of ages were included. The population tested was representative of Scottsdale, an upper-middle-class community of 120,000. About two thirds of Scottsdale residents are white-collar workers, whereas one third hold blue-collar or service positions. Fourteen percent of Scottsdale residents are aged 65 years or older, and 19% of participants in the program were in this age range.

Mean cholesterol levels in female participants increased with increasing age throughout all age ranges. Mean cholesterol levels in men increased with age only until the 50- to 59-year age group, then decreased. Similar trends with age have been noted in other populations.[6]

Of all participants, 29% had been told previously they had elevated cholesterol levels (Table 2). This group with a positive history accounted for 60% of cholesterol levels higher than 6.21 mmol/L (240 mg/dL) in the screened population. Of the individuals with no previous history of high cholesterol, 82 (10%) were identified as having cholesterol levels higher than 6.21 mmol/L (240 mg/dL), and 334 (41%) were found to have levels higher than 5.17 mmol/L (200 mg/dL).

Regarding medical therapy, 62 individuals (5%) reported taking medication to lower cholesterol during the 2 weeks prior to the screening date. Of this group, 18 had cholesterol levels lower than 5.17 mmol/L (200 mg/dL), 27 were in the 5.17 to 6.18-mmol/L (200 to 239 mg/dL) range, and only 17 had levels above 6.21 mmol/L (240 mg/dL).

In the follow-up telephone survey, 60% of individuals with initial cholesterol levels higher than 6.21 mmol/L (240 mg/dL) were contacted 4 to 6 months after their initial screening. Ninety-seven percent of these (120 individuals) completed the telephone questionnaire. Many of the participants who could not be contacted were believed to be out of town, since the survey took place during summer, when a large number of Scottsdale residents relocate for the season to cooler climates.

Of those surveyed, 88% claimed increases in exercise level, including 28% who reported moderate increases, and 16% who made major changes (Table 3). Ninety-eight percent said they made dietary changes, including 14% who were consuming oat bran, 33% who described moderate changes, and 26% who made major diet changes. Visits to physicians regarding the elevated cholesterol levels were reported by 58%. Only 7% of this high-risk group were taking cholesterol-lowering medications prior to the initial screening, whereas 25% were on such medications 4 to 6 months later. The most commonly used

TABLE 1. CHOLESTEROL LEVELS BY AGE AND SEX

Age Group (years)	Sex	No.	Mean Cholesterol mmol/L(mg/dL)	Cholesterol Ranges mmol/L (mg/dL) Percent <5.17 (<200)	Percent 5.17-6.21 (200-240)	Percent >6.21 (>240)
20–29	M	96	4.32 (167.16)	84	16	0
	F	85	4.61 (178.12)	75	19	6
30–39	M	144	5.00 (193.21)	57	31	12
	F	116	4.76 (184.14)	72	23	5
40–49	M	91	5.51 (213.19)	41	42	18
	F	109	5.11 (197.54)	49	40	11
50–59	M	76	5.65 (218.50)	39	34	26
	F	107	5.56 (214.84)	32	47	21
60–69	M	85	5.47 (211.64)	36	40	24
	F	130	5.98 (231.31)	21	45	35
70 and older	M	51	5.18 (200.49)	51	33	16
	F	66	6.09 (235.58)	17	44	39
Age and/or sex unknown	—	72	5.40 (208.88)	49	33	18
Total	—	1228	5.26 (203.39)	48	34	17

medications were lovastatin (43%), niacin (23%), cholestyramine (17%) and gemfibrozil (10%).

DISCUSSION

Widespread education on the health risks of elevated cholesterol and the benefits of cholesterol reduction have resulted in increasing numbers of people who want to have their cholesterol levels measured. Community screening programs are an increasingly available option for these individuals.

Concern has been expressed that voluntary screening programs may attract a lower risk group than the general population.[6,7] The present study suggests, however, that community screening does identify some patients at high risk. Among individuals screened, 41% had a level higher than 5.17 mmol/L (200 mg/dL), yet had no prior history of an elevated level.

Individuals with elevated levels should be encouraged to seek physician follow-up for several reasons. Like elevated blood pressure, high cholesterol levels should be confirmed by repeat measurement. Fasting serum lipid profiles are necessary to delineate risk by measuring serum high-density lipoprotein (HDL) levels and calculating low-density lipoprotein (LDL) levels. Secondary causes of hyperlipidemia, such as diabetes and hypothyroidism, should be ruled out. In the present study, 58% of those with high screening levels reported physician follow-up within 4 to 6 months, and 18% had been started on cho-

TABLE 2. PRIOR HISTORY OF ELEVATED CHOLESTEROL

Prior History	No. (%)	Current Screening Cholesterol, mmol/L (mg/dL) <5.17 (<200) No. (%)	5.17–5.66 (200–219) No. (%)	5.69–6.18 (220–239) No. (%)	≥6.21 (≥240) No. (%)
Yes	353 (29)	84 (24)	78 (22)	65 (18)	126 (36)
No	818 (67)	484 (59)	159 (19)	93 (11)	82 (10)
Not recorded	57 (5)				
Total	1228 (100)				

TABLE 3. SELF-REPORTED CHANGES IN DIET AND EXERCISE 4 TO 6 MONTHS AFTER SCREENING IN INDIVIDUALS WITH INITIAL CHOLESTEROL LEVEL > 6.21 mmol/L (240 mg/dL)

	Diet Changes No. (%)	Increased Exercise No. (%)
None	2 (2)	14 (12)
Yes, unspecified	8 (7)	15 (12)
Yes, minor	22 (18)	39 (32)
Yes, moderate	40 (33)	33 (28)
Yes, Major	31 (26)	19 (16)
Yes, oat bran	17 (14)	—
Total	120 (100)	120

lesterol-lowering medication, compared with 74% reporting physician follow-up in a similar survey by Greenland et al.[8]

Twenty-nine percent of individuals attending the screening program had a prior history of an elevated cholesterol level. This figure is much higher than earlier figures of 11% reported by Reiss[9] and 8% by Schucker et al.[10] This increase could be attributed to a more health-conscious study population, but probably reflects heightened public interest in cholesterol measurement. It suggests that increasing numbers of individuals are using screening programs to monitor their cholesterol levels, much as a person may have blood pressure measured outside a medical facility.

Questions have been raised regarding the accuracy of fingerstick cholesterol determinations.[11] Quality control should be encouraged in screening programs along with periodic verification of accuracy of screening methods. Persons admitting a history of high cholesterol should be cautioned that fingerstick methods may not be as accurate as serum measurements, and that determination of HDL and LDL levels may be needed to evaluate the degree of risk and effectiveness of therapy.

Changing ingrained lifestyle patterns can be very difficult. It was encouraging that the majority of high-risk individuals in the present study reported diet and exercise changes 4 to 6 months after screening. It cannot be concluded that the single educational intervention caused these lifestyle changes, however, because there was no control group that did not receive the intervention. In addition, the extent of change in these areas may have been exaggerated, since they were self-reported and were not verified by diet records or exercise logs.

Questions have been raised about the lack of HDL level screening in the NCEP recommendations. Individuals with low total cholesterol may be at risk because of other cardiac risk factors and low HDL levels, but will be missed by current screening guidelines. Adjustments in screening recommendations will probably occur in the future, but community screening of total cholesterol remains a convenient, cost-effective method of screening large numbers of people.

Voluntary community screening programs appear to identify many hypercholesterolemic individuals who had no prior knowledge of their lipid status. On the other hand, some people with known hypercholesterolemia apparently use screening programs to monitor their cholesterol levels. When combined with education, community screening may motivate lifestyle changes and encourage physician follow-up of high-risk individuals. Further research regarding the utilization, quality control, and appropriate role of community cholesterol screening is needed.

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