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CROSS-SECTIONAL ANALYSIS OF CARDIOVASCULAR RISK FACTORS FOR PARTICIPANTS OF A UNIVERSITY FACULTY AND STAFF WELLNESS PROGRAM

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ABSTRACT

CROSS-SECTIONAL ANALYSIS OF CARDIOVASCULAR RISK FACTORS FOR PARTICIPANTS OF A UNIVERSITY FACULTY AND STAFF WELLNESS PROGRAM. **Frank Essig, Dean Sinclair, Jennifer Hare, Jennifer Moreillon, Daniel Funk, Ann Marie Swank**. **JEP**online 2004;7(4):37-43. Reducing the prevalence of risk factors for cardiovascular disease (CVD) and enhancing physical fitness are important components of worksite wellness programs. Effective programs have the potential to significantly reduce corporate health care costs and enhance employee morale. This study presents descriptive cross-sectional results of CVD risk factors from 541 participants of a comprehensive University Faculty and Staff Wellness Program and compares results with recommended standards. 541 participants (average age = 41.8 ± 9.7 years, range = 21-70 years, 276 males and 265 females) underwent fasting blood lipid profile and glucose determination, height, weight, body composition assessment with hydrostatic weighing, and resting measures of heart rate and blood pressure. Average risk factor results were: BMI = 25.6 ± 12.6, %body fat = 25.2 ± 8.5, resting heart rate (beats/minute) = 73.5 ± 13.7, resting blood pressure (mmHg) = 124.9/78.9 ± 19.9/9.8, total cholesterol (mg/dL) = 210.9 ± 44.4, HDL-C (mg/dL) = 52.8 ± 27.9, TG (mg/dL) = 129.4 ± 93.4, LDL-C (mg/dL) = 132.2 ± 45.6 and glucose (mg/dL) = 98.2 ± 12.3. With the exception of HDL-C and triglycerides most risk factors evaluated indicated modest elevations in comparison to recommended values. Age-related increases in body composition, lipid profile and blood pressure were found for both male and female subjects while age-related increases for blood pressure was only detected in females. Strategies to reduce age-related increases in risk factors may include establishing and encouraging participation in University Wellness programs.

Key Words: Preventive medicine, Exercise, Fitness, Heart disease

INTRODUCTION

The University of Louisville initiated the Faculty Staff Wellness Program (FSWP) in 1985 to promote general health and well being for faculty and staff. The primary impetus for initiating the program was reducing health care costs with the expectation that healthy employees would be able to work more efficiently, require less days of sick leave, and make less use of the health care system. The FSWP was designed to use existing resources available at the University in order to keep operational costs minimal and was offered as a benefit from the Personnel Department. The FSWP offered four components consistent with needs and interests of potential participants (1): CVD risk factor evaluation, exercise testing and prescription, nutrition and weight control counseling, stress management, and organized exercise sessions. Evaluation of the impact of wellness programs in non-corporate settings, especially those settings involving college and University faculty and staff have been rare (8,12). Watts and associates (12) evaluated the impact of such a program on CVD risk factors, however their sample size was small (n = 9). The current paper presents descriptive, cross-sectional results of CVD risk factors in 542 participants, stratified by age in 10-year intervals, collected over the 7 years this service was provided and compares results to currently recommended standards.

METHODOLOGY

Faculty, staff and Master's level graduate students of the Exercise Physiology Laboratory at the University of Louisville performed the CVD risk factor evaluation of the FSWP. An American College of Sports Medicine certified Program Director was responsible for designing and directing the fitness evaluation and participant education. The University employed a cardiologist as Medical Director with the responsibilities of evaluating participant's health status and ability to participate in exercise, based on medical history, physical examination and exercise stress test results. The presence of a cardiologist provided a degree of safety and credibility to the program and likely enhanced participation of the faculty (8). Under the guidance and supervision of the Program and Medical Directors, Exercise Physiology graduate students conducted participant evaluation and counseled participants.

Each participant received instructions describing all procedures to be conducted and completed a health history and lifestyle questionnaire as well as an informed consent form that was approved by the University legal counsel prior to any evaluation procedures. CVD analysis was performed on the Monday morning of each week during the school year and included:

1. Blood sampling by venipuncture. (Each blood sample was sent to a contracted clinical laboratory service for analysis of serum triglycerides, glucose, total cholesterol (TC), High-density lipoprotein-cholesterol (HDL-C), and low-density lipoprotein-cholesterol (LDL-C).)
2. Resting blood pressure by the auscultation method and heart rate as well as heart rhythm using a LifePak-7 EKG monitor.
3. Percent body fat determined by hydrostatic weighing and height and weight were determined using standard scaling procedures.

Exercise Physiology graduate students analyzed the results of the evaluation procedures, including advice from the cardiologist and program director and developed an individualized program consistent with each participant's goals. Each participant received their results in a one on one, private conference thus allowing each participant to receive information most important to their personal lifestyle. All test results were forwarded to the participant's personal physician.

Statistical analysis consisted of a one way Analysis of variance (ANOVA) performed for each CVD risk factor (lipid profile, blood pressure and body composition) across the five age groups ranging from 21-70 years of age

at 10-year intervals. Where significant results were found differences were probed with a Tukey post hoc test. A p-value of < 0.05 was the chosen level of significance.

RESULTS

A total of 540 faculty and staff (275 males and 265 females) underwent the CVD risk factor evaluation, exercise testing and prescription component of the FSWP. The average age for the males was 43.7 ± 9.4 years and for the females 39.9 ± 9.8 years. Table 1 displays age stratified means and standard deviations for body mass index (BMI), weight and percent body fat for both males and females. Statistical analysis demonstrated no significant differences for BMI across age groups for either males or females. Body weight was significantly decreased ($p < 0.05$) for the age group of 61-70 yrs for both males and females, however it must be noted that this group was a small sample size compared to other age groups. Body fat significantly ($p < 0.05$) increased for all four age groups in comparison to the 21-30 year group for both males and females. There were no significant differences between these four age groups for either males or females. These findings indicate the importance of measuring body composition in addition to body weight for assessing changes in cardiovascular risk.

Table 1. Means and standard deviations for BMI, body weight (kgs) and percent body fat for male and female FSWP participants stratified by age.

	Males				
Group	21-30 (n=19)	31-40 (n=93)	41-50 (n=103)	51-60 (n=48)	61-70 (n=13)
BMI	25.5 ± 5.1	25.9 ± 2.7	26.2 ± 3.5	26.9 ± 2.5	24.9 ± 2.5
Weight	79.9 ± 12.9	82.0 ± 6.3	81.2 ± 12.3	82.5 ± 12.0	73.8 ± 8.4*
% Fat	17.7 ± 6.8	19.6 ± 6.4#	22.3 ± 6.3#	23.9 ± 5.5#	22.8 ± 4.3#
	Females				
Group	21-30 (n=50)	31-40 (n=103)	41-50 (n=71)	51-60 (n=35)	61-70 (n=6)
BMI	24.5 ± 3.9	24.9 ± 3.2	25.9 ± 3.6	24.8 ± 3.1	23.3 ± 1.9
Weight	65.9 ± 14.5	66.2 ± 13.9	67.9 ± 15.5	66.8 ± 13.2	61.1 ± 8.0*
% Fat	26.3 ± 8.4	28.3 ± 8.5#	31.2 ± 7.7#	32.6 ± 7.8#	28.4 ± 11.7#

significantly different in comparison to 21-30 year age group.
* significantly different in comparison to all other age groups.

Table 2 presents age-stratified results of lipid profiles including TC, HDL-C, TG, TC/HDL ratio and GLC for both males and females. Both males and females demonstrate significant ($p<0.05$) age-related increases in TC, LDL-C and TG. Specifically, for males aged 41-50 and 51-60, TC, TG and LDL-C were significantly increased ($p < 0.05$) in comparison to the remaining age groups. For females aged 51-60 and 61-70, TC and TG levels were significantly elevated in comparison to the other age groups. For LDL-C this significant finding is expanded to the 41-50 yr age classification. It is interesting to note that the elevations in lipid values correspond to at-risk age groups for CVD events with both males and females. For blood glucose levels no significant differences were detected for either males or females. The American Diabetes Association recommends a fasting glucose level of 60-114 mg/dL. All age groups were within the normal limits for this variable.

Table 2. Means and standard deviations for lipid profile and glucose for male and female FSWP participants stratified by age.

	Males				
	21-30 (n=19)	31-40 (n=93)	41-50 (n=103)	51-60 (n=58)	61-70 (n=13)
TC	193.0 ± 31.2	208.7 ± 53.2	220.1 ± 42.4*	227.5 ± 39.7*	205 ± 33.0
HDL	45.0 ± 12.6	45.7 ± 11.8	46.9 ± 11.5	47.8 ± 14.8	46.6 ± 11.4
TG	118.5 ± 72.2	125.7 ± 66.6	162.9 ± 114.1*	160.3 ± 137.3*	130.3 ± 55.7
GLC	99.8 ± 9.2	98.5 ± 12.4	100.8 ± 11.5	104.3 ± 12.2	101.9 ± 8.7
TC/HDL	4.5 ± 1.2	4.8 ± 1.8	5.0 ± 1.6	4.8 ± 2.8	4.4 ± 2.9
LDL-C	124.4 ± 23.4	137.9 ± 39.9	141.4 ± 31.8*	147.6 ± 29.8*	132.3 ± 24.8
	Females				
	21-30 (n=50)	31-40(n=103)	41-50 (n=71)	51-60 (n=35)	61-70 (n=6)
TC	200.6 ± 37.5	190.9 ± 41.7	218 ± 39.6	232.6 ± 36.9*	233.3 ± 50.5*
HDL	56.2 ± 12.4	55.5 ± 12.7	56.8 ± 14.9	58.3 ± 13.9	60.5 ± 24.5
TG	102.9 ± 56.1	101.2 ± 93.2	121.8 ± 86.1	138.7 ± 50.5*	133.7 ± 67.5*
GLC	94.5 ± 9.6	92.8 ± 10.5	97.5 ± 12.9	101.8 ± 16.0	103.5 ± 17.8
TC/HDL	3.7 ± 1.1	3.6 ± 1.1	4.1 ± 1.3	3.9 ± 2.7	3.9 ± 2.1
LDL-C	123.8 ± 2.8	115.2 ± 31.3	144.7 ± 29.7*	146.1 ± 37.9*	146.1 ± 37.9*

***** significantly different from other age groups ($p < 0.05$)

Table 3 displays age stratified results for resting heart rate, systolic blood pressure and diastolic blood pressure for both males and females. There were no significant differences ($p > 0.05$) noted for males for heart rate or blood pressure at any age group. For females aged 51-60 and 61-70 in comparison to 21-30 and 31-40 age groups the systolic blood pressure was significantly elevated and for the diastolic blood pressure only the age group of 51-60 was elevated again consistent with age groups of women most at risk for CVD.

Table 3. Means and standard deviations for heart rate and blood pressure for male and female FSWP participants stratified by age.

	Males				
	21-30 (n=19)	**31-40 (n=93)**	**41-50 (n=103)**	**51-60 (n=48)**	**61-70 (n=13)**
HR	76.5 ± 15.1	73.2 ± 13.9	70.4 ± 12.8	71.4 ± 11.5	71.4 ± 11.5
SBP	126.4 ± 18.5	126.7 ± 13.8	124.6 ± 11.7	126.2 ± 11.7	126.2 ± 11.7
DBP	78.0 ± 6.8	78.4 ± 8.7	81.6 ± 8.5	82.3 ± 8.4	79.2 ± 8.4
	Females				
	21-30 (n=50)	**31-40 (n=103)**	**41-50 (n=71)**	**51-60 (n=35)**	**61-70 (n=6)**
HR	81.7 ± 13.4	76.8 ± 13.0	80.3 ± 15.4	78.2 ± 9.8	83.7 ± 13.5
SBP	119.6 ± 13.1	118.7 ± 13.9	124.1 ± 15.6	128.7 ± 15.0*	129.3 ± 19.0*
DBP	76.9 ± 8.5	74.5 ± 11.5	78.9 ± 11.0	83.2 ± 8.1*	76.7 ± 11.3

DISCUSSION

This study provides a descriptive, age stratified, cross-sectional analysis of CVD risk factors for participants of a University faculty and staff wellness program. Findings indicate that modest age-related increases were noted for body fat percentage, total cholesterol and triglycerides. In general, across all age groups modest elevations in all risk factors were noted with respect to normative recommended values.

The Expert Panel on Energy, Obesity, and Body Weight Standards characterizes a body mass index (BMI) of 20-24.9 kg/m^2 as a desirable range; 25-29.9 as overweight and > 30 as obese for men and women (5). No significant age-related changes were noted for BMI for either males or females. Values for the five male age classifications ranged from 24.9 to 26.9, with only the 61-70 yr age group classified with a desirable BMI. The

remaining four groups fell in the classification of overweight. The values for the five age classifications for females ranged from 23.3 to 25.9 with four out of the five age groups classified in the desirable range for BMI. Only the 51-60 yr age range was classified in the overweight category.

Normative data for body composition recommends for males <15% average; 16-24% as above average and >25% as at risk and for females 23% average; 24-31 as above average and > 32% as at risk (7). All five of the age groups for the males were classified in the above average category while four of the female age groups were classified as above average and one as at risk (51-60). There were also age-related increases in body composition noted for both males and females. In summary, individuals at above average or at risk body composition levels may be at a reduced capacity to perform their job, may take more days off work, and have greater health care costs. Thus an intervention plan such as the FSWP may be beneficial if weight loss or maintenance strategies such as diet and exercise are included.

The National Cholesterol Education Program (NCEP), Adult Treatment Panel III (ATP III) recommends total cholesterol less than 200 mg/dL for a desirable cholesterol level while a blood cholesterol level of 200-239 mg/dL is considered borderline-high and >240 mg/dL is considered high blood cholesterol (4). For both males and females, four of five age groups were classified in the borderline high-risk category. In addition, there were age-related increases found for both males and females for age ranges of 41-60 and 51-70 respectively in comparison to other age groups. The NCEP, ATP III recommends HDL cholesterol be greater than 35 mg/dL and classifies an HDL-C greater than 60 mg/dL as a negative risk factor for CVD (4). All age groups were above the 35 mg/dL recommendations and one age group for the females was above 60 mg/dL indicating reduced risk of CVD. The NCEP, ATP III recommended that serum triglyceride levels be less than 200 mg/dL for a desirable level (4). All age groups for both males and females were within the normal limits for triglyceride values. Age-related increases were noted for both males and females for age ranges of 41-60 and 51-70 respectively.

The NCEP, ATP III encourages adults to have their total cholesterol measured at least once every 5 years, know their cholesterol numbers, and the ways to lower their cholesterol numbers if elevated (4,9). Perryman et al. (9) indicates that Wellness programs could provide an opportunity to educate faculty and staff for early detection and prevention of chronic diseases such as CVD. In addition, individuals aware their cholesterol values were greater than 200 mg/dL were likely to implement a healthier lifestyle and motivated to attend regular screenings to determine whether their cholesterol values had decreased (9). The method of assessing a credible lipid profile is important as Beerman et al. (2) site the preference for using a 12-hour fast for assessing lipid and glucose profiles rather than portable analyzers and non-fasting conditions. The current study used a 12- hour fast for the lipid profiles generated so values reported are credible.

The Joint Committee on Detection, Evaluation, and Treatment of High Blood Pressure (JNC VII) recommended an optimal blood pressure of <120 mmHg for systolic blood pressure and <80 mmHg for diastolic blood pressure (3). Patients are considered pre-hypertensive when the systolic reading is between 120-139 mmHg or the diastolic reading is 80-89 mmHg. Stage 1 hypertension is characterized by a systolic blood pressure between 140-159 mm Hg or a diastolic blood pressure between 90-99 mm Hg. Three out of five age groups for females were classified as pre-hypertensive while all five male age categories were pre-hypertensive. In addition, age-related increases noted for females aged 51-70 for systolic blood pressure only.

Incorporating a wellness program as part of a benefits package for employees can benefit both employees and the university initiating the program and is a plausible strategy for impacting the age-related increase in risk factors noted in the current data set. The benefits, as stated in a 1992 national survey of worksite health promotion programs, include improved employee health (28%), morale (26%), productivity (16%) and reduced health insurance costs (19%) and absenteeism (19%) (2,9). Compared to costs, such benefits of comprehensive

health promotion programs yield positive results (11). Also, universities can be motivated to promote wellness programs in order to obtain reduced insurance rates with documentation of improved health status of university faculty and staff as a result of participation in such programs (11).

In order to reap the benefits of a Wellness Program it is critical to keep participants involved and one method to accomplish this goal is to offer incentives to employees. One example would be to offer a discount in the employee's insurance premiums as reward for continued participation. In one particular health promotion program, hospital employees received a financial enticement of $100-$150 to continue involvement in the wellness program (10). In yet another strategy, employees earned points for attendance and healthy lifestyle changes adopted over the course of a year. At the end of the year the employees were given rewards based on the number of points accumulated (11). For the universities promoting wellness programs the benefits can include reduced healthcare costs, reduced absenteeism and turnover, as well as improved productivity (10,11). All university employees should be targeted for participation in a FSWP, and the benefits of the program will provide positive feedback to those who continue to practice healthy lifestyles.

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