

cholesterol (LDL-C) and serum triglycerides are major risk factors of this disease (2, 3). The modification of lipid profile may be important both in the prevention and control of coronary heart disease (3). Behavioral methods are recommended by the National Cholesterol Education Programme as the first line of prevention and treatment for hypercholesterolemia and other risk factors (4).

Raja yoga meditation of the Brahmakumaris is a behavioral intervention, which is simple to practice. There are studies showing lowered cholesterol in those practicing yoga and transcendental meditation (3, 4). However, effects of raja yoga meditation on serum lipids in normal, Indian women have not been reported. In an earlier work we have demonstrated an improvement in lipid profile in those practicing raja yoga meditation (5), but this study looked at the cumulative lipid profile of both men and women of all age groups. Therefore, we did a pilot study on normal Indian women to see if the raja yoga meditation had an effect on their lipid profile.

METHODS

This pilot study was conducted on 49 normal female volunteers. All were vegetarians and led a sedentary lifestyle. There was no history of hypertension or diabetes mellitus. None of them were smokers and gave no history of alcohol intake. The volunteers were divided into pre-menopausal women (n=23) and post-menopausal women (n=26). They were further divided into three groups: non-meditators (n=7 in the pre-menopausal

women and n=8 in the post-menopausal women), short term meditators (meditating for 6 months to 5 years; n=8 in the pre-menopausal women and n=9 in the post-menopausal women) and long term meditators (meditating for more than 5 years; n=8 in the pre-menopausal women and n=9 in the post-menopausal women).

The non-meditators were a mixed group of staff and students of B.J. Medical college and Civil hospital, Ahmedabad, Gujarat, India who had never done any kind of meditation. The meditators were practicing raja yoga meditation for 1 hour every morning (7:30 A.M.-8:30 A.M.) at the local Brahmakumari centre, Ahmedabad, Gujarat, India. In raja yoga meditation the individual sat in a relaxed and comfortable position and then used visual or auditory images for concentration. Whenever the mind wandered away, it was to be brought back to the visual or auditory image being used quietly and persistently. This helped one proceed to "dhyana", i.e. meditation.

Lipid profile was assessed as described earlier (5). The protocol was approved by the institution where the work was done and informed consent taken from the subjects.

Statistical methods used :

One-way analysis of variance (ANOVA) was applied to find the significance of differences between the three groups in both the pre and the post-menopausal women. In addition, the groups significantly different at 5% level by ANOVA were subjected to Bonferroni multiple comparisons procedure. Comparison between the pre-menopausal and post-menopausal women in all the three

groups was done using independent sample 't' test and 'P' less than 0.05 were taken as significant.

RESULTS

The lipid profile of non-meditators, short-term meditators and long-term meditators in pre and post-menopausal women is shown in Table I.

Serum cholesterol (P=0.01), serum triglyceride (P=0.04) and LDL-C (P=0.03) were significantly more in non-meditators in the post-menopausal women when compared to those in pre-menopausal women (independent sample t test). High density lipoprotein-C (HDL-C) did not show any significant change. In pre-menopausal women there was no significant difference in the lipid profile among the three groups. In the post-menopausal women, both short and long-term meditators showed a significant lowering of serum cholesterol and LDL-C as compared to non-meditators. Serum triglyceride and HDL-C showed no significant change.

There was no significant change in the lipid profile in short-term meditators between

the pre and post-menopausal women. Neither was there any significant difference in lipid profile in long-term meditators between pre and post-menopausal women.

DISCUSSION

A better lipid profile seen in the raja yoga meditators when compared to non-meditators in our study is similar to other studies on transcendental meditation (4) and yoga (3). However, in these studies the subjects had hypercholesterolemia and were coronary risk subjects. In our study the subjects were normal human female volunteers.

Estrogen, the female sex hormone has a plasma cholesterol lowering action. It also produces vasodilatation (6). These actions reduce atherogenesis, decrease the incidence of myocardial infarction and other complications of atherosclerotic valvular disease in premenopausal women. The circulating levels of estrogen are considerably lower in post-menopausal women. Serum lipids - cholesterol, triglyceride, LDL-C increase while HDL-C decreases with age in women (1, 7). The lipid

TABLE I: Lipid profile in pre and post menopausal women.

<i>Lipid profile (mg/dl)</i>	<i>Non-meditators</i>		<i>Short term meditators</i>		<i>Long term meditators</i>	
	<i>Pre menopausal women</i>	<i>Post menopausal women</i>	<i>Pre menopausal women</i>	<i>Post menopausal women</i>	<i>Pre menopausal women</i>	<i>Post menopausal women</i>
Cholesterol mean±SD	235±61.2	332.3±74.5 [#]	202.5±33.5	238.8±65 [*]	189.4±47.6	232.2±38.5 [*]
Triglyceride mean±SD	102.1±43.4	181.8±86 [#]	114.8±55.7	163.3±110.1	109.9±40.2	143.1±42
HDL-C mean±SD	50.0±26.8	60.5±29.6	42.5±5.4	56.6±21.4	54.7±11.7	52.3±12.8
LDL-C mean±SD	164.5±41.4	235.4±68 [#]	137.0±40.6	149.6±79.2 [*]	112.7±47	151.3±37.4 [*]

HDL-C : High density Lipoprotein - Cholesterol.

LDL-C : Low density Lipoprotein - Cholesterol.

[#]significant at 5% level from pre-menopausal women non meditators.

^{*}significant at 5% level from post-menopausal women non meditators.

profile in pre-menopausal non-meditators was better than that of post-menopausal non-meditators, thus showing them to be at a greater risk for CAD.

In pre-menopausal women, the lipid profile did not improve significantly on practicing raja yoga meditation. However, post-menopausal women showed significant improvement in the lipid profile indicating that raja yoga meditation confers benefits to cardiovascular system by improving the lipid profile in post-menopausal women.

Dietary intervention affects lipid profile (8). Exercise and physical fitness reduce cardiovascular risk (9). In our study, even though the subjects had a similar dietary habit and level of physical activity, meditators in post-menopausal group had significantly lower serum cholesterol and LDL-C levels than non-meditators.

Meditation is believed to gradually diminish sympathetic dominance, resulting in a better balance between the sympathetic and the parasympathetic (10). It also brings about a hypo-metabolic state (11). By modifying the state of anxiety, meditation reduces stress induced sympathetic overactivity (10). Thus, a decrease in sympathetic discharge and better ability to overcome stress can be cited as possible mechanisms for the improvement in lipid profile seen in our study. Metabolic effects of meditation include a decreased adrenocortical activity and long term decreased cortisol secretion and decreased thyroid-stimulating hormone (12). This may be another cause of decrease in serum cholesterol and LDL-C observed in the present study.

Now the question arises as to why raja yoga meditation confers significant benefits in lipid profile only in post-menopausal women? One possibility could be the fact that in the post-menopausal women, serum cholesterol, triglycerides and LDL-C was significantly more in non-meditators as compared to non-meditators in pre-menopausal women. We know that lipid profile increases with age in women (except HDL-C). So probably meditation lowers serum cholesterol and LDL-C when their circulating levels are higher.

This study suggests that though raja yoga meditation does not have an effect on the lipid profile of normal pre-menopausal women, it improves the lipid profile of the post-menopausal women who are at a higher risk of CAD. Thus it provides significant health benefits to the post-menopausal women by reducing the risk factors for CAD. However, the physiological role of raja yoga meditation and its effect on the lipid profile in the post-menopausal women needs to be studied further with larger sample size. Our pilot study indicates that raja yoga meditation has the potential of conferring benefits to cardiovascular system by improving the lipid profile in post-menopausal women.

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